NUENDO *3*

MEDIA PRODUCTION SYSTEM

Mac | PC VERSION

⊙ steinberg

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MIDI realtime parameters and effects

Introduction

This chapter describes the included MIDI realtime effects and their parameters and how to apply and handle MIDI effects.

For each MIDI track, you can set up a number of track parameters and MIDI effects. These affect how the MIDI data is played back, "transforming" MIDI events in real time before they are sent to the MIDI outputs.

On the following pages, the available parameters and effects are described. Keep in mind:

- The actual MIDI events will not be affected – the changes happen "on the fly".
- Since the track parameter settings don't actually change the MIDI data on the track, they will not be reflected in the MIDI editors. To convert the settings to "real" MIDI events, use the Merge MIDI in Loop function (see page 25).

The Inspector – General handling

The track parameters and effects are set up in the Inspector (although some settings are available in the mixer as well). Here's a brief rundown on how to handle the Inspector:

- To show or hide the Inspector, click the Inspector icon on the Project window's toolbar.

- The Inspector for a MIDI track is divided into eight sections. You can fold or unfold the sections individually by clicking on the section name.
Clicking the name for a hidden section brings it to view and hides the other sections. [Ctrl]/[Command]-clicking the tab allows you to hide or show a section without affecting other sections. Finally, [Alt]/[Option]-clicking a tab shows or hides all sections in the Inspector.

- **Folding a section does not affect the functionality but merely hides the section from view.**
In other words, your settings will still be active even if you fold the Inspector settings.

Basic track settings

The topmost Inspector section contains the basic settings for the se-lected MIDI track. These are settings that either affect the basic func-tionality for the track (mute, solo, enable record, etc.) or send out additional MIDI data to the connected devices (program change, vol-ume, etc.). The section contains all settings in the Track list (see the chapter "The Project window" in the Operation Manual), with a few additional parameters:

Parameter	Description
Track name field	Click to rename the track.
Mute/Solo buttons	Mutes or solos the MIDI track.
Read/Write buttons	Used for automating the track settings – see the chapter "Auto-mation" in the Operation Manual.
Input transformer button	Opens the Input Transformer dialog, allowing you to transform incoming MIDI events in real time. For further information, see page 235.
Record enable button	Activate this to make the track ready for recording.
Monitor button	When this is activated (and MIDI Thru Active is on in the Pref-erences–MIDI dialog), incoming MIDI will be routed to the se-lected MIDI output.
Toggle Timebase button	Switches between musical (tempo related) and linear (time re-lated) time base for the track. See the chapter "The Project window" in the Operation Manual.

Parameter	Description
Lock button	Activating this disables all editing of all events on the track.
Lane display type button	Allows you to divide the tracks in lanes.
Edit In-Place button	This opens a type of Key editor in the Project window that allows you to edit events in context with other tracks - see page 115.
Edit button	This opens the channel settings window for the track (a window showing a channel strip with volume fader and other controls, along with effect settings – see the chapter "The mixer" in the Operation Manual).
Volume	Use this to adjust the level for the track. Changing this setting will move the track's fader in the Mixer window, and vice versa. See the chapter "The mixer" in the Operation Manual for more about setting levels.
Pan	Use this to adjust the panning of the track.
Delay	This adjusts the playback timing of the MIDI track. Positive values delay the playback while negative values cause the track to play earlier. The values are set in milliseconds.
In/Out/Chn pop-ups	This is where you select MIDI input, MIDI output and MIDI channel for the track.
Open Device button	If the MIDI track is routed to a VST instrument, clicking this button opens the control panel for the VST instrument.
Bnk/Prg/Programs	Allows you to select sounds by sending MIDI Bank Select and Program Change messages (see below)
Map pop-up	Allows you to select a drum map for the track – see page 128.

▪ **Note that the functionality of the "Programs" settings (used for selecting sounds in the connected MIDI instrument) depends on to which instrument the MIDI output is routed, and how you have set up this in the MIDI Device Manager.**
The MIDI Device Manager allows you to specify which MIDI instruments and other devices are connected to the various MIDI outputs, thus making it possible to select patches by name. See page 145.

▪ **Many of the basic track settings are duplicated in "mixer channel strip form", in the Channel section at the bottom of the Inspector.**
See page 12.

Other Inspector sections

Apart from the basic track settings (above), the Track Parameters and the effect sections (both described on the following pages), the Inspector for a MIDI track also contains the following:

The Channel section

This contains a single channel strip, allowing you to set volume, pan, mute/solo and other parameters for the track. This is a "mirror" of the track's channel strip in the Nuendo mixer – see the chapter "The mixer" in the Operation Manual.

The Notepad section

This is a standard notepad, allowing you to enter notes and comments about the track. Each track has its own notepad in the Inspector.

The Network section

This contains controls related to Nuendo's Network functions. See the Networking pdf document for information.

VST Instrument section

If the MIDI track is routed to a VST Instrument, an additional section will appear at the bottom of the Inspector, labeled with the name of the VST instrument. Clicking this section shows a duplicate of the Inspector settings for the VST Instrument channel. This makes it easy to adjust the channel settings for the VST Instrument while you are editing the MIDI track.

• If the VST Instrument has multiple outputs (and thus several mixer channels), there will be a setting called "Output" at the top of the VST Instrument section.

User Panel section

This allows you to display MIDI device panels, which are control panels for external hardware. See page 157.

Track parameters
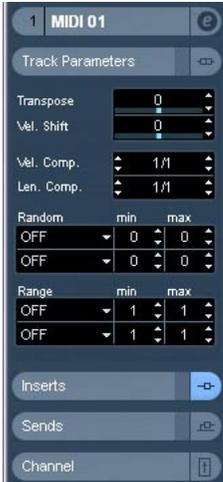
The following settings will affect the MIDI events on the track in real time during playback. They will also be in effect if you play "live" with the track selected and record enabled (provided that "MIDI Thru Active" is activated on the Preferences–MIDI page). This makes it possible to e.g. transpose or adjust the velocity of your live playing.

▪ **If you want to compare the result of your track parameters with the "unprocessed" MIDI, you can use the Bypass button in the Track Parameters section.**
When this is activated, the Track Parameter settings will be temporarily disabled. A bypassed section is indicated by its Inspector tab turning yellow.

Transpose

This allows you to transpose all notes on the track in semitones. The available range is -127 to +127 semitones, but remember that the total range of MIDI note numbers is 0 to 127. Furthermore, not all instruments can play back notes over the whole range. Therefore, extreme transpositions can give rather strange and unwanted results.

▪ **You can also transpose individual MIDI parts using the Transpose field in the info line.**
The transposition in the info line (for the individual part) is added to the transpose value you have set up for the whole track in the Inspector.

Velocity Shift

This setting lets you change the dynamics of all notes on the track. The value in this field is added to the velocity of each note message that is sent out (use negative values to lower the velocities). The range is -127 to +127 with 0 representing no change in velocity.

Note that the effects of changing the velocity depends on the sound and instrument.

▪ **You can also adjust the velocity of events in individual MIDI parts using the Velocity field in the info line.**
The velocity shift in the info line (for the individual part) is added to the velocity shift you have set up for the whole track in the Inspector.

Velocity Compression

This function multiplies the velocity values with the factor you specify. This factor is set using a numerator (left value) and a denominator (right value), resulting in a fractional number (1/2, 3/4, 3/2 etc.). For example, if you set the factor to 3/4, the velocities will be three quarters of their original values. The point is, that this will also affect the difference in velocity between the notes, thereby compressing or expanding the velocity scale. Typically, you would combine this setting with the Velocity Shift parameter. An example:

Let's say you have three notes with the velocity values 60, 90 and 120, and wish to "even out" the velocity differences somewhat. If you set the Velocity Compression value to 1/2, the notes will play back with the velocities 30, 45 and 60. By adding 60 in the Velocity Shift field, you will have the notes playing back with the velocities 90, 105 and 120, meaning you have in effect compressed the velocity range.

In a similar way, you can use Velocity Compression values greater than 1/1 together with negative values in the Velocity Shift field, to expand the velocity range.

Remember that the maximum velocity is always 127 no matter how much you try to expand.

Length Compression

This value adjusts the lengths of all notes on the track. As with Velocity Compression, the value is set with a numerator and denominator. For example, the value 2/1 means that all note lengths will be doubled, while 1/4 means all note lengths will be quarter of the actual lengths.

Random

The Random settings let you introduce random variations to various properties of MIDI notes. Anything from very subtle variations to dramatic changes can be applied. There are two separate "Random generators", each of which are set up in the following way:

1. Pull down the Random pop-up menu and select which note property should be randomized.
   The options are position, pitch, velocity and length.

▪ **Keep in mind that depending on the content of the track, certain parameter changes might not be immediately noticeable, or have any effect at all (as would be the case if applying random length to a percussion track playing "one-shot" samples for example).**
   To best audition the random changes choose a track with clearly defined rhythm and note content, if possible (as opposed to a string pad).

2. Set the desired range of random deviation by entering values in the two number fields.
   The two values govern the limits of the randomization, so that the values will vary between the left value and the right value (you cannot set the left value higher than the right value). The maximum random range for each property is listed in the table below:

Property	Range
Position	-500 to +500 ticks
Pitch	-120 to +120 semitones
Velocity	-120 to +120
Length	-500 to +500 ticks

▪ **Note again that you can make independent settings for the two random generators.**

▪ To deactivate the Random function, pull down the Random pop-up menu(s) and select "OFF".

Range

The Range function lets you specify a note (pitch) or velocity range and either force all notes to fit within this range, or exclude all notes outside this range from playback. As with the Random function, there are two separate Range settings. Set them up as follows:

1. **Pull down the Range pop-up menu and select one of the following four modes:**

Mode	Description
Vel. Limit	This function affects all velocity values outside the specified range. Velocity values below the Min setting (the lower limit of the range) are set to the Min value, and velocity values above the Max setting are set to the Max value. Notes with velocity values within the set range are not affected. Use this if you want to force all velocity values to fit within a certain range.
Vel. Filter	Velocity Filter works by excluding all notes with velocity values outside the specified range. Notes with velocity values below the Min setting or above the Max setting will not be played back. Use this to "isolate" notes with certain velocity values.
Note Limit	This function allows you to specify a pitch range, and forces all notes to fit within this range. Notes outside the specified range are transposed up or down in octave steps until they fit within the range. Note: If the range is too "narrow", so that some notes cannot be fit within the range by octave-transposing, these notes will get a pitch in the middle of the range. For example, if you have a note with a pitch of F3, and the range is C4-E4, that note will be transposed to D4.
Note Filter	Note Filter works by excluding all notes with pitches outside the specified range. Notes lower than the Min setting or higher than the Max setting will not be played back. Use this to "isolate" notes with certain pitches.

2. **Use the two fields to the right to set the min and max values.**
These values will be shown as numbers (0-127) for the velocity modes and as note numbers (C-2 to G8) for the pitch modes.

Note again that you can make independent settings for the two Range functions.

▪ To deactivate the Range function, pull down the Range pop-up menu(s) and select "OFF".

MIDI effects

Nuendo comes with a number of MIDI effect plug-ins, capable of transforming the MIDI output from a track in various ways.

Just like the MIDI track parameters, MIDI effects are applied in real time to the MIDI data played back from the track (or to MIDI you play live "thru" the track).

What are MIDI effects?

Although a MIDI effect can be similar to an audio effect, it's important to remember that you're not processing the sound resulting from MIDI playback, but the MIDI data (the "instructions" for how the music should be played back).

A MIDI effect will change properties of the MIDI events (e.g. change the pitch of notes) and/or generate new MIDI events (for example, a MIDI delay may add new MIDI notes, "echoing" the original notes).

▪ **For descriptions of the inlcuded MIDI effect plug-ins, see .**

Insert and send effects

As with audio effects, there are two ways to route the MIDI events on a track to an effect:

▪ **If you add an insert effect, the MIDI events will be sent to the effect, which will process the data and pass it on to the track's MIDI output (or to another insert effect).**
In other words, the MIDI events will be routed "through" the insert effect.

▪ **If you use a send effect, the MIDI events will be sent both to the track's MIDI output and to the effect.**
That is, you will get both the unprocessed MIDI events and the output of the MIDI effect. Note that the effect can send its processed MIDI data to any MIDI output – not necessarily to the one used by the track.

There are separate sections in the Inspector for Inserts and Sends:

Inserts section

This allows you to add up to four MIDI insert effects. The section contains the following items:

Item	Description
Edit button	Opens the Channel Settings window for the MIDI track.
Bypass button	Click this to temporarily disable all insert effects for the track (useful for comparing with the unprocessed MIDI, etc.).
Inserts section tab	This lights blue if any insert effect is activated.
Effect selection pop-up menu (x 4)	Selecting an effect from this pop-up menu automatically activates it and brings up its control panel (which can be a separate window or a number of settings below the insert slot in the Inspector). To remove an insert effect completely, select "No Effect".
On button (x 4)	Allows you to turn the selected effect on or off.
Edit button (x4)	Click this to bring up the control panel for the selected effect. Depending on the effect, this may appear in a separate window or below the insert slot in the Inspector. Clicking the button again hides the control panel.

▪ **Effects that display their controls in the Inspector can be forced to appear in a separate control panel window by pressing [Alt]/[Option] and clicking the Edit button.**

Sends section

This allows you to add up to four MIDI send effects. Unlike audio send effects, you can select and activate send effects individually for each track. The section contains the following items:

Item	Description
Edit button	Opens the Channel Settings window for the MIDI track.
Bypass button	Click this to temporarily disable all send effects for the track (useful for comparing with the unprocessed MIDI, etc.).
Sends section tab	This lights blue if any send effect is activated.
Effect selection pop-up menu (x 4)	Selecting an effect from this pop-up menu automatically activates it and brings up its control panel (which can be a separate window or a number of settings below the send slot in the Inspector). To remove a send effect completely, select "No Effect".
On button (x 4)	Allows you to turn the selected effect on or off.
Edit button (x4)	Click this to bring up the control panel for the selected effect. Depending on the effect, this may appear in a separate window or below the sends slot in the Inspector. Clicking the button again hides the control panel.
Output pop-up menu (x4)	This determines to which MIDI output the effect should send the processed MIDI events.

Item	Description
Channel setting (x4)	This determines on which MIDI channel the effect should send the processed MIDI events.
Pre button (x4)	If this is activated, the MIDI signals will be sent to the send effects before the track parameters and insert effects.

- **Effects that display their controls in the Inspector can be forced to appear in a separate control panel window by pressing [Alt]/[Option] and clicking the Edit button.**

About presets

Several of the MIDI plug-ins come with a number of presets for instant use. The controls for handling presets consist of a Presets pop-up menu along with Store (+) and Remove (-) buttons.

- To load a preset, select it from the Presets pop-up menu.

- To store your current settings as a preset, click the (+) button to the right.
  A dialog appears, asking you to specify a name for the preset. The stored preset will then be available for selection from the pop-up menu for all instances of that MIDI plug-in, in all projects.

- To remove a stored preset, select it and click the (-) button to the right.

Applying a MIDI insert effect – an example

Here is a step-by-step example of how to add a MIDI insert effect to a MIDI track:

1. Select the MIDI track and open the Inspector.

2. Click the Inserts tab in the Inspector.

▪ Alternatively you could use the mixer: bring up the extended mixer panel and select "Inserts" on the view options pop-up menu for the track's channel strip.

3. Click in one of the insert slots to show the MIDI effect pop-up menu.

4. Select the desired MIDI effect from the pop-up menu.
The effect is automatically activated (the power button for the insert slot lights up) and its control panel appears, either in a separate window or in the Inserts section below the slot (depending on the effect).

Now all MIDI from the track will be routed through the effect.

5. Use the control panel to make settings for the effect.
For descriptions of the included MIDI effects, see page 8.

▪ You can bypass the insert effect by clicking its power button (above the insert slot).

▪ To bypass all insert effects for the MIDI track, use the bypass button in the Inserts section in the Inspector, in the mixer channel strip or in the Track list.

▪ To remove an insert effect, click in its slot and select "No Effect".

Managing plug-ins

Selecting Plug-in Information from the Devices menu opens a window in which all loaded plug-ins, audio and MIDI, are listed.

▪ To view the MIDI effect plug-ins, click the MIDI Plug-ins tab.
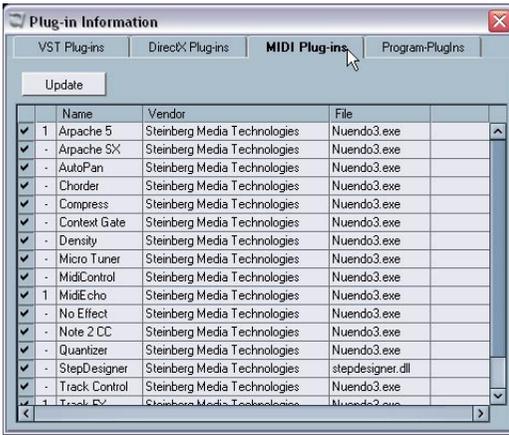
▪ The leftmost column allows you to deactivate plug-ins.
This is useful if you have plug-ins installed that you don't want to use in Nuendo. Only plug-ins that are activated (ticked checkbox) will appear on the MIDI effect pop-up menus.

▪ The second column shows how many instances of each plug-in are currently used in the project.

▪ The remaining columns show various information about each plug-in and cannot be edited.

Merge MIDI in Loop

As mentioned, the parameters and effects described in this chapter do not change the MIDI events themselves, but work rather like "filters", affecting the music on playback. However, sometimes you may want to make these settings permanent, i.e. convert them to "real" MIDI events on the track. You might for example want to transpose a track and then edit the transposed notes in a MIDI editor. For this, you need to use the Merge MIDI in Loop function on the MIDI menu. This combines all MIDI events on all unmuted tracks, applies track parameters and effects and generates a new MIDI part, containing all the events as you would hear them play back.

1. Make sure only the desired MIDI track(s) are unmuted.
   If you only want to include events from a single track in the Merge operation, you may want to solo the track.

2. Set up the left and right locator around the area you want to merge.
   Only events starting within this cycle area will be included.

3. Select the track on which you want the new part to be created.
   This could be a new track or an existing track. If there are data in the cycle area on the track, you can choose whether this should be kept or overwritten (see below).

4. Select Merge MIDI in Loop from the MIDI menu.
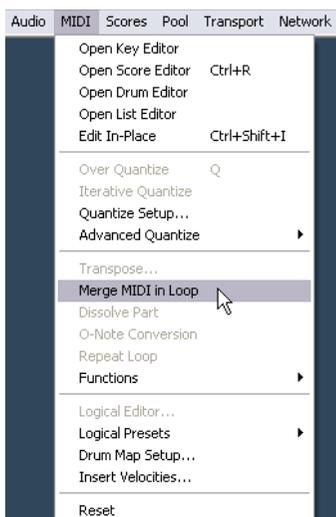
5. Fill in the dialog that appears.

The options in the dialog are:

Option	Description
Include Inserts	If this is activated, any MIDI insert effects activated for the track(s) will be applied.
Include Sends	If this is activated, any MIDI send effects activated for the track(s) will be applied.
Erase Destination	If this is activated, all MIDI data between the left and right locator on the destination track will be deleted.

6. Click OK.

A new part is created between the locators on the destination track, containing the processed MIDI events.

Applying effects to a single part

Normally, the MIDI track parameters and effects affect a whole MIDI track. This may not always be what you want – you may want to apply some MIDI effects to a single part for example (without having to create a separate track for that part only). The Merge MIDI in Loop function can help:

1. Set up your track parameters and MIDI effects the way you want them for the part.

This will of course affect the whole track, but focus on the part for now.

2. Set the locators to encompass the part.

This is easiest done by selecting the part and selecting Locators to Selection from the Transport menu (or using the corresponding key command, by default [P]).

3. Make sure the track holding the part is selected in the Track list.

4. Select Merge MIDI in Loop.

5. In the dialog that appears, activate the desired effect options, make sure that Erase Destination is activated and click OK.

Now a new part is created on the same track, containing the processed events. The original part is deleted.

6. Turn off or reset all track parameters and effects, so that the track plays back as usual.

The included MIDI effects

Arpache 5
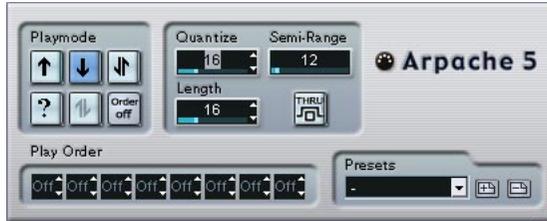
A typical arpeggiator accepts a chord (a group of MIDI notes) as input, and plays back each note in the chord separately, with the playback order and speed set by the user. The Arpache 5 arpeggiator does just that, and more. Before describing the parameters, let's look at how to create a simple, typical arpeggio:

1. Select a MIDI track and activate monitoring (or record enable it) so that you can play "thru" the track.
Check that the track is properly set up for playback to a suitable MIDI instrument.

2. Select and activate the arpeggiator.
For now, use it as an insert effect for the selected track.

3. In the arpeggiator panel, use the Quantize setting to set the arpeggio speed.
The speed is set as a note value, relative to the project tempo. For example, setting Quantize to "16" means the arpeggio will be a pattern of sixteenth notes.

4. Use the Length setting to set the length of the arpeggio notes.
This allows you to create staccato arpeggios (Length smaller than the Quantize setting) or arpeggio notes that overlap each other (Length greater than Quantize).

5. Set the Semi-Range parameter to 12.
This will make the notes arpeggiate within an octave.

6. Play a chord on your MIDI instrument.
Now, instead of hearing the chord, you will hear the notes of the chord played one by one, in an arpeggio.

7. Try the different arpeggio modes by clicking the Playmode buttons.

The symbols on the buttons indicate the playback order for the notes (up, down, up+down, etc.). The Play Order settings are described below.
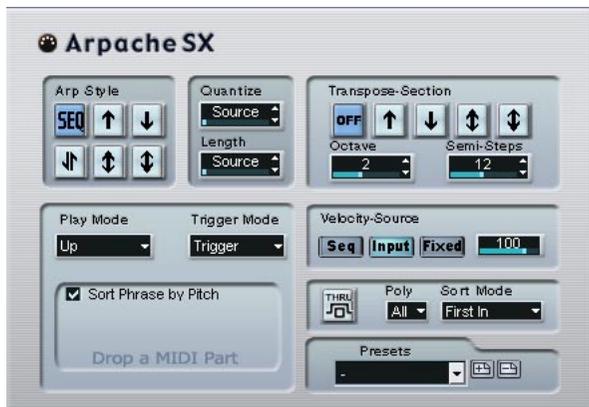
Parameters

The Arpache 5 has the following settings:

Setting	Description
Playmode buttons	Allows you to select the playback order for the arpeggiated notes. The options are down+up, up+down, up, down, random ("?" button) and "Order off", in which case you can set the playback order manually with the Play Order fields below.
Quantize	Determines the speed of the arpeggio, as a note value related to the project tempo. The range is 32T (1/32 note triplets) to 1. (dotted note values).
Length	Sets the length of the arpeggio notes, as a note value related to the project tempo. The range is the same as for the Quantize setting.
Semi-Range	Determines the arpeggiated note range, in semitones counted from the lowest key you play. This works as follows: - Any notes you play that are outside this range will be transposed in octave steps to fit within the range. - If the range is more than one octave, octave-transposed copies of the notes you play will be added to the arpeggio (as many octaves as fit within the range).
Thru	If this is activated, the notes sent to the arpeggiator (i.e. the chord you play) will be passed through the plug-in (sent out together with the arpeggiated notes).
Play Order	If the "Order on" playmode is selected, you can use these "slots" to specify a custom playback order for the arpeggio notes: Each slot corresponds to a position in the arpeggio pattern. For each slot, you specify which note should be played on that position by selecting a number. The numbers correspond to the keys you play, counted from the lowest pressed key. So, if you play the notes C3-E3-G3 (a C major chord), "1" would mean C3, "2" would mean E3, and "3" would mean G3. Note that you can use the same number in several slots, creating arpeggio patterns that are not possible using the standard play modes.

Arpache SX

This is an even more versatile and advanced arpeggiator, capable of creating anything from traditional arpeggios to complex, sequencer-like patterns. The Arpache SX has the following parameters:

Parameter	Description
Arp Style	Determines the basic behaviour of the Arpache SX. In the Seq mode, the arpeggiator uses an imported MIDI part as a starting point for the pattern – this is described below. All other modes describe how the notes in the chord you play should be arpeggiated – up, down, up & down, mostly up or mostly down.
Quantize	Determines the resolution of the arpeggio, i.e. its "speed". The "Source" setting is used in Seq mode, see below.
Length	Determines the length of the arpeggio notes. The "Source" setting is used in Seq mode, see below.
Transpose	When a mode other than "Off" is selected, the arpeggio will be expanded upwards, downwards or both (depending on the mode). This is done by adding transposed repeats of the basic arpeggio pattern. The "Octave" setting sets the number of transposed repeats and the "Semi-Steps" setting determines how much each repeat will be transposed.
Play Mode	See the description of Seq mode below!
Trigger Mode	See the description of Seq mode below!

Parameter	Description
Velocity Source	Determines the velocity of the notes in the arpeggio. The options are Seq (used in Seq mode only), Input (the same as the velocity values of the corresponding notes in the chord you play) or Fixed, in which case all arpeggio notes will get the velocity set in the value field to the right.
Thru	If this is activated, the notes sent to the arpeggiator (i.e. the chord you play) will be passed through the plug-in (sent out together with the arpeggiated notes).
Poly	Determines how many notes should be accepted in the input chord. The "All" setting means there are no limitations.
Sort Mode	When you play a chord into the Arpache SX, the arpeggiator will look at the notes in the chord as sorted in the order specified here. For example, if you play a C-E-G chord, with "Note Lowest" selected, C will be the first note, E will be the second and G the third. This affects the result of the Arp Style setting.

Seq mode

When Seq mode is selected in the Arp Style section, the Arpache SX uses an additional MIDI part as a pattern. This pattern then forms the basis for the arpeggio, in conjunction with the MIDI input.

▪ To import a MIDI part into the Arpache SX, drag it from the Project window and drop it in the "Drop a MIDI Part" section on the Arpache SX.

Now, the notes in the dropped MIDI part will be sorted internally, either according to their pitch ("Sort Phrase by Pitch" checkbox activated) or according to their play order in the part. This results in a list of numbers. For example, if the notes in the MIDI part are C E G A E C and they are sorted according to pitch, the list of numbers will read 1 2 3 4 2 1. Here, there are 4 different notes/numbers and 6 trigger positions.

Now the MIDI input (the chord you send into the Arpache SX) will also generate a list of numbers, with each note in the chord corresponding to a number depending on the Sort Mode setting.

The two lists of numbers will now be matched – the Arpache SX tries to play back the pattern from the dropped MIDI file but using the notes from the MIDI input (chord). The result depends on the Trigger Mode setting:

Trigger Mode	Description
Trigger	The whole pattern from the dropped MIDI file will be played back, but transposed according to one of the notes in the MIDI input. Which note is used for transposing depends on the Sort Mode setting.
Trigger Cnt.	As above, but even when all keys are released, the phrase continues playing from the last position (where it stopped), when a new key is pressed on the keyboard. This is typically used when playing "live" through the Arpache SX.
Sort Normal	Matches the notes in the MIDI input to the notes in the dropped MIDI part. If there are fewer notes (numbers) in the MIDI input, some steps in the resulting arpeggio will be empty.
Sort First	As above, but if there are fewer notes in the MIDI input, the missing notes will be replaced by the first note.
Sort Any	As above, but if there are fewer notes in the MIDI input, the missing notes will be replaced by any (random) note.
Arp. Style	As above, but if there are fewer notes in the MIDI input, the missing notes will be replaced by the last valid note in the arpeggio.

Finally, the Play Mode setting affects the resulting arpeggio. Note also that you can choose to keep the original note timing, note length and note velocities from the dropped MIDI part, by selecting "Source" in the Quantize and Length fields, and "Seq" in the Velocity Source section.

Autopan

This plug-in works a bit like an LFO in a synthesizer, allowing you to send out continuously changing MIDI controller messages. One typical use for this is automatic MIDI panning (hence the name), but you can select any MIDI Continuous Controller event type. The Autopan effect has the following parameters:

Waveform selectors

These determine the shape of the controller curves sent out. The results of most of these waveforms are obvious from looking at the buttons, but a few of them require some extra explanations:

This generates a "random" controller curve.

These generate curves with a "periodical envelope". The amplitude will gradually increase or decrease over a time, set with the Period parameter (see below).

Period

This is where you set the speed of the Autopan, or rather the length of a single controller curve cycle. The value can be set in ticks (1/480ths of quarter notes), or as rhythmically exact note values (by clicking the arrow buttons next to the value). The lower the note value, the slower the speed. For example, if you set this to 240 ("8th") the waveform will be repeated every eighth note.

Density

This determines the density of the controller curves sent out. The value can be set in ticks (1/480ths of quarter notes), or as rhythmically exact note values (by clicking the arrow buttons next to the value). The higher the note value, the smoother the controller curve. For example, if you set this to 60 (shown as "32th") a new controller event will be sent out every 60th tick (at every 1/32 note position).

You should probably avoid extremely low Density values, as these will generate a very large number of events (which may cause the MIDI instrument to "choke", delaying notes etc.).

AmpMod

This is only used for the two waveforms with "periodical envelopes" (see above). The period value (set in beats) determines the length of the envelope. In the following figure, Period is set to 4th and the Amp-Mod is 4 beats. This results in a quarter note-based curve in which the top amplitude decreases gradually, repeated each bar:
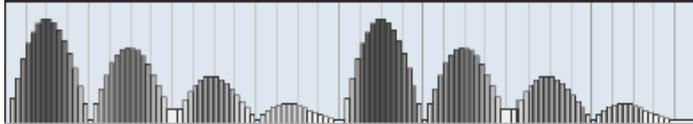
Controller

Determines which Continuous Controller type is sent out. Typical choices would include pan, volume and brightness but your MIDI instrument may have controllers mapped to various settings, allowing you to modulate the synth parameter of your choice – check the MIDI implementation chart for your instrument for details!

Min and Max

These determine the minimum and maximum controller values sent out, i.e. the "bottom" and "top" of the controller curves.

Chorder

The Chorder is a MIDI chord processor, allowing you to assign complete chords to single keys in a multitude of variations. There are three main modes of operation: Normal, Octave and Global. You switch between these modes by clicking the respective button to the left below the keyboard.
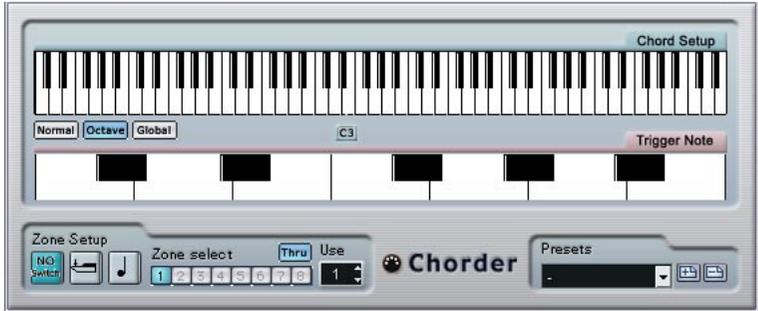
Normal mode
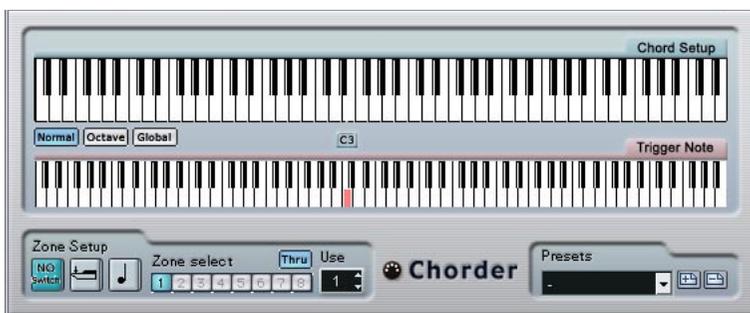
In this mode, you can assign a different chord to each single key on the keyboard. Proceed as follows:

1. Select the key to which you want to assign a chord, by clicking in the lower "Trigger Note" keyboard display.

2. Set up the desired chord for that key by clicking in the upper "Chord Setup" keyboard display.
Clicking a key adds it to the chord; clicking it again removes it.

3. Repeat the above with any other keys you wish to use.

If you now play the keys you have set up, you will instead hear the assigned chords.

Octave mode

The Octave mode is similar to the Normal mode, but you can only set up one chord for each key in an octave (that is, twelve different chords). When you play a C note (regardless of whether it's a C3, C4 or any other octave) you will hear the chord set up for the C key.

Global mode
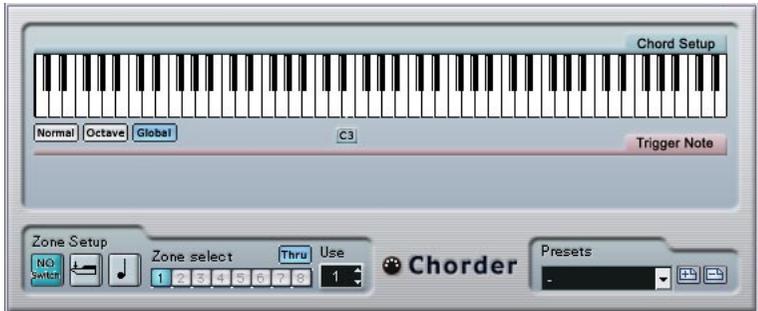
In the Global mode, you only set up a single chord, using the Chord Setup keyboard display (the lower keyboard display is hidden). This chord is then played by all keys on the keyboard, but transposed according to the note you play.

Using switches

The Switch Setup section at the bottom of the panel allows you to set up variations to the defined chords. This works with all three modes and provides a total of eight variations for each assignable key (that is, a maximum of 8 different chords in Global mode, 12x8 chords in Octave mode and 128x8 chords in Normal mode).

The variations can be controlled by velocity or note range. Here's how you set it up:

1. Select one of the two switch modes: velocity or note.
How to use these is explained below.

The velocity switch mode selected.

2. Specify how many variations you want to use with the Use value box.

3. Click the first Switch Select button and set up the chord(s) you want for the first variation.

4. Click the next Switch Select button and set up the chord(s) you want for that variation.

5. Repeat this for the number of variations you specified with the Use setting.
Each Switch Select button corresponds to a variation.

6. Now you can play the keyboard and control the variations according to the selected switch modes.
These work as follows:

Switch mode	Description
Velocity	The full velocity range (1-127) is divided into "zones", according to the number of variations you specified. For example, if you're using two variations (Max is set to 2) there will be two velocity "zones": 1-63 and 64-127. Playing a note with velocity at 64 or higher will trigger the second variation, while playing a softer note will trigger the first variation.

Switch mode	Description
Note	In this mode, the chorder will play one chord at a time – you cannot play several different chords simultaneously. When the Note switch mode is selected, you play a key to determine the base note for the chord, then press a higher key to select a variation. The variation number will be the difference between the two keys. To select variation 1, press a key one semitone higher than the base note, for variation 2, press a key two semitones higher, and so on.

▪ To turn the variation switch feature off, select the "No Switch" mode.

Compress

This MIDI compressor is used for evening out or expanding differences in velocity. Though the result is similar to what you get with the Velocity Compression track parameter, the Compress plug-in presents the controls in a manner more like regular audio compressors. The parameters are:

Parameter	Description
Threshold	Only notes with velocities over this value will be affected by the compression/expansion.
Ratio	This determines the rate of compression applied to the velocity values above the threshold level. Ratios greater than 1:1 result in compression (i.e. less difference in velocity) while ratios lower than 1:1 result in expansion (i.e. greater difference in velocity). What actually happens is that the part of the velocity value that is above the threshold value is divided by the ratio value.
Gain	This adds or subtracts a fixed value from the velocities. Since the maximum range for velocity values is 0-127, you may need to use the Gain setting to compensate, keeping the resulting velocities within the range. Typically, you would use negative Gain settings when expanding and positive Gain settings when compressing.

Context Gate
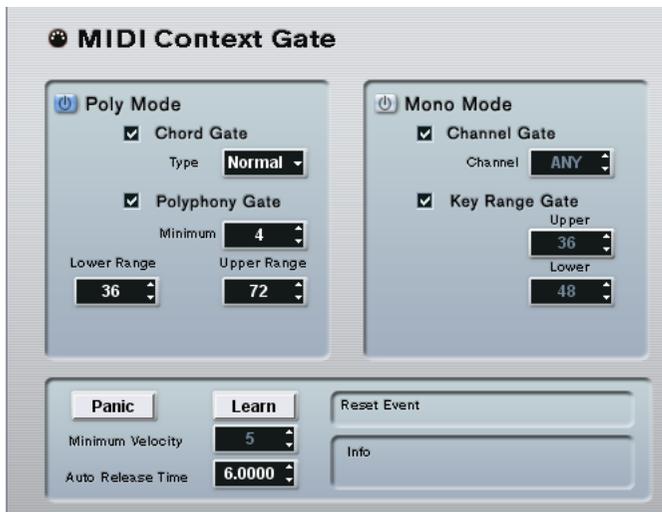
The Context Gate allows for selective triggering/filtering of MIDI data. It can be used for context selective control of MIDI devices. The following parameters are available:

Poly Mode – Chord Gate

When Chord Gate is activated, only notes in recognized chords are let through. There are two modes of chord recognition available; Simple and Normal. In Simple mode, all standard chords (major/minor/b5/ dim/sus/maj7 etc.) are recognized, whereas Normal mode also takes more tensions into account.

Poly Mode – Polyphony Gate

This allows you to filter MIDI according to the number of pressed keys within a given key range. This can be used independently or in conjunction with the Chord Gate function.

▪ The Minimum value field allows you to specify the minimum number of notes needed for the notes to be let through.

▪ The Upper/Lower Range sets the key range.
Only notes within this range will be let through.

Mono Mode – Channel Gate

When this is activated, only single note events in a specified MIDI channel are let through, which can be used with MIDI controllers that can send MIDI over several channels simultaneously, for example guitar controllers which send data for each string over a separate channel. You can either set this to a specific channel (1-16), or to "Any", i.e. no channel gating.

Mono Mode – Key Range Gate

This can be used independently or in conjunction with the Channel Gate function. Played notes will sound (no note off message) until a note is played inside the set Upper and Lower range (and additionally the set Channel Gate channel, if checked).

Learn button

When this is activated, you can specify a Reset trigger event via MIDI. Whenever this specific MIDI event is sent, it triggers an "All Notes Off" message. When you have set the Reset event, the Learn button should be deactivated.

Auto Release time

If there is no input activity, all resounding notes are sent a note off message after the set time, in seconds or milliseconds.

Min Velocity

Notes below a set velocity threshold value will be gated.

Panic button

Sends an "All Notes Off" message over all channels, in case of hanging notes.

Density

This generic control panel affects the "density" of the notes being played from (or thru) the track. When this is set to 100%, the notes are not affected. Lowering the Density setting below 100% will randomly filter out or "mute" notes. Raising the setting above 100% will instead randomly add new notes.

Micro Tuner

The Micro Tuner lets you set up a different microtuning scheme for the instrument, by detuning each key.

▪ Each Detune field corresponds to a key in an octave (as indicated by the keyboard display). Adjust a Detune field to raise or lower the tuning of that key, in cents (hundreds of a semitone).

▪ Set the Convert setting according to whether the track is routed to a VST instrument or a "real" standard MIDI instrument (capable of receiving microtuning information).

The Micro Tuner comes with a number of presets, including both classical and experimental microtuning scales.

MIDIControl

This generic control panel allows you to select up to eight different MIDI controller types, and use the value fields/sliders to set values for these. A typical use for this would be if you're using a MIDI instrument with parameters that can be controlled by MIDI controller data (e.g. filter cutoff, resonance, levels, etc.). By selecting the correct MIDI controller types, you can use the plug-in as a control panel for adjusting the sound of the instrument from within Nuendo, at any time.

▪ To select a controller type, use the pop-up menus to the right.
▪ To deactivate a controller slider, set it to "Off" (drag the slider all the way to the left).

MIDIEcho

This is an advanced MIDI Echo, which will generate additional echo-ing notes based on the MIDI notes it receives. It creates effects similar to a digital delay, but also features MIDI pitch shifting and much more. As always it is important to remember that the effect doesn't "echo" the actual audio, but the MIDI notes which will eventually produce the sound in the synthesizer.

The following parameters are available:

Quantize

The echoed notes will be moved in position to a quantizing grid, as set up with this parameter. You can either use the slider or type to set the value in ticks (1/480 ticks of quarter notes) or click the arrow buttons to step between the "rhythmically exact" values (displayed as note values – see the table below). This makes it easy to find rhythmically relevant quantize values, but still allows experimental settings in between.

An example: setting this to "16th" will force all echo notes to be played on exact 16th note positions, regardless of the timing of the original notes and the Echo-Quant. setting.

▪ **To disable quantizing, set this parameter to its lowest value (1).**

Length

This sets the length of the echoed notes. This can either be the same as their original notes (parameter set to its lowest value, "Source") or the length you specify manually. You can either set the length in ticks or click the arrow buttons to step between the "rhythmically exact" lengths (displayed as note values – see the table below).

▪ **The length can also be affected by the Length Decay parameter.**

Repeat

This is the number of echoes (1 to 12) from each incoming note.

Echo-Quant.

The Echo-Quant. parameter sets the delay time, i.e. the time between a played note and its first echo note. You can either use the slider or type to set the value in ticks (1/480 ticks of quarter notes) or click the arrow buttons to step between the "rhythmically exact" delay times (displayed as note values – see the table below).

For example, setting this to "8th" will cause the echo notes to sound an eighth note after their original notes.

▪ **The echo time can also be affected by the Echo Decay parameter.**

Velocity Decay

This parameter allows you to add or subtract to the velocity values for each repeat so that the echo fades away or increases in volume (provided that the sound you use is velocity sensitive). For no change of velocity, set this to 0 (middle position).

Echo Decay

This parameter lets you adjust how the echo time should be changed with each successive repeat. The value is set as a percentage.

▪ When set to 100% (middle position) the echo time will be the same for all repeats (as set with the Echo-Quant. parameter).
▪ If you raise the value above 100, the echoing notes will play with gradually longer intervals (i.e. the echo will become slower).
▪ If you lower the value below 100, the echoing notes will become gradually faster, like the sound of a bouncing ball.

Pitch Decay

If you set this to a value other than 0, the repeating (echoing) notes will be raised or lowered in pitch, so that each successive note has a higher or lower pitch than the previous. The value is set in semitones.

For example, setting this to -2 will cause the first echo note to have a pitch two semitones lower than the original note, the second echo note two semitones lower than the first echo note, and so on.

Length Decay

This parameter lets you adjust how the length of the echoed notes should change with each successive repeat. The higher the setting (25 – 100), the longer the echoed notes will be compared to their original notes.

About ticks and note values

The timing- and position-related parameters (Echo-Quant., Length and Quantize) can all be set in ticks. There are 480 ticks to each quarter note. While the parameters allow you to step between the rhythmically relevant values (displayed as note values), the following table can also be of help, showing you the most common note values and their corresponding number of ticks:

| Note Value	Ticks
1/32 note	60
1/16 note triplet	90
1/16 note	120
1/8 note triplet	160
1/8 note	240
Quarter note triplet	320
Quarter note	480
Half note	960

Note to CC
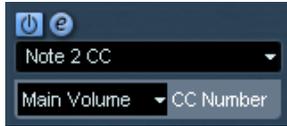
This effect will generate a MIDI continuous controller event for each incoming MIDI note. The value of the controller event corresponds to the note number (pitch) and the single parameter allows you to select which MIDI controller should be sent out (by default controller 7, MIDI volume). The incoming MIDI notes pass through the effect unaffected.

For example, if MIDI volume (controller 7) is selected, notes with low note numbers (pitches) will lower the volume in the MIDI instrument, while higher note numbers will raise the volume. This way you can create "keyboard tracking" of volume or other parameters.

Note that a controller event is sent out each time a new note is played. If high and low notes are played simultaneously, this could lead to somewhat confusing results. Therefore, the Note to CC effect is probably best applied to monophonic tracks (playing one note at a time).

Quantizer
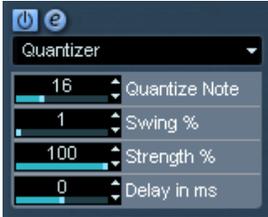
Quantizing is a function that changes the timing of notes by moving them towards a "quantize grid". This grid may consist of e.g. straight sixteenth notes (in which case the notes would all get perfect sixteenth note timing), but could also be more loosely related to straight note value positions (applying a "swing feel" to the timing, etc.).

While the Quantize function on the MIDI menu applies the timing change to the actual notes on a track, the Quantizer effect allows you to apply quantizing "on the fly", changing the timing of the notes in real time. This makes it easier to try out different settings when creating grooves and rhythms. Note however, that the main Quantize function contains settings and features that are not available in the Quantizer.

The Quantizer has the following parameters:

| Parameter	Description
Quantize Note	This sets the note value on which the quantize grid is based. Straight notes, triplets and dotted notes are available. For example, "16" means straight sixteenth notes and "8T" means eighth note triplets.
Swing	This allows you to offset every second position in the grid, creating a swing or shuffle feel. The value is a percentage – the higher you set this, the farther to the right every even grid position is moved.
Strength	This determines how close the notes should be moved to the quantize grid. When set to 100%, all notes will be forced to the closest grid position; lowering the setting will gradually loosen the timing.
Delay	This delays (positive values) or advances (negative values) the notes in milliseconds. Unlike the Delay setting in the Track Parameters, this delay can be automated.

Step Designer
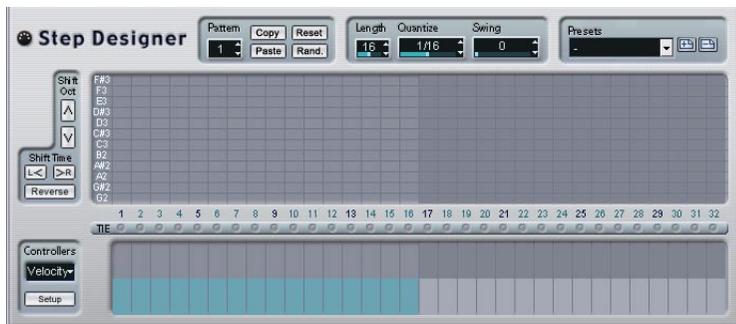
The Step Designer is a MIDI pattern sequencer that sends out MIDI notes and additional controller data according to the pattern you set up. It does not make use of the incoming MIDI, other than automation data (such as recorded pattern changes).

Creating a basic pattern

1. Use the Pattern selector to choose which pattern to create.
Each Step Designer can hold up to 200 different patterns.

2. Use the Quantize setting to specify the "resolution" of the pattern.
In other words, this setting determines how long each step is. For example, if Quantize is set to "16th" each step will be a sixteenth note.

3. Specify the number of steps in the pattern with the Length setting.
As you can see in the note display, the maximum number of steps is 32. For example, setting Quantize to 16 and Length to 32 would create a two bar pattern with sixteenth note steps.

4. Click in the note display to insert notes.
You can insert notes on any of the 32 steps, but the Step Designer will only play back the number of steps set with the Length parameter.

- The display spans one octave (as indicated by the pitch list to the left). You can scroll the displayed octave up or down by clicking in the pitch list and dragging up or down.
  This way you can insert notes at any pitch. Note that each step can contain one note only – the Step Designer is monophonic.
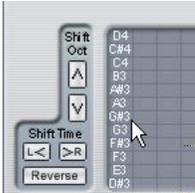
Click and drag to view other octaves.

- To remove a note from the pattern, click on it again.

5. Select "Velocity" on the Controllers pop-up menu.
   This pop-up menu determines what is shown in the lower controller display.

6. Adjust the velocity of the notes by dragging the velocity bars in the controller display.
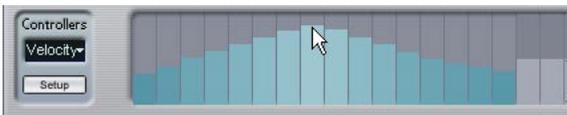
7. To make notes shorter, select "Gate" on the Controllers pop-up menu and lower the bars in the controller display.
   When a bar is set to its maximum value (fully up), the corresponding note will be the full length of the step (as set with the Quantize parameter).

8. To make notes longer, you can tie two notes together. This is done by inserting two notes and clicking the Tie button below the second note.
   When the Tie button is lit for a note, it won't retrigger – instead the previous note will be lengthened. Also, the tied (second) note will automatically get the same pitch as the first note. You can add more notes and tie them in the same way, creating longer notes.

9. If you now start playback in Nuendo, the pattern will play as well, sending out MIDI notes on the track's MIDI output and channel (or, if you have activated the Step Designer as a send effect, on the MIDI output and channel selected for the send in the Inspector).

Adding controller curves

The Controllers pop-up menu has two more items: two controller types.

▪ You can select which two controller types (filter cutoff, resonance, volume, etc.) should be available on the pop-up menu by clicking the Setup button and selecting controllers from the lists that appears. This selection is global to all patterns.

▪ To insert controller information in a pattern, select the desired controller from the pop-up menu and click in the controller display to draw events. The MIDI controller events will be sent out during playback along with the notes.

▪ **If you drag a controller event bar all the way down, no controller value will be sent out on that step.**

Other pattern functions

The following functions make it easier to edit, manipulate and manage patterns:

| Function	Description
Shift Oct	These buttons allow you to shift the entire pattern up or down in octave steps.
Shift Time	Moves the pattern one step to the left or right.
Reverse	Reverses the pattern, so that it plays backwards.
Copy/Paste	Allows you to copy the current pattern and paste it in another pattern location (in the same Step Designer or another).
Reset	Clears the pattern, removing all notes and setting controller values to default.
Random	Generates a completely random pattern – useful for experimenting.
Swing	The Swing parameter allows you to offset every second step, creating a swing or shuffle feel. The value is a percentage – the higher you set this, the farther to the right every even step is moved.
Presets	See page 22. Note that a stored Preset contains all 200 patterns in the Step Designer.

Automating pattern changes

You can create up to 200 different patterns in each Step Designer – just select a new pattern and add notes and controllers as described above.

Typically, you want the pattern selection to change during the project. You can accomplish this by automating the Pattern selector, either in real time by activating the Write automation and switching patterns during playback or by drawing in the automation subtrack for the Step Designer's MIDI track. Note that you can also press a key on your MIDI keyboard to change patterns. For this, you have to set up the Step Designer as an insert effect for a record enabled MIDI track. Press C1 to select pattern 1, C#1 to select pattern 2, D1 to select pattern 3, D#1 to select pattern 4 and so on. If you want, you can record these pattern changes as note events on a MIDI track. Proceed as follows:

1. Select the desired MIDI track or create a new one and activate the Step Designer as an insert effect.

2. Set up several patterns as described above.

3. Press the Record button and press the desired keys on your keyboard to select the corresponding patterns.
   The pattern changes will be recorded on the MIDI track.

4. Stop recording and play back the MIDI track.
   You will now hear the recorded pattern changes.

▪ **This will only work for the first 92 patterns.**

Track Control
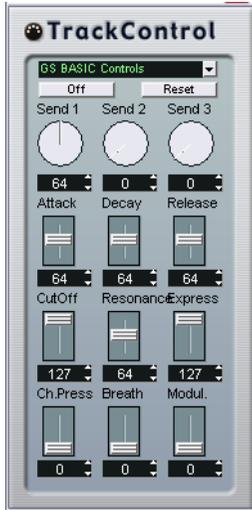
The Track Control effect contains three ready-made control panels for adjusting parameters on a GS or XG compatible MIDI device. The Roland GS and Yamaha XG protocols are extensions of the General MIDI standard, allowing for more sounds and better control of various instrument settings. If your instrument is compatible with GS or XG, the Track Controls effect allows you to adjust sounds and effects in your instrument from within Nuendo.

Selecting a control panel

At the top of the Track Controls effect window you will find a pop-up menu. This is where you select which of the available control panels to use:

Control panel	Description
GS Basic Controls	Effect sends and various sound control parameters for use with instruments compatible with the Roland GS standard.
XG Effect + Sends	Effect Sends and various sound control parameters for use with instruments compatible with the Yamaha XG standard.
XG Global	Global settings (affecting all channels) for instruments compatible with the Yamaha XG standard.

About the Reset and Off buttons

Regardless of the selected mode, you will find two buttons labelled "Off" and "Reset" at the top of the control panel:

▪ Clicking the Off button will set all controls to their lowest value, without sending out any MIDI messages.
▪ Clicking the Reset button will set all parameters to their default values, and send out the corresponding MIDI messages.
For most parameters, the default values will be zero or "no adjustment", but there are exceptions to this. For example, the default Reverb Send settings are 64.

GS Basic Controls

The following controls are available when the GS Basic Controls mode is selected:

Control	Description
Send 1	Send level for the reverb effect.
Send 2	Send level for the chorus effect.
Send 3	Send level for the "variation" effect.
Attack	Adjusts the attack time of the sound. Lowering the value shortens the attack, while raising it gives a slower attack. Middle position (64) means no adjustment is made.
Decay	Adjusts the decay time of the sound. Lowering the value shortens the decay, while raising it makes the decay longer.
Release	Adjusts the release time of the sound. Lowering the value shortens the release, while raising it makes the release time longer.
Cutoff	Adjusts the filter cutoff frequency.
Resonance	Adjusts the filter resonance.
Express	Allows you to send out expression pedal messages on the track's MIDI channel.
Press.	Allows you to send out aftertouch (channel pressure) messages on the track's MIDI channel. This is useful if your keyboard cannot send aftertouch, but you have sound modules that respond to aftertouch. The default value for this parameter is zero.
Breath	Allows you to send breath control messages on the track's MIDI channel.
Modul.	Allows you to send modulation messages on the track's MIDI channel (just as you normally do with a modulation wheel on a MIDI keyboard).

XG Effects + Sends

The following controls are available when the XG Effects + Sends mode is selected:

Control	Description
Send 1	Send level for the reverb effect.
Send 2	Send level for the chorus effect.
Send 3	Send level for the "variation" effect.
Attack	Adjusts the attack time of the sound. Lowering this value shortens the attack, while raising it gives a slower attack. Middle position means no adjustment is made.
Release	Adjusts the release time of the sound. Lowering this value shortens the release, while raising it makes the release time longer. Middle position means no adjustment is made.
Harm.Cont	Adjusts the harmonic content of the sound.
Bright	Adjusts the brightness of the sound.
CutOff	Adjusts the filter cutoff frequency.
Resonance	Adjusts the filter resonance.

XG Global Settings

In this mode, the parameters affect global settings in the instrument(s). Changing one of these settings for a track will in fact affect all MIDI instruments connected to the same MIDI output, regardless of the MIDI channel setting of the track. Therefore, to avoid confusion it might be a good idea to create an empty track and use this only for these global settings.

The following controls are available:

Control	Description
Eff. 1	This allows you to select which type of reverb effect should be used: No effect (the reverb turned off), Hall 1-2, Room 1-3, Stage 1-2 or Plate.
Eff. 2	This allows you to select which type of chorus effect should be used: No effect (the chorus turned off), Chorus 1-3, Celeste 1-3 or Flanger 1-2.
Eff. 3	This allows you to select one of a large number of "variation" effect types. Selecting "No Effect" is the same as turning off the variation effect.
Reset	Sends an XG reset message.
MastVol	This is used to control the Master Volume of an instrument. Normally you should leave this in its highest position and set the volumes individually for each channel (with the volume faders in the Nuendo mixer or in the Inspector).

Track FX

This plug-in is essentially a duplicate of the Track Parameter section. This can be useful if you e.g. need extra Random or Range settings, or if you prefer to have your track parameters in a separate window (to get this, [Alt]/[Option]-click the Edit button for the effect).

The Track FX also includes an additional function that isn't available among the track parameters:
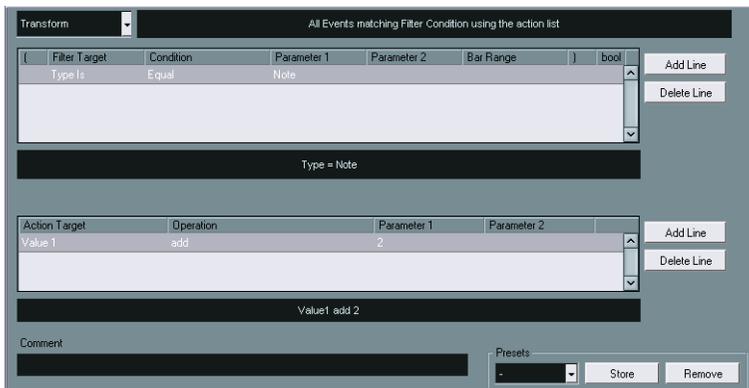
Scale Transpose
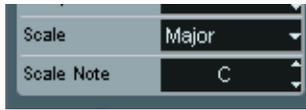
This allows you to transpose each incoming MIDI note, so that it fits within a selected musical scale. The scale is specified by selecting a key (C, C#, D, etc.) and a scale type (major, melodic or harmonic minor, blues, etc.).

▪ **To turn Scale Transpose off, select "No Scale" from the Scale pop-up menu.**

Transformer

The Transformer is a real-time version of the Logical Editor. With this you can perform very powerful MIDI processing on the fly, without affecting the actual MIDI events on the track.

The Logical Editor is described starting on page 211. As the parameters and functions are almost identical, the descriptions for the Logical Editor also apply to the Transformer. Where there are differences between the two, this is clearly stated.

2
MIDI processing and quantizing

Introduction

This chapter describes the various MIDI processing functions available on the MIDI menu. These offer various ways to change MIDI notes and other events, in the Project window or within a MIDI editor.

MIDI functions vs. track parameters

In some cases, the result of a MIDI function can also be obtained by using MIDI track parameters and effects (see page 8). For example, the MIDI functions transpose and quantize are also available as a track parameter and a MIDI effect, respectively. The main difference is that track parameters don't affect the actual MIDI events on the track in any way, while MIDI functions change the events "permanently" (although recent changes can be undone). Use the following guidelines to decide which path to choose:

- If you want to adjust a few parts or events only, use MIDI functions. The track parameters and effects affect the output of the whole track (although they can be made permanent in a specific area with the Merge MIDI in Loop function).
- If you want to experiment with different settings, track parameters can be the best way to go.
- Track parameter settings are not reflected in the MIDI editors, since the actual MIDI events aren't affected. This can be potentially confusing; if you've e.g. transposed notes using track parameters, the MIDI editors will still show the notes with their original pitch (but they will play back at their transposed pitch). MIDI functions can be a better way in those cases.

Of course, there are also MIDI functions that have no track parameter counterpart, and vice versa.

What is affected by the MIDI functions?

Which events are affected when you use a MIDI function depends on the function, the active window and the current selection:

- A MIDI function may only apply to MIDI events of a certain type.
  For example, quantization affects notes only, while the Delete Controllers function obviously applies to MIDI controller events.
- In the Project window, the MIDI functions apply to all selected parts, affecting all events (of the relevant types) in them.
- In the MIDI editors, the MIDI functions apply to all selected events. If no events are selected, all events in the edited part(s) will be affected.

Quantizing

What is quantizing?

Quantizing in its fundamental form is a function that automatically moves recorded notes, positioning them on exact note values:

For example, if you record a series of eighth notes, some of them may end up slightly beside the exact eighth note positions.
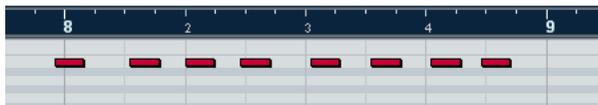
Quantizing the notes with the quantize grid set to eighth notes will move the "misplaced" notes to exact positions.


However, quantizing is not only a method of correcting errors, it can also be used creatively in various ways. For example, the "quantize grid" does not have to consist of perfectly straight notes, some notes can automatically be excluded from quantizing, etc.

▪ **When quantizing MIDI, only notes are affected (not other event types).**
It is also possible to quantize audio events, which is especially useful when working with Nuendo's loop slicing features – see the chapter "Working with hitpoints and slices" in the Operation Manual.

Setting Up

At its most basic, setting up quantizing consists of selecting a note value from the Quantize pop-up menu on the toolbar (in the Project window or a MIDI editor).

Straight note values — Triplet note values — Dotted note values
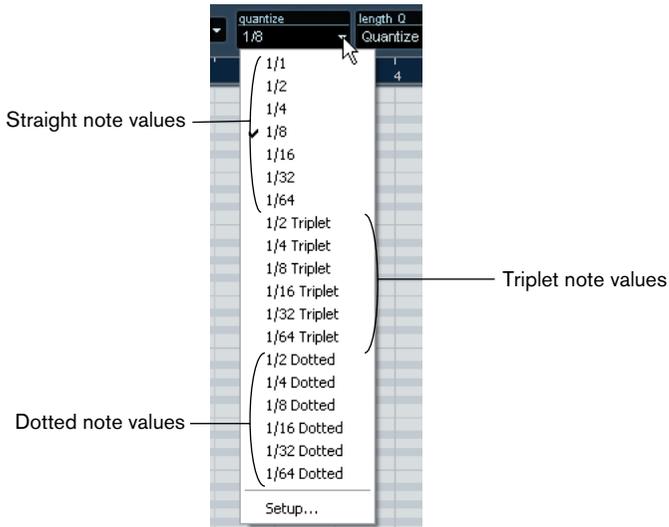
By default, this allows you to quantize to exact note values (straight, triplet or dotted notes) only. If you want more options, select "Quantize Setup…" from the MIDI menu (or "Setup…" from the Quantize pop-up menu) to open the Quantize Setup dialog.
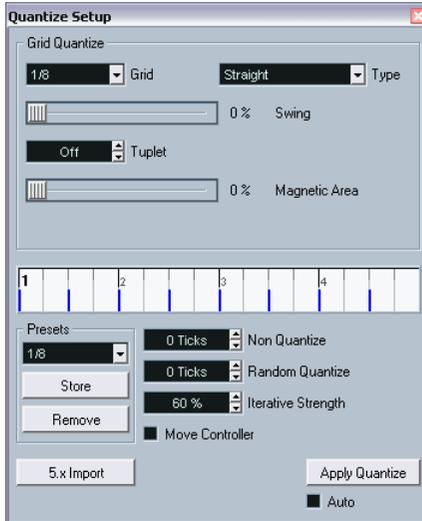
Any settings you make in the dialog are immediately reflected in the Quantize pop-up menus. However, if you want your settings permanently available on the Quantize pop-up menus, you have to use the presets functions (see page 63).

The dialog contains the following settings:

Grid display

The grid display shows one bar (four beats), with blue lines indicating the quantize grid (the positions that notes will be moved to).

The Grid and Type pop-ups

These are used to determine the basic note value for the quantizing grid. In other words, these have the same functionality as the Quantize pop-up menu on the toolbar.

Swing

The Swing slider is only available when a straight note value is selected for the grid and Tuplet is off (see below). It lets you offset every second position in the grid, creating a swing or shuffle feel. When you adjust the Swing slider, the result is shown in the grid display below.
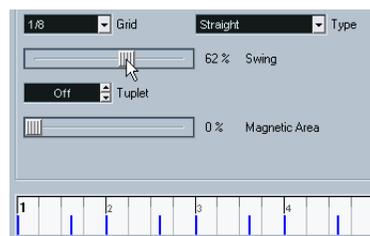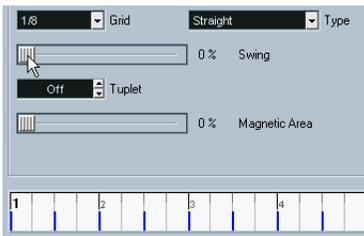
A straight eighth note grid compared with a grid with 62% swing.

Tuplet

Allows you to create more rhythmically complex grids, by dividing the grid into smaller steps.

Magnetic Area

This allows you to specify that only notes within a certain distance from the grid lines should be affected by quantizing.

- When the slider is set to 0%, the Magnetic Area function is deactivated, i.e. all notes are affected by quantizing.
  If you move the slider gradually to the right, you will note how the magnetic areas are shown around the blue lines in the grid display.
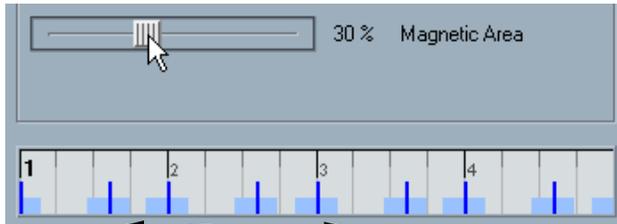
Only notes within the indicated zones will be affected by quantizing.

Presets

The controls in the lower left corner of the dialog allow you to store the current settings as a preset, available on the Quantize menus in the toolbars. The usual preset procedures apply:

- To store the settings as a preset, click the Store button.

- To "load" a stored preset, showing the stored settings in the dialog, just select it from the pop-up menu.
  This is useful if you want to modify an existing preset.

- To rename the selected preset, double click on the name and type in a new one.

- To remove a stored preset, select it from the pop-up menu and click Remove.

  You can also create presets by extracting existing grooves – see page 65.

Auto and Apply

These functions allow you to apply quantizing directly from the dialog, as described below.

If you don't want to apply the quantizing you have set up in the dialog, you can close the window by clicking its standard close box. You can also leave the dialog open while you continue working.

The Non Quantize setting

This is an additional setting that affects the result of the quantizing. It allows you to set a "distance" in ticks (120ths of sixteenth notes).

Events that already are within the specified distance from the quantize grid will not be quantized. This allows you to keep slight variations when you quantize, but still correct notes that are too far from the grid.

The Random Quantize setting

This is an additional setting that affects the result of the quantizing. It allows you to set a "distance" in ticks (120ths of sixteenth notes).

Events will be quantized to random positions within the specified "distance" from the quantize grid, thus creating a more "loose" quantizing. Much like the Non Quantize setting, this allows for slight variations, while at the same time keeping notes from ending up too far from the grid.

The Iterative Strength setting

This affects the results of the Iterative Quantize function, as described below.

The Move Controller setting

When this is activated, controllers related to notes (pitch bend, etc.) are automatically moved with the notes when these are quantized.

Extracting a groove

You can extract the groove from an audio event or MIDI part and turn it into a Quantize preset:

▪ To extract the groove from an audio event, you use Hitpoints and the "Create Groove Quantize" function.
See the chapter "Working with hitpoints and slices" in the Operation Manual.

▪ To extract the groove from a MIDI part, you select the part and select "Part to Groove" from the Advanced Quantize submenu on the MIDI menu.

In both cases, the resulting groove appears on the Quantize menus and you apply it as you would any Quantize preset. You can also view and edit the resulting quantize settings in the Quantize Setup dialog.

Applying quantize

There are several ways to apply the quantize:

▪ The standard method is to select "Over Quantize" from the MIDI menu (or using a key command, by default [Q]).
This quantizes the selected MIDI parts or notes, according to the current Quantize pop-up menu setting.

▪ You can also apply quantizing directly from the Quantize Setup dialog, by clicking the "Apply" button.

▪ If you activate the "Auto" checkbox in the Quantize Setup dialog, any change you make in the dialog is immediately applied to the selected MIDI parts or notes.
A great way of using this feature is to set up a playback loop, and adjust the settings in the dialog until you get the desired result.

When you apply quantize, the result is based on the original position of the notes. Therefore, you can freely try different quantize settings with no risk of "destroying" anything. See also Undo and Freeze Quantize, .

### The Auto Quantize function

If you activate the Auto Q button on the Transport panel, all MIDI recordings you make are automatically quantized according to the settings you have made in the Quantize Setup dialog.

Iterative Quantize

Another way to apply "loose" quantization is to use the Iterative Quantize function on the MIDI menu. It works like this:

Instead of moving a note to the closest quantize grid position, Iterative Quantize moves it only part of the way. You specify how much the notes should be moved towards the grid with the Iterative Strength setting in the Quantize Setup dialog.

Iterative Quantize is also different from "regular" quantization, in that the operation is not based on the notes' original positions but on their current, quantized position. This makes it possible to repeatedly use Iterative Quantize, gradually moving the notes closer to the quantize grid until you've find the desired timing.
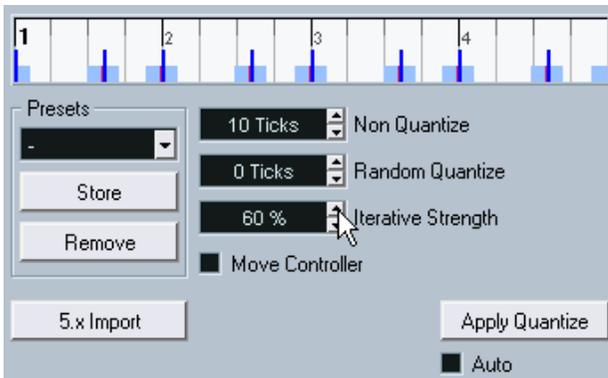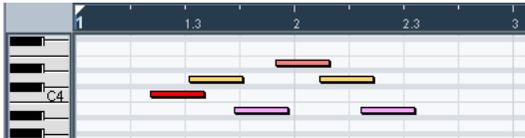
Quantize Lengths

This function is only available from within the MIDI editors.

This function (on the Advanced Quantize submenu on the MIDI menu) will quantize the length of the notes, without changing their start positions. At its most basic level, this function will set the length of the notes to the Length Quantize value on the MIDI editors' toolbar. However, if you have selected the "Quantize Link" option on the Length Quantize pop-up menu, the function will resize the note according to the quantize grid, taking the Swing, Tuplet and Magnetic Area settings into account. An example:
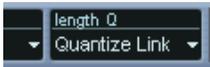
1. Length Quantize set to "Quantize Link".

2. Some notes, all a 1/16th note of length.

3. Here, the quantize value has been set to straight 1/16th notes with Swing at 100%. Since Snap is activated (see page 140), the quantize grid is reflected in the note display's grid.

4. Selecting Quantize Lengths will adjust the note lengths according to the grid. If you compare the result to the first figure above, you will find that notes that started within the odd sixteenth note "zones" got the longer grid length, and notes in the even zones got the shorter length.

Quantize Ends

The Quantize Ends function on the Advanced Quantize submenu will only affect the end positions of notes. Apart from that, it works just like regular quantizing, taking the Quantize pop-up menu setting into account.

Undo and Freeze Quantize

As mentioned above, the original position of each quantized note is stored. Therefore, you can make the selected MIDI notes revert to their original, unquantized state at any time, by selecting Undo Quantize from the Advanced Quantize submenu. This is independent from the regular Undo History.

However, there may be situations when you want to make the quantized positions "permanent". For example, you may want to quantize notes a second time, having the results based on the current quantized positions rather than the original positions. To make this possible, select the notes in question and select "Freeze Quantize" from the Advanced Quantize submenu. This makes the quantized positions permanent.

After you have performed a Freeze Quantize for a note, you cannot undo its quantization.

Transpose

The Transpose item on the MIDI menu opens a dialog with settings for transposing the selected notes:
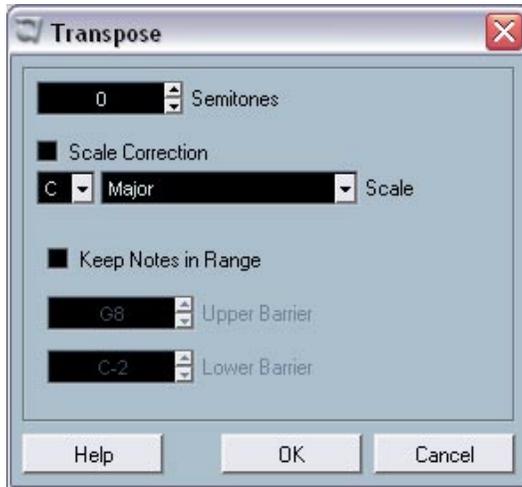
Semitones

This is where you set the amount of transposition.

Scale Correction

Scale Correction transposes the selected notes by forcing them to the closest note of the selected scale type. This can be used for creating interesting key and tonal changes, either by itself or in conjunction with the other settings in the Transpose dialog.

▪ To activate Scale Correction, click the checkbox.

▪ Select a root note for the scale from the note drop-down menu.
Make sure to select the correct root note if you want to keep the result in the same key as the original notes, or select an entirely different key if you want to experiment.

▪ Select the desired scale type from the Scale drop-down menu.

Keep Notes in Range

When this checkbox is activated, transposed notes will remain within the Upper and Lower Barrier values.

▪ If a note ends up outside the barriers after transposition, it will be shifted to another octave, keeping the correct transposed pitch if possible.
If this isn't possible (if you have set a very narrow range between the Upper and Lower Barrier), the note will be transposed "as far as possible", i.e. to the Upper or Lower Barrier note. If you set the Upper and Lower Barriers to the same value, all notes will be transposed to this pitch!

OK and Cancel

Clicking OK performs the transposition. Clicking Cancel closes the dialog without transposing.

Other MIDI menu functions

The following items can be found on the MIDI menu–Functions sub-menu:

Legato

Extends each selected note so that it reaches the next note. You can specify the desired gap or overlap with the "Legato Overlap" setting in the Preferences dialog (Editing page).

When using Legato with this setting, each note will be extended to end 5 ticks before the next note.

Fixed Lengths

This function is only available from within the MIDI editors.

This function resizes all selected notes to the length set with the Length Quantize pop-up menu on the MIDI editor toolbar.

Delete Doubles

This function removes double notes, i.e. notes of the same pitch on the exact same position. Double notes can occur when recording in Cycle mode, after Quantizing, etc.

This function always affects whole MIDI parts.

Delete Controllers

This function removes all MIDI controllers from the selected MIDI parts.

This function always affects whole MIDI parts.

Delete Continuous Controllers

This function removes all "continuous" MIDI controller events from the selected MIDI parts. That is, "on/off" events such as sustain pedal events are not removed.

This function always affects whole MIDI parts.

Delete Notes

Allows you to delete very short or weak notes. This is useful for automatically removing unwanted "ghost notes" after recording. Selecting "Delete Notes…" opens a dialog in which you set up the criteria for the function:
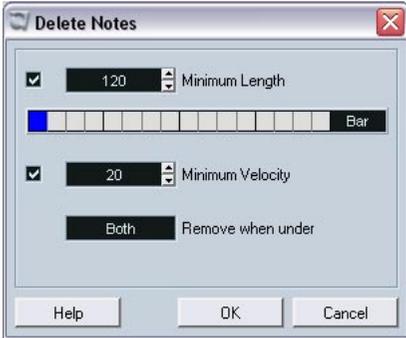
The parameters have the following functionality:

Minimum Length

When the Minimum Length checkbox is activated, the note length is taken into account, allowing you to remove short notes. You can either specify the minimum length (for notes to be kept) in the value display or by dragging the blue line in the graphical length display below.

▪ The graphical length display can correspond to 1/4 bar, one bar, two bars or four bars.
You change this setting by clicking in the field to the right of the display.

In this case, the whole length display corresponds to one bar, and the Minimum Length is set to 1/32nd notes (60 ticks).

Minimum Velocity

When the Minimum Velocity checkbox is activated, the velocity of notes is taken into account, allowing you to remove weak notes. You specify the minimum velocity (for notes to be kept) in the value display.

Remove when under

This setting is only available when both Minimum Length and Minimum Velocity is activated. By clicking the value display, you select whether both length and velocity criteria must be met for notes to be deleted, or whether one of the criteria will suffice.

OK and Cancel

Clicking OK performs the automatic delete according to the rules set up. Clicking Cancel closes the dialog without deleting notes.

Restrict Polyphony

Selecting this item opens a dialog in which you can specify how many "voices" should be used (for the selected notes or parts). Restricting the polyphony this way is useful when you have an instrument with limited polyphony and want to make sure all notes will be played. The effect is achieved by shortening notes as required, so that they end before the next note starts.

Pedals to Note Length

This function scans for Sustain pedal on/off events, lengthens the affected notes to match the Sustain pedal off position, and then removes the Sustain Controller on/off events.

Delete Overlaps (mono)

This function allows you to make sure that no two notes of the same pitch overlap (i.e. that one starts before the other ends). Overlapping notes of the same pitch can confuse some MIDI instruments (a new Note On is transmitted before the Note Off is transmitted). This command can then be used to automatically rectify the problem.

Delete Overlaps (poly)

This function shortens notes when required, so that no note begins before another ends. This happens regardless of which pitch the notes have.

Velocity

This function opens a dialog that allows you to manipulate the velocity of notes in various ways.
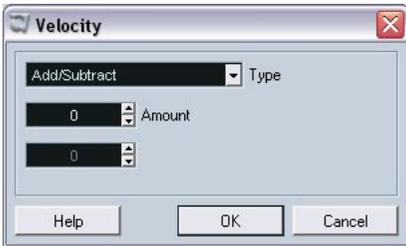
To apply the function, select one of the three processing types from the Type pop-up, adjust the settings and click OK (to close the dialog without applying, click Cancel).

The following types of velocity processing are available:

Add/Subtract

This simply adds a fixed number to the existing velocity values. You set the value (positive or negative) with the Amount parameter.

Compress/Expand

Compresses or expands the "dynamic range" of MIDI notes by scaling the velocity values according to the Ratio setting (0 – 300%). The principle behind this is that multiplying different velocity values with a factor higher than 1 (over 100%) will also make the differences between velocity values greater, while using a factor lower than 1 (under 100%) will make the differences smaller. In short:

- To compress ("even out" velocity differences), use ratio values below 100%.
  After compression, you would probably want to add a velocity amount (with the Add/Subtract function) to maintain the average velocity level.

- To expand (create greater difference in velocity), use ratio values above 100%.
  Before you expand, you may want to adjust the velocity with the Add/Subtract function, so that the average velocity is somewhere in the middle of the range. If the average velocity is high (near 127) or low (near 0), expansion will not work properly, simply because velocity values can only be between 0 and 127!

Limit

This function allows you to make sure that no velocity values fall outside a given range (the Lower and Upper values). Any velocity values outside this range are raised/lowered to exactly the Lower/Upper values.

Fixed Velocity

This function sets the velocity of all selected notes to the Insert Velocity value on the toolbar in the MIDI editors.

Thin Out Data

Thins out MIDI data. Use this to ease the load on MIDI devices if you have recorded very dense controller curves etc.

Reverse

This function inverts the order of the selected events (or of all events in the selected parts), causing the MIDI music to play backwards. Note though, that the effect is different from reversing an audio recording. With MIDI, the individual notes will still play as usual in the MIDI instrument – it's only the order of playback that is changed.

Dissolve Part

The Dissolve Part function on the MIDI menu has two separate uses:

▪ When you work with MIDI parts (on MIDI channel "Any") containing events on different MIDI channels.
Dissolve Part separates the events according to MIDI channel.

▪ When you want to separate MIDI events according to pitch.
A typical example would be drum and percussion tracks, where each pitch usually corresponds to a separate drum sound.

Dissolving parts into separate channels

Setting a track to MIDI channel "Any" will cause each MIDI event to play back on its original MIDI channel, rather than a channel set for the whole track. There are two main situations when "Any" channel tracks are useful:

▪ When you record several MIDI channels at the same time.
You may for example have a MIDI keyboard with several keyboard zones, where each zone sends MIDI on a separate channel. Recording on an "Any" channel track allows you to play back the recording with different sounds for each zone (since the different MIDI notes play back on separate MIDI channels).

▪ When you have imported a MIDI file of Type 0.
MIDI files of Type 0 contain only one track, with notes on up to 16 different MIDI channels. If you were to set this track to a specific MIDI channel, all notes in the MIDI file would be played back with the same sound; setting the track to "Any" will cause the imported file to play back as intended.

The Dissolve Part function scans MIDI parts for events on different MIDI channels and distributes the events into new parts on new tracks, one for each MIDI channel found. This allows you to work with each musical part individually. Proceed as follows:

1. Select the part(s) containing MIDI data on different channels.

2. Select "Dissolve Part" from the MIDI menu.

3. In the dialog that appears, select the "Separate Channels" option.

Now, for each MIDI channel used in the selected part(s), a new MIDI track is created and set to the corresponding MIDI channel. Each event is then copied into the part on the track with the corresponding MIDI channel. Finally, the original part(s) are muted.

An example:

This part contains events on
MIDI channel 1, 2 and 3.

Selecting "Dissolve Part" creates new parts on new tracks, set to channel 1, 2 and 3. Each new part contains only the events on the respective MIDI channel.

The original MIDI part is muted.

Dissolving parts into separate pitches

The Dissolve Part function can also scan MIDI parts for events of different pitch, and distribute the events into new parts on new tracks, one for each pitch. This is useful when the different pitches are not used in a regular melodic context, but rather for separating different sounds (e.g. MIDI drum tracks or sampler sound FX tracks). By dissolving such parts, you can work with each sound individually, on a separate track. Proceed as follows:

1. Select the part(s) containing MIDI data.

2. Select "Dissolve Part" from the MIDI menu.

3. In the dialog that appears, select the "Separate Pitches" option.
   A new MIDI track is created for each used pitch in the selected part(s). The events are then copied into the parts on the track for the corresponding pitch. Finally, the original part(s) are muted.

3

The MIDI editors

About editing MIDI

There are several ways to edit MIDI in Nuendo. You can use the tools and functions in the Project window for large-scale editing, or use the functions on the MIDI menu to process MIDI parts in various ways (see page 58). For hands-on graphical editing of the contents of MIDI parts, you use the MIDI editors:

▪ **The Key Editor is the default MIDI editor, presenting notes graphically in an intuitive piano roll-style grid.**
The Key Editor also allows for detailed editing of non-note events such as MIDI controllers.

▪ **The Edit In-Place function allows you to edit MIDI parts directly in the Project window.**
This is much like working in the Key Editor, but makes it easier to edit MIDI in context with other track types. See page 115.

▪ **The Drum Editor is similar to the Key Editor, but takes advantage of the fact that with drum parts, each key corresponds to a separate drum sound.**
This is the editor to use when you're editing drum or percussion parts.

▪ **The List Editor shows all events in the selected MIDI parts as a list, allowing you to view and edit their properties numerically.**

▪ **The Score Editor shows MIDI notes as a musical score and comes with advanced tools and functions for notation, layout and printing.**
The Score Editor is described in the separate document "Score Layout and Printing". However, even if your focus is on creating printed scores we recommend that you study this chapter as well, to get a grip on the common MIDI editing procedures.

▪ **Finally, you can also edit MIDI in the Project Browser.**
Like the List Editor, this shows the events in a list and allows you to perform numerical editing. However, you will probably find the List Editor more suited for MIDI editing, since it has various dedicated features and functions for this. The Project Browser is described in the Operation Manual .

About this chapter

This chapter describes how to use the Key, Drum and List Editors. Please note that a lot of features are identical in these editors (especially in the Key and Drum Editors) – they are all described in the Key Editor section. The sections about the Drum Editor (see page 117) and the List Editor (see page 132) describe the specific features of these editors only.

Opening a MIDI editor

There are two ways to open a MIDI editor:

▪ Select one or several parts (or a MIDI track, with no parts selected) and select Open Key Editor, Open Score Editor, Open Drum Editor or Open List Editor from the MIDI menu (or use the corresponding key command).
The selected parts (or all parts on the track, if no part was selected) will open in the chosen editor.

▪ Double click a part.
Which editor opens depends on the settings in the Preferences dialog (Event Display–MIDI page):

Double clicking will open the editor selected on the Default Edit Action pop-up menu. However, if the option "Edit as Drums when Drum Map is assigned" is activated and a drum map is selected for the edited track (see page 128), the Drum Editor will open. This way you can double click to open the Key Editor (or the Score Editor or List Editor, depending on your preferences) but drum tracks will automatically open in the Drum Editor.

- **If the part you open for editing is a shared copy, any editing you perform will affect all shared copies of this part.**
  Shared copies are created by pressing [Alt]/[Option]+[Shift] and dragging, or by using the Repeat function with the "Shared copies" option activated. In the Project window, shared copies are indicated by the part name in italics and an icon in the right corner of the part (see the chapter "The Project window" in the Operation Manual).

Handling several parts

When you open a MIDI editor with several parts (or a MIDI track containing several parts) selected, you might find it somewhat hard to get an overlook of the different parts when editing.

If so, the editor toolbar features a few functions to make working with multiple parts easier and more comprehensive:

- The Part List menu lists all parts that were selected when you opened the editor (or all parts on the track, if no parts were selected), and lets you select which part should be active for editing.
  When you select a part from the list, it is automatically made active and centered in the note display.

- **Note that it is also possible to activate a part by using the Arrow tool and clicking on an event in a part.**

- The button "Edit Active Part Only" lets you restrict editing operations to the active part only.
  If you for example select "All" from the Select submenu on the Edit menu with this option activated, only events in the active part will be selected. Similarly, if you select notes by dragging with the Arrow tool (making a selection rectangle), only the notes in the active part will be selected.

"Edit Active Part Only" activated on the toolbar.

- You can zoom in on the active part so that it fills the screen by selecting "Zoom to Event" from the Zoom submenu on the Edit menu.

- The button "Show Part Borders" can be used if you want to see clearly defined borders for the active part.
  When this is activated, all parts except the active one are grayed out, making the borders easily discernible. In the Key Editor, there are also two "markers" in the ruler with the name of the active part, marking its beginning and end. These can be moved freely to change the size of the part.

"Show Part Borders" activated on the toolbar.

- It is possible to cycle between parts, making them active, with key commands.
  In the Key Commands dialog – Edit category, there are two functions: "Activate Next Part" and "Activate Previous Part". If you assign key commands to these, you can use them to cycle between parts in the editors. Please refer to the chapter "Key commands" in the Operation Manual for instructions on how to set up key commands.

The Key Editor – Overview
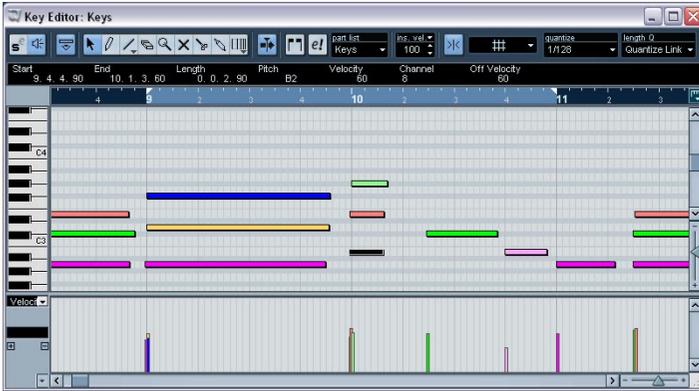
The toolbar

As in other windows, the toolbar contains tools and various settings. The user can configure what toolbar items should be shown or hidden and store/recall different toolbar configurations – see the chapter "Customizing" in the Operation Manual.

Solo Editor button   Key Editor tools   Show/Hide Part borders   Part list

Audition on/off   Show/Hide Info line   Autoscroll on/off   Edit active part only

Velocity for inserted notes   Transpose Palette

Nudge Tools   Snap on/off   Grid modes

Quantize settings · Step Input · Step/Midi input controls

Midi Input

Mouse pointer display: Current pitch- and meter position · Color pop-up menu · Chord recognition display

Independent track loop on/off · Loop range (see page 91). · Open Device Button

The info line

Start	End	Length	Pitch	Velocity	Channel
1.02.04.008	1.04.04.014	0.2.0.6	C6	100	1

The info line shows information about selected MIDI notes. You can edit all values on the info line using regular value editing (see page 100 for details). Length and position values are displayed in the format currently selected for the ruler (see below).

▪ To hide or show the info line, click the icon in the toolbar.

The ruler

The ruler shows the time line, by default in the display format selected on the Transport panel. You can select a separate format for a MIDI editor ruler by clicking the arrow button to the right of it and selecting an option from the pop-up menu that appears. For a list of the available formats, see the chapter "The Project window" in the Operation Manual.

At the bottom of the pop-up menu there are two additional items:

- If "Time Linear" is selected, the ruler, note display and controller display will be linear in relation to time.
  This means that if the ruler shows bars and beats, the distance between the bar lines will vary depending on the tempo.

- If "Bars+Beats Linear" is selected, the ruler, note display and controller display will be linear in relation to tempo.
  I.e. if the ruler shows bars and beats, the distance between beats will be constant.

  In most cases, you would probably set the display format to "Bars+Beats" in "Bars+Beats Linear" mode when editing MIDI.

The note display
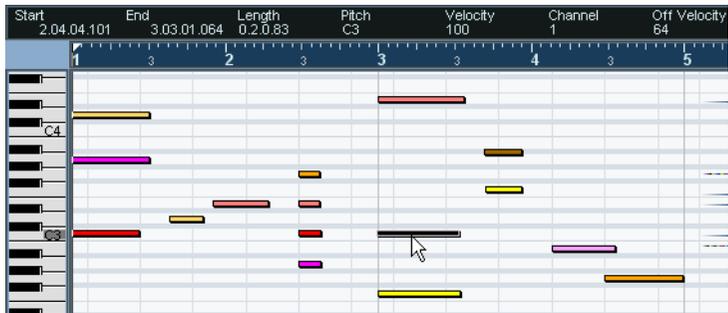
The note display is the main area in the Key Editor. It contains a grid, in which MIDI notes are shown as boxes. The width of a box corresponds to the note length, and the vertical position of a box corresponds to the note number (pitch), with higher notes higher up in the grid. The piano keyboard to the left serves as a guide for finding the right note number.

The chord recognition function

Nuendo features a handy chord recognition function that helps you identify chords in the key editor note display. To find out which chord some simultaneously played notes make up, place the project cursor over the notes. All MIDI notes currently "touched" by the project cursor are analyzed and the chord recognition display in the toolbar shows you which chord the notes form.
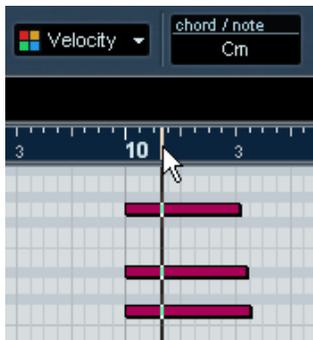
In the picture above, the project cursor touches the notes C, Eb and G. As shown in the chord recognition display, this results in a C minor chord.

The controller display
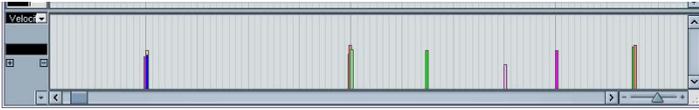
The area at the bottom of the Key Editor window is the controller display. This consists of one or several controller lanes, each showing one of the following properties or event types:

- Velocity values of the notes.
- Pitch Bend events.
- Aftertouch events.
- Poly Pressure events.
- Program Change events.
- Any type of continuous controller event.

To change the size of the controller display, drag the divider between the controller display and the note display. This will make the controller display larger and the note display smaller, or vice versa.

Velocity values are shown as vertical bars in the controller display, with higher bars corresponding to higher velocity values:
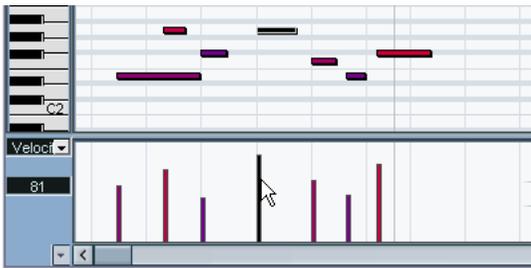
Each velocity bar corresponds to a note in the note display.

Events in the controller display (that is, anything other than velocity values) are shown as "blocks", the heights of which correspond to the "values" of the events. However, events that have been recorded (or drawn with a low quantize value) may appear more like "filled curves", simply because they are positioned very closely:
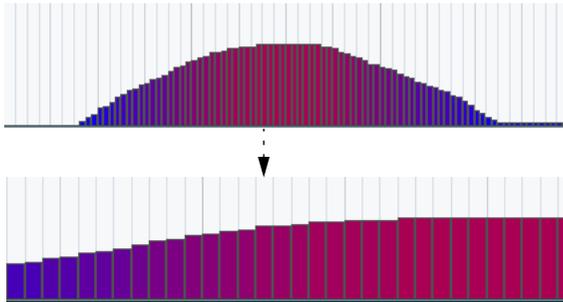
If you zoom in on the upper "curve", you will find that it consists of separate events.

▪ **Unlike notes, events in the controller display have no length. The value of an event in the display is "valid" until the start of the next event:**

If you delete the second event…   …the first event will be "valid" until the start of the third event.

For a description of editing in the controller display, see .

Key Editor operations

Zooming

Zooming in the Key Editor is done according to the standard zoom procedures, using the zoom sliders, the Zoom tool or the Zoom sub-menu on the Edit menu.

▪ When you drag a rectangle with the Zoom tool, the result depends on the option "Zoom Tool Standard Mode: Horizontal Zooming Only" in the Preferences dialog (Editing page).
If this is on, the window will only be zoomed horizontally; if not, the window will be zoomed both horizontally and vertically.

Playing back

You can play back your music as usual when working in a MIDI editor. There are a couple of features making it easier to edit during playback:

Solo button

If you activate the Solo button, only the edited MIDI parts will be heard during regular playback.

Autoscroll

As described in the chapter "The Project window" in the Operation Manual, the Autoscroll function makes the window "follow" the project cursor during playback, so that the current play position is visible at all times. However, when you are working in a MIDI editor, you may want to deactivate Autoscroll – this way, the events you are working with will stay visible.

The Autoscroll button on the toolbar of each MIDI editor is indepen-
dent for the editor. For example, this means you can have Autoscroll
deactivated in the Key Editor and activated in the Project window.

The independent track loop function

The independent track loop is a sort of "mini-cycle", affecting only the
MIDI part being edited. When the loop is activated, the MIDI events
within the loop will be repeated continuously and completely indepen-
dent – other events (on other tracks) will be played back as usual. The
only "interaction" between the loop and the "regular playback" is that
every time the cycle starts over again, so does the loop.

To set up the independent track loop, proceed as follows:

1. Turn on the loop by clicking on the Loop button on the toolbar.
   If it isn't visible, you need to right-click (Windows) or [Ctrl]-click (Mac) the toolbar and
   add the Independent Track Loop Settings section – see the chapter "Customizing" in
   the Operation Manual.
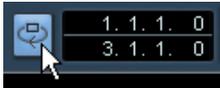
When the loop is activated, the cycle isn't shown in the editor's ruler.
Now you need to specify the length of the loop:

2. Either [Ctrl]/[Command]-click and [Alt]/[Option]-click in the ruler to
   set the start and end of the loop, respectively…

3. …or edit the loop start and end positions numerically in the fields next
   to the Loop button.

   The independent track loop is indicated in dark blue in the ruler.

▪ **The MIDI events will be looped as long as the Loop button is activated
   and the MIDI editor window is open.**

Auditioning

If the speaker icon on the toolbar is activated, individual notes will au-
tomatically be played back (auditioned) when you move or transpose
them, or when you create new notes by drawing. This makes it easier
to hear what you're doing.

Creating and editing notes

To draw new notes in the Key Editor, you use the Pencil tool or the
Line tool.

Drawing notes with the Pencil tool

With the Pencil tool, you insert single notes by clicking at the desired
time position (horizontal) and pitch position (vertical).

• When you move the pointer in the note display, its bar position is indi-
cated in the toolbar, and its pitch is indicated both in the toolbar and
on the piano keyboard to the left.
This makes it easy to find the right note and insert position.

• If Snap is activated, this determines the start position of the created
note (see).

- If you just click once, the created note will have the length set on the Length Quantize pop-up menu on the toolbar.
  You can create a longer note by clicking and dragging the pointer with the mouse button pressed. The length of the created note will be a multiple of the Length Quantize value.

Drawing notes with the Line tool

The Line tool can be used for creating series of contiguous notes. To use the Line tool, click and drag to draw a line and then release the mouse button.

- **The Line tool has several different modes.**
  To select one of the modes, click on the Line tool icon on the toolbar when the tool is already selected. This opens a pop-up menu from which you can select one of the Line modes.
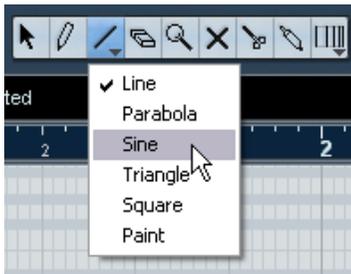
The tool icon will change appearance according to the selected mode.

Mode	Description
Line	This is the default mode for the Line tool. When this mode is selected, you click and drag to create a straight line, in any angle. When you release the mouse button a series of notes will be created, aligned with the line. If Snap is activated, the notes will be spaced and sized according to the Quantize value.
Parabola, Sine, Triangle, Square	These modes insert events along different curve shapes. While they can be used for creating notes, they're probably best suited for controller editing (see page 109).
Paint	Allows you to insert multiple notes by dragging with the mouse button pressed. If Snap is activated, the notes will be positioned and sized according to the Quantize and Length Quantize values. If you press [Ctrl]/[Command] while painting, movement will be restricted to horizontal only (i.e. the painted notes will have the same pitch).

Setting velocity values

When you draw notes in the key editor, the notes will get the velocity value set in the insert velocity field on the toolbar.

You can use one of three different methods for determining the velocity:

▪ Selecting a predefined velocity value from the insert velocity pop-up menu.
The menu contains five different predefined velocity values. The "Setup..." item opens a dialog that allows you to specify which five velocity values should be available on the pop-up menu (you can also open this dialog by selecting "Insert Velocities..." from the MIDI menu).
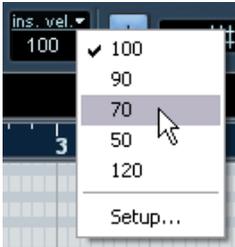
▪ Manually entering the desired velocity value by clicking in the insert velocity field and typing the desired value.

▪ Using a key command.
You can assign a key command to each of the five available velocity values in the Key Commands dialog (MIDI category – the items Insert Velocity 1-5). This allows for quick switching between different velocity values when entering notes. See the chapter "Key commands" in the Operation Manual for instructions on how to set up key commands.

Selecting notes

Selecting notes is done using any of the following methods:

▪ Use the Arrow tool.
The standard selection techniques apply.

▪ Use the Select submenu on the Edit menu or Quick menu.
The Select menu options are:

Option	Description
All	Selects all notes in the edited part.
None	Deselects all events.
In Loop	Selects all notes that are partially or completely inside the boundaries of the left and right locators.
From Start to Cursor	Selects all notes that begin to the left of the project cursor.
From Cursor to End	Selects all notes that end to the right of the project cursor.
Equal Pitch – all Octaves	This function requires that a single note is selected. It selects all following notes that have the same pitch (in any octave) as the currently selected note.
Equal Pitch – same Octave	As above, but selects notes of the exact same pitch only (same octave).

▪ You can also use the left and right arrow keys on the computer keyboard to step from one note to the next or previous.
If you press [Shift] and use the arrow keys, the current selection will be kept, allowing you to select several notes.

▪ To select all notes of a certain pitch, press [Ctrl]/[Command] and click on the desired key in the keyboard display to the left.
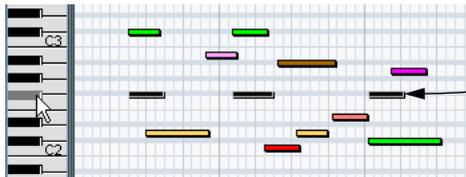
All notes of the corresponding pitch are selected.

You can also press [Shift] and double click on a note to select all the following notes of the same pitch – or use the Equal Pitch functions on the Select submenu.

▪ If the option "Auto Select Events under Cursor" is activated in the Preferences dialog (Editing page), all notes currently "touched" by the project cursor are automatically selected.

Moving and transposing notes

To move notes in the editor, use any of the following methods:

▪ Click and drag to a new position.
All selected notes will be moved, maintaining their relative positions. If Snap is activated, this determines to which positions you can move the notes, see page 140.

Note also that you can restrict movement to horizontal or vertical only by holding down [Ctrl]/[Command] while dragging.

▪ Use the up and down arrow keys on the computer keyboard.
This method allows you to transpose the selected notes, without risking to move them horizontally. You can also use the Transpose function (see page 69) or the info line (see page 85) for this. Note that pressing [Shift] and using the up and down arrow keys will transpose notes in steps of one octave.

▪ Use the Move to Cursor function on the Edit menu.
This moves the selected notes to the project cursor position.

▪ Select a note and adjust its position or pitch on the info line.
See page 100.

▪ Use the Move buttons in the Nudge palette on the toolbar.
This moves the selected note(s) by the amount set on the Quantize pop-up menu. By default, the Nudge palette isn't shown on the toolbar – see the chapter "Customizing" in the Operation Manual for more info.

You can also adjust the position of notes by quantizing (see page 59).

Duplicating and repeating notes

Notes are duplicated much in the same way as events in the Project window:

▪ Hold down [Alt]/[Option] and drag the note(s) to a new position.
If Snap is on, this determines to which positions you can copy notes (see page 140).

▪ Selecting Duplicate from the Edit menu creates a copy of the selected note and places it directly after the original.
If several notes are selected, all of these are copied "as one unit", maintaining the relative distance between the notes.

▪ Selecting Repeat from the Edit menu opens a dialog, allowing you to create a number of copies of the selected note(s).
This works like the Duplicate function, but you can specify the number of copies.

▪ You can also perform the Repeat function by dragging: Select the note(s) to repeat, press [Alt]/[Option], click the right edge of the last selected note and drag to the right.
The longer to the right you drag, the more copies (as indicated by the tooltip).
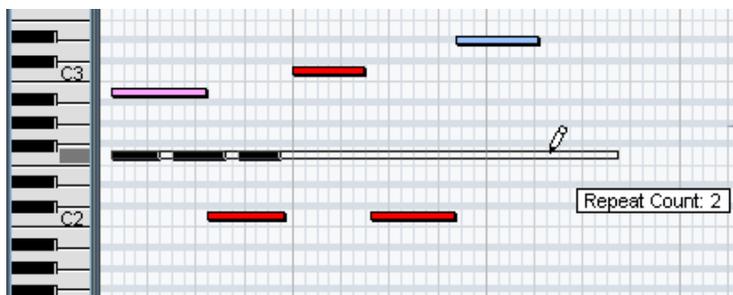
Using cut and paste

You can use the Cut, Copy and Paste options on the Edit menu to move or copy material within a part or between different parts. When you paste copied notes, you can either use the regular Paste function or the Paste Time function on the Edit menu's Range submenu.

▪ "Paste" inserts the copied notes at the project cursor position, without affecting existing notes.

- "Paste Time" inserts at the project cursor position, but moves (and if necessary, splits) existing notes to make room for the pasted notes.

Selecting "Paste Time" with this data on the clipboard
and the project cursor here…
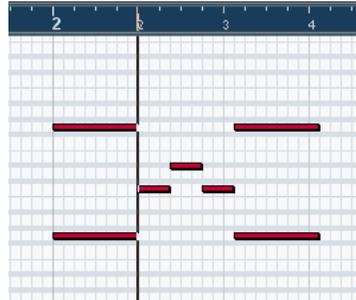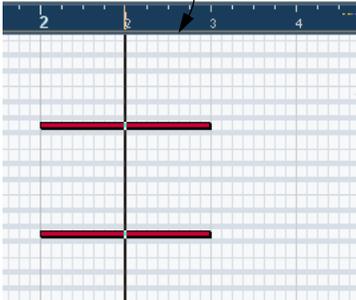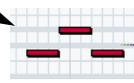
…will give you this.

Resizing notes

To resize a note, use one of the following methods:

- Position the arrow tool at the start or end of the note, so that the pointer takes on the shape of a small double arrow. Click and drag to the left or right to resize the note.
  This method allows you to resize the note from either direction.

- Click with the Pencil tool within the note box and drag to the left or the right (to make the note shorter or longer, respectively).

  With both these methods, the resulting length will be a multiple of the Length Quantize value on the toolbar.

- Use the Trim Start/End buttons on the Nudge palette on the toolbar.
  This resizes the selected note(s) by moving their start or end positions, in steps according to the Length Quantize value on the toolbar. By default, the Nudge palette isn't shown on the toolbar – see the chapter "Customizing" in the Operation Manual for more info.

- Select the note and adjust its length on the info line.
  See for details on info line editing.

Splitting notes

There are three ways to split notes:

▪ Clicking on a note with the Scissors tool splits the note at the position you pointed (taking the Snap setting into account if activated).
If several notes are selected, they are all split at the same position if applicable.

▪ If you select "Split at Cursor", all notes that are intersected by the project cursor are split at the cursor position.

▪ If you select "Split Loop", all notes that are intersected by the left or right locator are split at the locator positions.

Gluing notes

Clicking on a note with the Glue Tube tool will "glue it together" with the next note of the same pitch. The result will be one long note spanning from the start of the first note to the end of the second note, and with the properties (velocity, etc.) of the first note.

Muting notes

Individual notes can be muted in the Key Editor, as opposed to muting an entire MIDI part in the Project window. This allows you to exclude notes from playback, but keep the option to bring them back again at any time. To mute a note, use one of the following methods:

▪ Click on it with the Mute tool.
▪ Drag a rectangle with the Mute tool, enclosing all notes you want to mute.
▪ Select the note(s) and choose Mute from the Edit menu.
The default key command for this is [Shift]+[M].
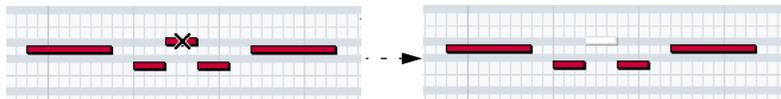
Muted notes are "dimmed" in the note display.

To unmute a note, either click it or enclose it with the Mute tool, or select it and choose Unmute from the Edit menu. The default key command for this is [Shift]+[U].

Deleting notes

To delete notes, either click on them with the Eraser tool or select them and press [Backspace].

Editing on the info line

The info line shows the values and properties of the selected event(s). If a single event is selected, its values are displayed on the info line. If several events are selected, the info line shows the values of the first of these events, in yellow.
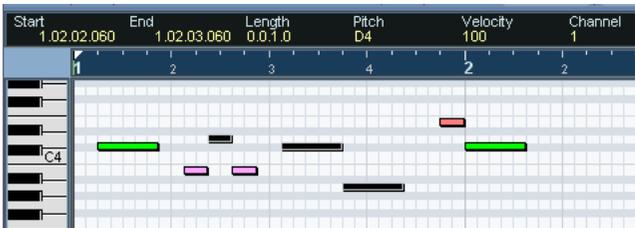
Several events selected.

You can edit the values on the info line using regular value editing. This allows you to move, resize, transpose or change velocity of events in a very precise manner. It's also possible to click the Pitch or Velocity field in the info line and play a note on your MIDI keyboard - the pitch or velocity will be adjusted according to the note you played.

▪ **If you have several events selected and change a value, all selected events will be changed relatively.**
In other words, the value will be changed by an equal amount for all selected events.

▪ **If you have several events selected, hold down [Ctrl]/[Command] and change a value, the change will be absolute.**
In other words, the value setting will be the same for all selected events.

Editing Notes via MIDI

You can change the properties of notes via MIDI. For example, this can be a fast way to get the right velocity value, since you will hear the result even as you edit:

1. Select the note you want to edit.

2. Click on the MIDI connector symbol on the toolbar.

The symbol should be lit. This enables editing via MIDI.

3. Use the note buttons on the toolbar to decide which properties should be changed by the MIDI input.
   You can enable editing of pitch, note-on and/or note-off velocity.

With this setting, the edited notes will get the pitch and velocity values of the notes input via MIDI, but the note-off velocities will be kept as they are.

4. Play a note on your MIDI instrument.
   The note selected in the editor will get the pitch, velocity and/or note-off velocity of the played note.

   The next note in the edited part is automatically selected, making it easy to quickly edit a series of notes.

• If you want another try, select the note again (easiest by pressing the [←] key on the computer keyboard) and again play a note on your MIDI instrument.

Step input

Step input, or step recording, is when you enter notes one at a time (or one chord at a time) without worrying about the exact timing. This is useful e.g. when you know the part you want to record but are not able to play it exactly as you want it.

Proceed as follows:

1. Click the Step Input button on the toolbar to activate Step Input mode.

2. Use the note buttons to the right to decide which properties should be included when you input the notes.
For example, you may not want to include the velocity and/or note-off velocity of the played notes. It's also possible to turn off the pitch property, in which case all notes will get the pitch C3, no matter what you play.

3. Click anywhere in the note display to set the start position (the desired position of the first note or chord).
The step input position is shown as a blue line in the note display, and in the lower mouse pointer display in the toolbar.
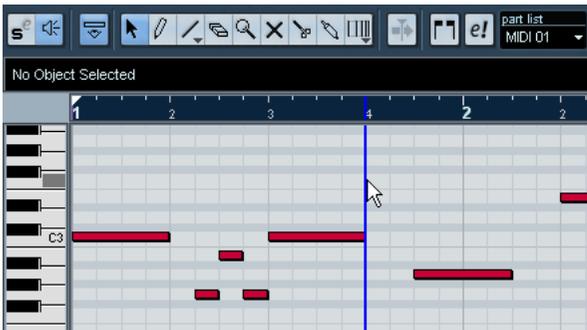
4. **Specify the desired note spacing and length with the Quantize and Length Quantize pop-up menus.**
The notes you input will be positioned according to the Quantize value and have the length set with the Length Quantize value. For instance, if you set Quantize to 1/8 notes and Length Quantize to 1/16 note, the notes will be sixteenth notes, appearing on each eighth note position.

5. **Play the first note or chord on your MIDI instrument.**
The note or chord appears in the editor and the step input position advances one quantize value step.

▪ **If Insert mode is activated, all notes to the right of the step input position will be moved to "make room" for the inserted note or chord.**

Insert mode activated.

6. **Continue in the same way with the rest of the notes or chords.**
You can adjust the Quantize or Length Quantize value as you go along, to change the timing or note lengths. You can also move the step input position manually by clicking anywhere in the note display.

▪ To insert a "rest", press the right arrow key on the computer keyboard.
This advances the step input position one step.

7. **When you're done, click the Step Input button again to deactivate step input.**

Editing in the controller display

About controller lanes

By default, the controller display has a single lane, showing one event type at a time. However, you can easily add lanes by right-clicking (Windows) or [Ctrl]-clicking (Mac) in the display and selecting "Create new controller lane" from the Quick menu. This allows you to view and edit different controllers at the same time.
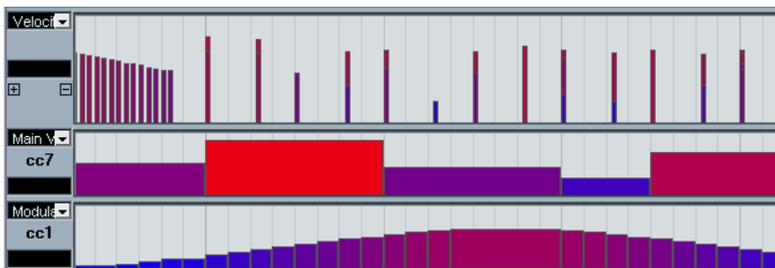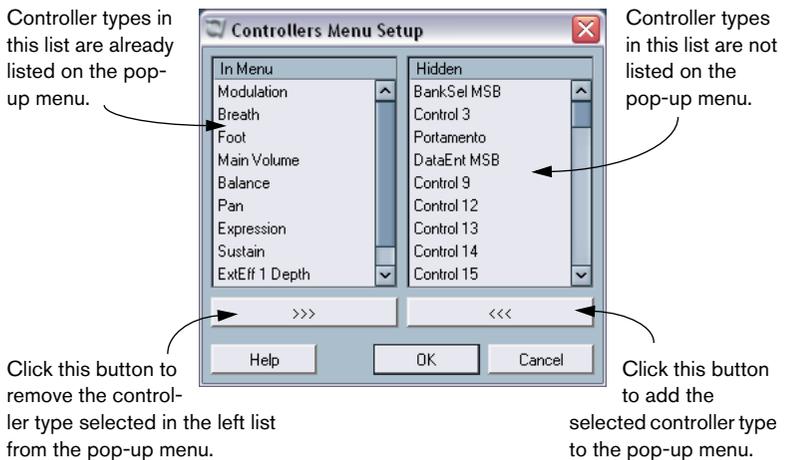

The controller display with three lanes set up.

▪ **To remove a lane, right-click in it and select "Remove this Lane" from the Quick menu.**
This hides the lane from view – it doesn't affect the events in any way.

▪ **If you remove all lanes, the controller display will be completely hidden.**
To bring it back again, select "Create new controller lane" from the Quick menu.

Selecting event type

Each controller lane shows one event type at a time. To select which type should be displayed, use the pop-up menu to the left of the lane.
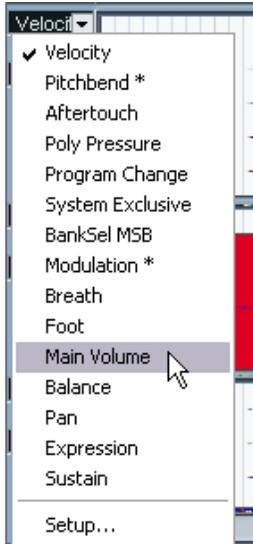
• Selecting "Setup…" opens a dialog in which you can specify which continuous controller event types you want available on the pop-up menu.

Controller types in this list are already listed on the pop-up menu.

Controller types in this list are not listed on the pop-up menu.

Click this button to remove the controller type selected in the left list from the pop-up menu.

Click this button to add the selected controller type to the pop-up menu.

- Each MIDI track has its own controller lane setup (number of lanes and selected event types).
  When you create new tracks, they get the controller lane setup last used.

Controller Lane presets

Once you have added the required number of controller lanes and selected the event types you need, you can store this combination as a controller lane preset. You could for example have a preset with one velocity lane only, another with a combination of velocity, pitch bend and modulation, and so on. This can make working with controllers much quicker.

- To add the current controller lane setup as a preset, pull down the pop-up menu in the lower left corner of the editor window and select "Add".
  Enter a name for the preset in the dialog that appears and click OK.

- To apply a stored preset, select it from the pop-up menu.
  This immediately brings up the controller lanes and event types in the preset.

- To remove or rename presets, select "Organize" from the pop-up.

Editing velocity values

When "Velocity" is selected for viewing, the lane shows the velocity of each note as a vertical bar.
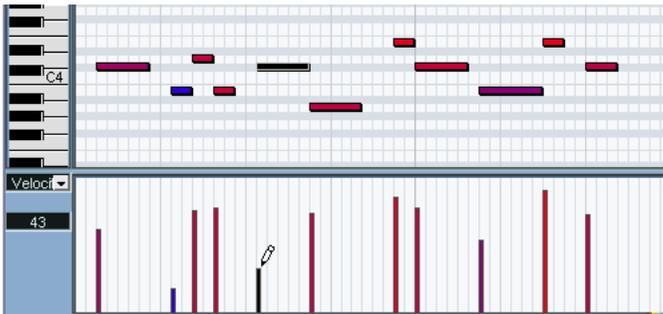
Velocity values are edited with the Pencil or the Line tool. The different tools and Line tool modes offer several possibilities, as listed below.

▫ **If the option "Controller Lane Editing: Select Tool defaults to Pen" is activated in the Preferences dialog (Editing page), the Arrow tool automatically switches to the Pencil tool when you move the pointer into the controller display.**
If you need to use the Arrow tool to select events in the controller display, press [Ctrl]/[Command].

▫ **If the Speaker icon (Acoustic Feedback) is activated on the toolbar, the notes will be played back when you adjust the velocity, allowing you to audition your changes.**

▫ You can use the Pencil tool to change the velocity of a single note: click on its velocity bar and drag the bar up or down.
While you drag, the current velocity value is shown in the display to the left.

▫ You can use the Pencil tool or the Line tool's Paint mode to change the velocity values of several notes by painting a "freehand curve".
When editing velocity, these two methods have the same functionality.
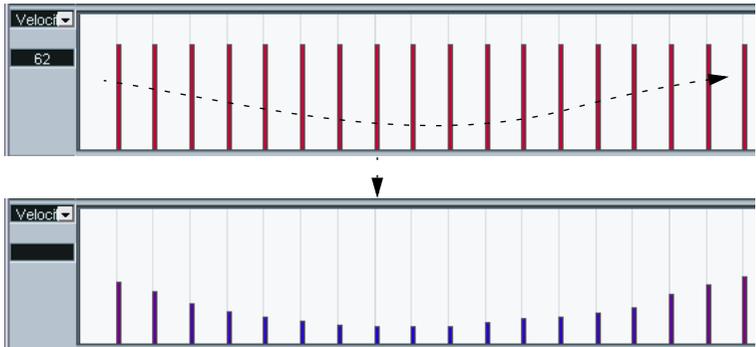
▪ Use the Line tool's Line mode for creating linear velocity ramps.
Click where you want the ramp to start and drag the cursor to where you want the ramp to end. When you release the mouse button, the velocity values are aligned with the line between the two points.
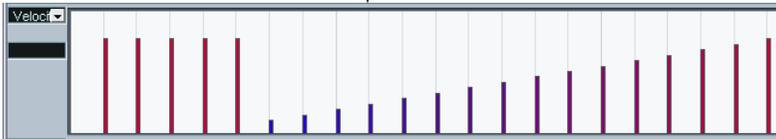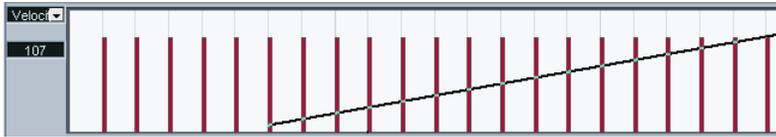
▪ Parabola mode works in the same way, but aligns the velocity values with a Parabola curve instead.
Use this for smooth, "natural" velocity fades, etc.
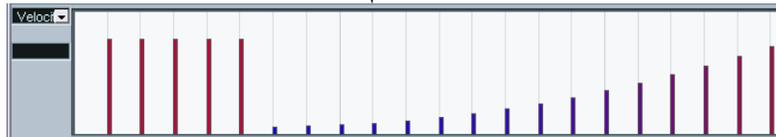
▪ The remaining three Line tool modes (Sine, Triangle and Square) align the velocity values with continuous curve shapes (see below).

Note:

▪ If there is more than one note on the same position (e.g. a chord), their velocity bars will overlap in the controller lane.
If none of the notes are selected, all notes at the same position will be set to the same velocity value when you draw. To edit the velocity of only one of the notes at the same position, first select the note in the note display. Now, editing will only affect the velocity of the selected note.

You can also adjust the velocity of a single note by selecting it and changing its velocity value on the info line.

Adding and editing events in the controller display

When any option other than "Velocity" is selected for viewing in a controller lane, you can create new events or edit the values of existing events using the Pencil tool or the Line tool in its various modes:
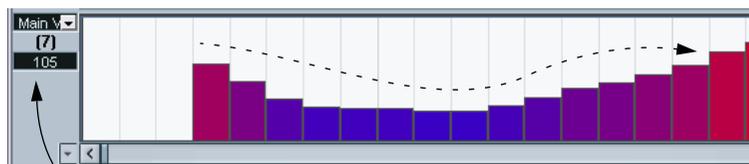
▪ Clicking with the Pencil tool or the Line tool in Paint mode creates a new event.
Note the "Select Tool defaults to Pen" option - see the chapter "Editing velocity values".

▪ To modify the value of an event (without creating a new one), press [Alt]/[Option] and use the Pencil tool or the Line tool's Paint mode.
Note that you can click and drag to change or add multiple events, draw controller curves, etc. You can press or release [Alt]/[Option] while drawing, switching dynamically between "edit mode" and "create mode".

If you want to enter or adjust a single event, click once with the Pencil tool or the Line tool in Paint mode:
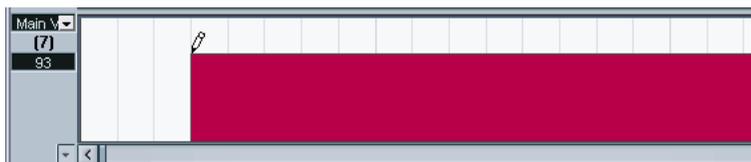
If you want to "paint a curve", drag the tool (with the mouse button pressed):


When you move the pointer in the controller lane, the corresponding value is displayed in this field.

▪ **With the Pencil tool and the Line tool in Paint mode, the quantize value determines the "density" of created controller curves (if Snap is activated).**
For very smooth curves, you should use a small quantize value or turn off Snap. However, please note that this creates a very large number of MIDI events, which can cause MIDI playback to "stutter" in some situations. A medium-low density is often sufficient.

- Clicking and dragging with the Line tool in Line mode shows a line in the controller lane, and creates events with values aligned with this line.
This is the best way to draw linear controller ramps. If you press [Alt]/[Option], no new events are created – use this mode for modifying existing controller curves.

Converting a controller curve to a ramp using the Line tool:
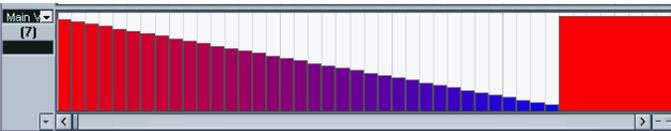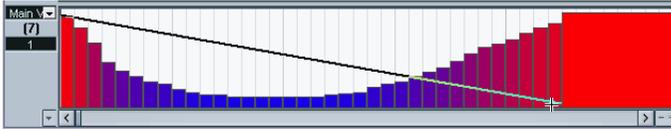
- The Parabola mode works in the same way, but aligns the values with a parabola curve instead, giving more "natural" curves and fades.
Note that the result depends on from which direction you draw the parabola:
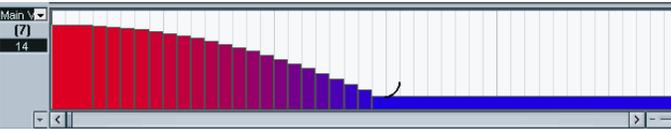

- In Parabola mode you can use modifier keys to determine the shape of the parabola curve.
If you press [Ctrl]/[Command] the parabola curve will be reversed, if you press [Alt]/[Option]+[Ctrl]/[Command] while snap is activated you can change the position of the whole curve (in both cases the snap value for the positioning will be a quarter of the quantize value). If you press [Shift], the exponent will be increased or decreased.

- **In Line and Parabola modes, the length quantize value determines the "density" of created controller curves (if Snap is activated).**
  For very smooth curves, you should use a small length quantize value or turn off Snap. To avoid over-dense controller curves (which may cause MIDI playback to "stutter"), use a medium-low density.

- The Sine, Triangle and Square modes create events with values aligned to continuous curves.
  In these modes, the quantize value determines the period of the curve (the length of one curve "cycle") and the length quantize value determines the density of the events (the lower the length quantize note value, the smoother the curve).

- In Sine, Triangle and Square mode you can also use modifier keys to determine the shape of the curve.
  If you press [Ctrl]/[Command] you can change the phase of the beginning of the curve, if you press [Alt]/[Option]+[Ctrl]/[Command] while snap is activated you can change the position of the whole curve (in both cases the snap value for the positioning will be a quarter of the quantize value).
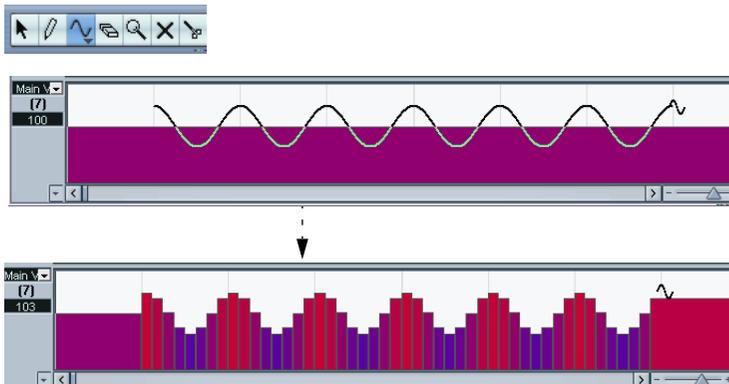
- **You can also set the curve period freely by holding down [Shift] when you insert events in Sine, Triangle or Square mode.**
  Activate Snap, [Shift]-click and drag to set the length of one period. The period length will be a multiple of the quantize value.

- In Triangle and Square mode you can press [Shift]+[Ctrl]/[Command] to change the maximum position of the triangle curve (to create sawtooth curves) or the pulse of the square curve. As in other modes, you can press [Alt]/[Option] if you want to change the existing events rather than creating new ones. Again, the snap value for the positioning will be a quarter of the quantize value.

Moving and copying events

You can move or duplicate events in a controller lane, much like you can with notes:

1. Click with the Arrow tool to select the events you want to cut or copy.
   If the option "Controller Lane Editing: Select Tool defaults to Pen" is activated in the Preferences dialog (Editing page), you need to press [Ctrl]/[Command] to get the Arrow tool.

2. Click and drag the events to move them.
   If Snap is activated, this determines to which positions you can move the events (see page 140).

• If you hold down [Alt]/[Option] and drag, the events will be copied rather than moved.

If there already is an event of the same type at the exact same position, this will be replaced by the moved event.

Remember that a non-note event doesn't have a length – it's "valid" until the next event (see page 89).

Using cut, copy and paste

You can use the standard Cut, Copy and Paste options on the Edit menu to move or copy events in the controller display:

1. Select the events you want to cut or copy.

2. Select Cut or Copy from the Edit menu.

3. If you want to paste the events into another MIDI part, open that part in another Key Editor window.

4. Position the project cursor where you want to paste the events.

5. Select Paste from the Edit menu.
   The events on the clipboard are added, starting at the project cursor position, maintaining their relative positions. If a pasted event ends up at the same position as an existing event of the same type, the old event is replaced.

### Deleting events in the controller display

You delete events by clicking with the Eraser tool or by selecting them and pressing [Backspace]. Please note:

▪ Deleting a controller event makes the last event before this valid up until the next event. It does not "zero" any controller changes. See page 89.

▪ You can delete notes by deleting their velocity bars in the controller display.
Please be aware that if there is more than one note on the same position, there may still only be one velocity bar visible – make sure you delete only the desired notes!

Adding and editing Poly Pressure events

Poly Pressure events are special, in that they "belong to" a specific note number (key). That is, each Poly Pressure event has two editable values: the note number and the amount of pressure. Therefore, when Poly Pressure is selected on the event type pop-up menu, there are two value fields to the left of the controller display, one for the note number and one for the amount:
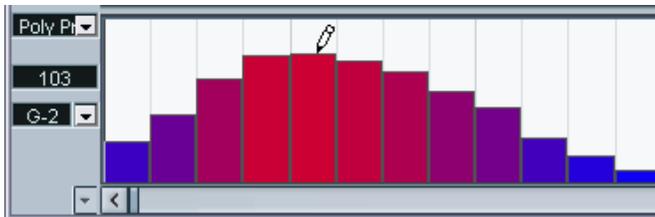
To add a new Poly Pressure event, proceed as follows:

1. Select Poly Pressure on the event type pop-up menu.

2. Set the note number by clicking on the keyboard display.
Note that this only works for the topmost lane. If you have selected "Poly Pressure" for several controller lanes, you have to type in the desired note number directly in the lower value field to the left of each lane. The selected note number is displayed in the lower value field to the left of the controller display.

3. Use the Pencil tool to add a new event, just as when adding regular controller events.

To view and edit existing Poly Pressure events, proceed as follows:

1. Select Poly Pressure on the event type pop-up menu.

2. Click on the arrow button next to the note number field to the left of the controller lane.
    A pop-up menu appears, listing all note numbers for which there already are Poly Pressure events.

3. Select a note number from the pop-up menu.
    The Poly Pressure events for the selected note number are shown in the controller lane.

4. Use the Pencil tool to edit the events as usual.
    Press [Alt]/[Option] to edit existing events without adding any new ones.

▪   Poly Pressure events can also be added and edited in the List Editor.

Edit In-Place

The Edit In-Place function makes it possible to edit MIDI parts directly in the Project window, for quick and efficient editing in context with other tracks. To open the In-Place editor, click the Edit In-Place button for a MIDI track in the track list or the Inspector.

This expands the MIDI track to show something like a miniature Key editor, allowing you to edit MIDI notes and controllers.

▪ To zoom or scroll the In-Place Editor, point at the left part of the piano keyboard display so that the cursor changes to a hand. Now you can click and drag to the right or left to zoom in or out vertically, and drag up or down to scroll the editor.

- Clicking in the upper right corner of the track list for the edited track brings up a local toolbar with some MIDI editor-specific settings.

For descriptions of these settings, see .

- Just like in the Key editor, you can edit velocity or continuous controllers at the bottom of the In-Place Editor.
  To change which controller type is shown, click in the controller name field directly below the piano keyboard and select a controller type from the pop-up menu.
  To add or remove controller lanes, right-click (Windows) or [Ctrl]-click (Mac) below the controller name field and select an option from the context menu that appears.

- When you select a MIDI note, the Project window info line shows information about that note, just like the info line in the Key editor.
  You can perform the same editing here as on the Key editor info line.

- The Snap button and Snap type pop-up menu on the Project window toolbar governs snapping in the In-Place editor, but the Snap Grid is set using the Quantize pop-up menu.

- To close the In-Place Editor, click the Edit In-Place button again.

The Drum Editor – Overview
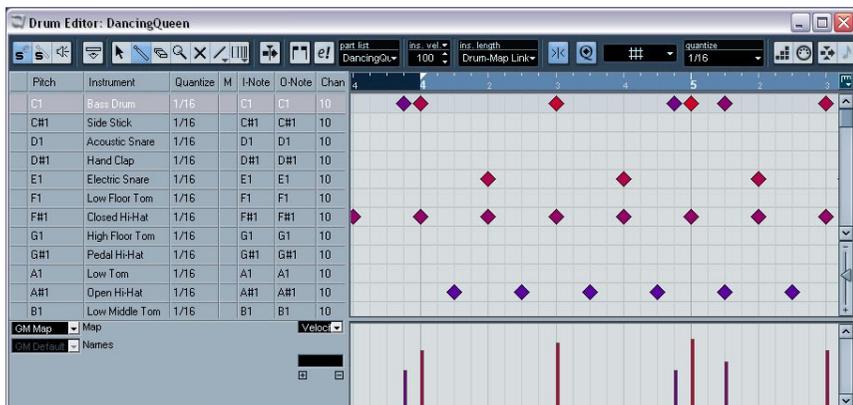
The toolbar and info line

These are much the same as the toolbar and info line in the Key Editor, with the following differences:

- The Drum Editor has no Pencil tool – instead there is a Drumstick tool (for inputting and removing notes) and a Line tool with various line and curve modes (for drawing several notes in one go or editing controller events).
- There are no Scissors and Glue Tube tools in the Drum Editor.
- As in the Key Editor, the mouse pointer display in the toolbar shows the pitch and position of the pointer, but the pitch is shown as a drum sound name rather than a note number.
- The Use Global Quantize button allows you to select which value should be used when Snap is on – the global quantize value on the toolbar or the individual quantize values for the drum sounds.
- Instead of a Length Quantize pop-up, there is an Insert Length pop-up menu. It is used in much the same way, as described on the following pages.

The drum sound list

Pitch	Instrument	Quantize	M	I-Note	O-Note	Chanr	Output
C1	Bass Drum	1/16		C1	C1	10	Default
C#1	Side Stick	1/16		C#1	C#1	10	Default
D1	Acoustic Snare	1/16		D1	D1	10	Default
D#1	Hand Clap	1/16		D#1	D#1	10	Default
E1	Electric Snare	1/16		E1	E1	10	Default
F1	Low Floor Tom	1/16		F1	F1	10	Default
F#1	Closed Hi-Hat	1/16		F#1	F#1	10	Default
G1	High Floor Tom	1/16		G1	G1	10	Default
G#1	Pedal Hi-Hat	1/16		G#1	G#1	10	Default
A1	Low Tom	1/16		A1	A1	10	Default
A#1	Open Hi-Hat	1/16		A#1	A#1	10	Default
B1	Low Middle Tom	1/16		B1	B1	10	Default
C2	High Middle Tom	1/16		C2	C2	10	Default
C#2	Crash Cymbal 1	1/16		C#2	C#2	10	Default
D2	High Tom	1/16		D2	D2	10	Default
D#2	Ride Cymbal 1	1/16		D#2	D#2	10	Default
E2	Chinese Cymbal	1/16		E2	E2	10	Default
F2	Ride Bell	1/16		F2	F2	10	Default
F#2	Tambourine	1/16		F#2	F#2	10	Default
G2	Splash Cymbal	1/16		G2	G2	10	Default

The purpose of the Drum Editor is to edit MIDI tracks where each note (pitch) plays a separate sound, as is typically the case with a MIDI drum kit. The drum sound list to the left lists all drum sounds by name (according to the selected drum map or name list – see below), and lets you adjust and manipulate the drum sound setup in various ways.

Note:

▪ The number of columns in the list depends on whether there's a drum map selected for the track or not.
See .

▪ You can reorder the columns by dragging the column headings, and resize the columns by dragging the dividers between the column headings.

The note display
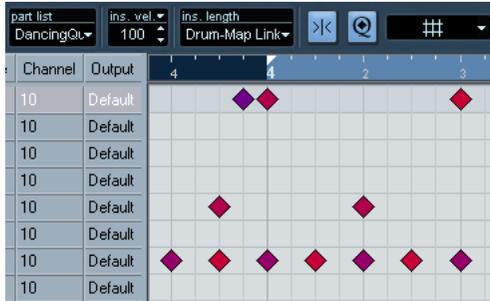
The Drum Editor's note display displays notes as diamond symbols. The vertical position of the notes corresponds to the drum sound list to the left, while the horizontal position corresponds to the note's position in time, just as in the Key Editor. Note however, that the diamond symbols don't indicate the length of the notes. This makes sense, since drum sounds most often are "one-shot" samples that play to their end regardless of the note lengths.

Drum map and name pop-up menus

Below the drum sound list you will find two pop-up menus, used for selecting a drum map for the edited track or (if no drum map is selected) a list of drum sound names. For an explanation of drum maps, see page 123.

Controller display

The controller display in the Drum Editor is exactly the same as in the Key Editor. You can add or remove controller lanes from the Quick menu, and create and edit events as described on page 104.

Drum Editor operations

The basic handling (zooming, playback, auditioning, etc.) is the same as in the Key Editor (see page 90). The following sections describe the procedures and features that are specific to the Drum Editor.

Creating and editing notes

The standard way of entering notes in the Drum Editor is to click with the Drumstick tool.

When you move the pointer in the note display, its bar position and drum sound is indicated in the toolbar, making it easy to find the right sound and position.

The position of the created note depends on the following factors:

▪ If Snap is deactivated on the toolbar, the note will appear exactly where you clicked.
In this mode, notes can be positioned freely.

▪ If Snap is activated and Use Global Quantize is deactivated on the toolbar, the note will snap to positions according to the quantize value set for the sound in the drum sound list.
You can set up different quantize values for different drum sounds. You may for example want hi-hat notes snap to sixteenth notes, but snare and bass drum snap to eighth notes.

▪ If both Snap and Use Global Quantize are activated, the note will snap to positions according to the Quantize setting on the toolbar (next to the Use Global Quantize button).

The length of the inserted note is determined by the Insert Length setting on the toolbar. However, if this is set to "Drum-Map Link", the note will get the length of the quantize value for the drum sound.

▪ **You can quickly audition the drum sounds by clicking in the leftmost column in the drum sound list.**
This plays the corresponding note.

▪ **Clicking with the Drumstick tool on an existing note will remove it.**
This makes drum pattern editing very quick and intuitive.

Setting velocity values

The notes you enter will get the insert velocity value set in the insert velocity field on the toolbar – to speed up things you may want to assign key commands to the insert velocity options. See page 94.

Selecting notes

Selecting notes is done by any of the following methods:

▪ Use the Arrow tool.
The standard selection techniques apply.

▪ Use the Select submenu on the Quick menu (see page 95).

▪ Use the left and right arrow keys on the computer keyboard to step from one note to the next or previous note.
If you press [Shift] and use the arrow keys, the current selection will be kept, allowing you to select several notes.

▪ You can also press [Shift] and double click on a note to select all the following notes for the same drum sound.

▪ If the option "Auto Select Events under Cursor" is activated in the Preferences dialog (Editing page), all notes currently "touched" by the project cursor are automatically selected.

Moving, duplicating or repeating notes

To move or copy notes in the editor (to other positions or other drum sounds), you use the same methods as in the Key Editor: click and drag, use the arrow keys or Edit menu functions, etc. – see page 96. There is one thing to note:

When you are moving or copying several selected notes by dragging them and Snap is activated but Use Global Quantize turned off, the notes will snap to positions according to the quantize values for the drum sounds. If the moved/copied notes have different quantize values, the largest value will determine snapping. For example, if you are moving two notes, with the quantize values 1/16 and 1/4 respectively, the notes will snap to quarter notes (1/4).

- **You can also adjust the position of notes by quantizing (see page 59).**
  Again, which quantize value is used depends on whether Global Quantize is used.

Muting notes and drum sounds

You can mute individual notes by clicking or enclosing them with the Mute tool or by using the Mute function on the Edit menu (see page 99).

Furthermore, if a drum map is selected (see page 128), the drum sound list will have a Mute column. Click in the Mute column for a drum sound to mute that sound. Finally, clicking the Drum Solo button will mute all drum sounds other than the selected one.

Pitch	Instrument	Quantize	M	I-Note	O-Note	Char
C1	Bass Drum	1/16		C1	C1	10
C#1	Side Stick	1/16		C#1	C#1	10
D1	Acoustic Snare	1/16	●	D1	D1	10
D#1	Hand Clap	1/16	●	D#1	D#1	10
E1	Electric Snare	1/16		E1	E1	10
F1	Low Floor Tom	1/16		F1	F1	10
F#1	Closed Hi-Hat	1/16	●	F#1	F#1	10
G1	High Floor Tom	1/16		G1	G1	10
G#1	Pedal Hi-Hat	1/16		G#1	G#1	10
A1	Low Tom	1/16		A1	A1	10

Muted drum sounds

Please note that the mute state for drum sounds is part of the drum map, so any other tracks using the same map will also be affected.

Deleting notes

To delete notes, click on them with the Drumstick tool or Eraser tool or select them and press [Backspace].

Other editing methods

As in the Key Editor, you can edit notes on the info line or via MIDI, and enter notes using step input. Please refer to .

Working with drum maps

Background

As discussed earlier, a drum kit in a MIDI instrument is most often a set of different drum sounds with each sound placed on a separate key (i.e. the different sounds are assigned to different MIDI note numbers). One key plays a bass drum sound, another a snare and so on.

Unfortunately, different MIDI instruments often use different key assignments. This can be troublesome if you have made a drum pattern using one MIDI device, and then want to try it on another. When you switch device, it is very likely that your snare drum becomes a ride cymbal, or your hi-hat becomes a tom, etc. – just because the drum sounds are distributed differently in the two instruments.

To solve this problem, and simplify several aspects of MIDI drum kits (like using drum sounds from different instruments in the same "drum kit"), Nuendo features so-called drum maps. A drum map is basically a list of drum sounds, with a number of settings for each sound. When you play back a MIDI track for which you have selected a drum map, the MIDI notes are "filtered" through the drum map before being sent to the MIDI instrument. Among other things, the map determines which MIDI note number is sent out for each drum sound, and so which sound is played in the receiving MIDI device.

A solution to the problem above would therefore be to make up drum maps for all your instruments. When you want to try your drum pattern on another instrument, you simply switch to the corresponding drum map and your snare drum sound will remain a snare drum sound.

Drum map settings

A drum map consists of settings for 128 drum sounds (one for each MIDI note number). To get an overview of these settings, open the Drum Editor and use the Map pop-up menu below the drum sound list to select the "GM Map" drum map.

This drum map is set up according to the General MIDI standard. For information on how to load, create and select other drum maps, see page 128.

Now, take a look at the drum sound list (you may have to drag the divider between the list and the note display to the right to see all columns). The columns show the settings of the drum map for each sound.

Pitch	Instrument	Quantize	M	I-Note	O-Note	Chanr	Output	17
C1	Bass Drum	1 - 16 Note		C1	C1	10	Default	
C#1	Side Stick	1 - 16 Note		C#1	C#1	10	Default	
D1	Acoustic Snare	1 - 16 Note		D1	D1	10	Default	
D#1	Hand Clap	1 - 16 Note		D#1	D#1	10	Default	
E1	Electric Snare	1 - 16 Note		E1	E1	10	Default	
F1	Low Floor Tom	1 - 16 Note		F1	F1	10	Default	
F#1	Closed Hi-Hat	1 - 16 Note		F#1	F#1	10	Default	
G1	High Floor Tom	1 - 16 Note		G1	G1	10	Default	
G#1	Pedal Hi-Hat	1 - 16 Note		G#1	G#1	10	Default	
A1	Low Tom	1 - 16 Note		A1	A1	10	Default	
A#1	Open Hi-Hat	1 - 16 Note		A#1	A#1	10	Default	

Here's a brief description (details follow below):

Column	Description
Pitch	The actual note number of the drum sound. This is what links notes on a MIDI track to drum sounds. For example, with the above drum map, all MIDI notes with the pitch C1 would be mapped to the Bass Drum sound. More on this below.
Instrument	The name of the drum sound.

Column	Description
Quantize	This value is used when entering and editing notes as described on page 120 and page 122.
Mute	Allows you to mute a drum sound, excluding it from playback. See page 122.
I-note	This is the "input note" for the drum sound. When this MIDI note is sent into Nuendo, (i.e. played by you), the note will be mapped to the corresponding drum sound (and automatically transposed according to the Pitch setting for the sound). See below.
O-note	This is the "output note", i.e. the MIDI note number that is sent out every time the drum sound is played back. See below.
Channel	The drum sound will be played back on this MIDI channel.
Output	The drum sound will be played back on this MIDI output. If you set this to "Default", the MIDI output selected for the track will be used.

▪ **All settings in a drum map (except the Pitch setting) can be changed directly in the drum sound list, or in the Drum Map Setup dialog (see page 129).**
Note that the changes you make will affect all tracks that use the drum map.

About Pitch, I-note and O-note

This can be a somewhat confusing area, but once you've grasped how it all works it's not very complicated. Going through the following "theory" will help you make the most out of the drum map concept – especially if you want to create your own drum maps.

As we said earlier, a drum map is a kind of "filter", transforming notes according to the settings in the map. It does this transformation twice; once when it receives an incoming note (i.e. when you play a note on your MIDI controller) and once when a note is sent from the program to the MIDI sound device.

In the following example, we have modified the drum map, so that the Bass Drum sound has different Pitch, I-note and O-note values.

Pitch	Instrument	Quantize	M	I-Note	O-Note	Channel
C1	Bass Drum	1 - 16 Note		A1	B0	10
C#1	Side Stick	1 - 16 Note		C#1	C#1	10
D1	Acoustic Snare	1 - 16 Note		D1	D1	10
D#1	Hand Clap	1 - 16 Note		D#1	D#1	10

I-notes

Let's look at what happens on input: When you play a note on your MIDI instrument, the program will look for this note number among the I-notes in the drum map. In our case, if you play the note A1, the program will find that this is the I-note of the Bass Drum sound.

This is where the first transformation happens: the note will get a new note number according to the Pitch setting for the drum sound. In our case, the note will be transformed to a C1 note, because that is the pitch of the Bass Drum sound. If you record the note, it will be recorded as a C1 note.

O-notes

The next step is the output. This is what happens when you play back the recorded note, or when the note you play is sent back out to a MIDI instrument in real time (MIDI Thru):

The program checks the drum map and finds the drum sound with the pitch of the note. In our case, this is a C1 note and the drum sound is the Bass Drum. Before the note is sent to the MIDI output, the second transformation takes place: the note number is changed to that of the O-note for the sound. In our example, the note sent to the MIDI instrument will be a B0 note.

Usage

So, what's the point of all this? Again, the purposes are different for I-notes and O-notes:

▪ **Changing the I-note settings allows you to choose which keys will play which drum sounds, when playing or recording from a MIDI instrument.**
For example, you may want to place some drum sounds near each other on the keyboard so that they can be easily played together, move sounds so that the most important sounds can be played from a short keyboard, play a sound from a black key instead of a white, and so on.
If you never play your drum parts from a MIDI controller (but draw them in the editor) you don't need to care about the I-note setting.

▪ **The O-note settings let you set things up so that the "Bass Drum" sound really plays a bass drum.**
If you're using a MIDI instrument in which the bass drum sound is on the C2 key, you set the O-note for the Bass Drum sound to C2. When you switch to another instrument (in which the bass drum is on C1) you want the Bass Drum O-note set to C1.
Once you have set up drum maps for all your MIDI instruments, you don't have to care about this anymore – you just select another drum map when you want to use another MIDI instrument for drum sounds.

The channel and output settings

You can set separate MIDI channels and/or MIDI outputs for each sound in a drum map. The following rules apply:

▪ When a drum map is selected for a track, the MIDI channel settings in the drum map override the MIDI channel setting for the track.
In other words, the MIDI channel setting you make in the Track list or Inspector for the track is normally disregarded. If you want a drum sound to use the channel of the track, set it to channel "Any" in the drum map.

▪ If the MIDI output is set to "default" for a sound in a drum map, the sound will use the MIDI output selected for the track.
Selecting any other option allows you to direct the sound to a specific MIDI output.

By making specific MIDI channel and output settings for all sounds in a drum map, you can direct your drum tracks directly to another MIDI instrument simply by selecting another drum map – you don't need to make any channel or output changes for the actual track.

- **To select the same MIDI channel for all sounds in a drum map, click the Channel column, press [Ctrl]/[Command] and select the desired channel.**
  All drum sounds will be set to this MIDI channel. The same procedure can be used for selecting the same MIDI output for all sounds as well.

  It can also be useful to select different channels and/or outputs for different sounds. This allows you to construct drum kits with sounds from several different MIDI devices, etc.

Managing drum maps

Selecting a drum map for a track

To select a drum map for a MIDI track, use the Map pop-up menu in the Inspector or in the Drum Editor:

Selecting "No Drum Map" turns off the drum map functionality in the Drum Editor. Even if you don't use a drum map, you can still separate sounds by name using a name list (see page 131).

Initially, the Map pop-up menu will only contain one map: "GM Map". However, you will find a number of drum maps included on the program DVD – how to load these is described below.

The Drum Map Setup dialog

To set up and manage your drum maps, select Drum Map Setup from the Map pop-up menus or the MIDI menu. This opens the following dialog:

This is where you load, create, modify and save drum maps. The list to the left shows the currently loaded drum maps; selecting a drum map in the list displays its sounds and settings to the right.

▪ **The settings for the drum sounds are exactly the same as in the Drum Editor (see).**
As in the Drum Editor, you can click the leftmost column to audition a drum sound. Note: if you audition a sound in the Drummap Setup dialog, and the sound is set to MIDI output "Default", the output selected on the Default pop-up menu in the lower left corner will be used. When auditioning a Default output sound in the Drum Editor, the MIDI output selected for the track will be used, as described on .

Below the drum sound list you will find a number of buttons, with the following functionality:

Button	Description
New Map	Click this to add a new drum map to the project. The drum sounds will be named "Sound 1, Sound 2" and so on, and have all parameters set to default values. The map will be named "Empty Map", but you can re-name it by clicking and typing in the list.

Button	Description
New Copy	Adds a copy of the currently selected drum map. This is probably the quickest way to create a new drum map: select the map that is similar to what you want, create a copy, change the desired drum sound settings and rename the map in the list.
Remove	Removes the selected drum map from the project.
Load	Opens a file dialog, allowing you to load drum maps from disk. On the Nuendo CD you will find a number of drum maps for different MIDI instruments – use this function to load the desired maps into your project.
Save	Opens a file dialog for saving the drum map selected in the list. If you have created or modified a drum map, you should use this function to save it as a file on disk – this allows you to load it into other projects. Drum map files have the extension ".drm".
Assign	Click this button to assign the selected drum map to the current MIDI track (only available if a MIDI track was selected when you opened the Drum Map Setup dialog). This is the same as selecting the drum map from the Map pop-up menu.
OK	Closes the dialog.

▪ **Drum maps are saved with the project files. If you have created or modified a drum map, you should use the Save function to store it as a separate file, available for loading into other projects.**
If you always want to have the same drum map(s) included in your projects, you may want to load these into the default project – see the chapter "File handling" in the Operation Manual.

O-Note Conversion

This function on the MIDI menu goes through the selected MIDI part(s) and sets the actual pitch of each note according to its O-note setting. This is useful if you want to convert the track to a "regular" MIDI track (with no drum map) and still have the notes play back the correct drum sound. A typical application is if you want to export your MIDI recording as a standard MIDI file (see the chapter "File handling" in the Operation Manual) – by first performing an O-Note Conversion you make sure that your drum tracks play back as they should when they are exported.

Using drum name lists

Even if no drum map is selected for the edited MIDI track, you can still use the Drum Editor if needed. As previously mentioned, the drum sound list will then only have four columns: Audition, Pitch, Instrument (drum sound names) and Quantize. There will be no I-note and O-note functionality.

In this mode, the names shown in the Instrument column depend on the selection on the Names pop-up menu, just below the Map pop-up in the Drum Editor.
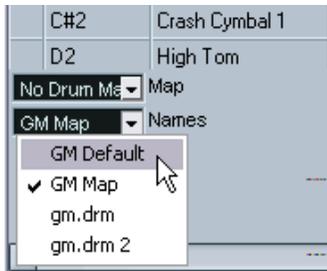
The options on this pop-up menu are the currently loaded drum maps plus a "GM Default" item which is always available. This means you can use the drum sound names in any loaded drum map without using I-notes and O-notes, should you so like.

The List Editor – Overview
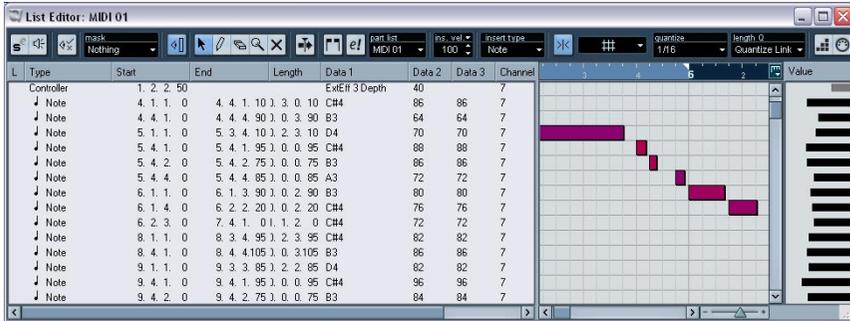
The toolbar

The toolbar contains several items that are the same as in the Key Editor (edit solo, snap, quantize settings, etc.). These are described earlier in this chapter. The following toolbar items are unique to the List Editor:

- The Insert pop-up menu is used when creating new events.
  This is where you determine what type of event to add (see page 134).

- The Mask pop-up menu and Filter view (Show Filter View button) allow you to hide events from view, based on their type and other properties.
  See page 137.

- The Value View button can be used for hiding and showing the Value display (see below).

  The List Editor has no info line (numerical editing is available in the list instead).

The list

This lists all events in the currently selected MIDI part(s), in the order (from top to bottom) they are played back. You can edit the event properties by using regular value editing, as described on page 134.

The event display

This shows the events graphically. The vertical position of an event in the display corresponds to its entry in the list (i.e. to the playback order), while the horizontal position corresponds to its actual position in the project. This is where you add new parts or events, drag to move them, etc.

The value display

This display shows the "value" of each event, allowing for easy viewing and graphical editing. Typically, the value shown is the "Data 2" or "Value 2" property (amounts for MIDI controller events, velocity for notes, etc.). You can show or hide this display by clicking the "Show List Value View" button on the toolbar.

List Editor operations

Customizing the view

You can click and drag the divider between the list and the event display to make one area wider and the other narrower. Furthermore, the list can be customized in the following ways:

- You can change the order of the columns by dragging the column headings.
- You can resize columns by dragging the dividers between the column headings.

Setting the display format

Just like in the Project window, you set the display format (bars+beats, seconds, etc.) by right-clicking (Windows) or [Ctrl]-clicking (Mac) in the ruler and selecting an option from the pop-up menu. This setting affects both the ruler and all start, end and length values shown in the list.

Zooming

You can change the horizontal magnification in the event display by using the zoom slider below the display or the Magnification Glass tool.

Adding events

To add a new event to the edited part, proceed as follows:

1. Use the Insert pop-up menu on the toolbar to select the event type.
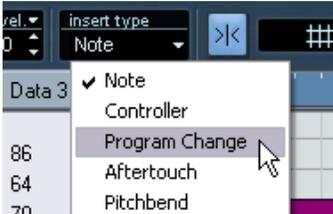
2. Select the Pencil tool and click in the event display, at the desired position (relative to the ruler).
If you are creating note events, you can click and drag to set the length of the note.

The new event appears in the list and in the display. Its properties will be set to default values, but can easily be adjusted in the list.

▪ Notes you enter will get the insert velocity value set in the insert velocity field on the toolbar. See page 94.

Editing in the list

The list allows you to perform detailed numerical editing of the events' properties. The columns have the following functionality:

Column	Description
L	Locate column. An arrow in this column indicates the event that starts closest before the project cursor position. If you click in this column for an event, the project cursor is moved to the start of that event. Double clicking moves the cursor position and starts/stops playback – useful for auditioning when editing in the list.
Type	The event type. This cannot be changed.
Start	The start position of the event, shown in the format selected for the ruler. Changing this is the same as moving the event. Note that moving the event past any other event in the list will re-sort the list (the list always shows the events in the order they are played back).
End	This is only used for note events, allowing you to view and edit the end position of a note (thereby resizing it).

Column	Description
Length	This is only used for note events. It shows the length of the note – changing this resizes the note and automatically changes the End value as well.
Data 1	This is the "data 1" or "value 1" property of the event. The content of this depends on the event type – for notes, this is the pitch, for example. Where applicable, the values are shown in the most relevant form. For instance, the Data 1 value for notes is shown as a note number in the format selected in the Preferences dialog (Event Display–MIDI page). See also the table on page 139.
Data 2	This is the "data 2" or "value 2" property of the event. The content of this depends on the event type – for notes, this is the velocity value, for example. See the table on page 139.
Channel	The MIDI channel of the event. Note that this setting is normally overridden by the channel setting for the track. To make a MIDI event play back on "its own" channel, set its track to channel "Any" in the Project window.
Comment	This column is used for some event types only, providing an additional comment about the event.

▪ You can edit several events at once. If several events are selected and you edit a value for one event, the other selected events' values will be changed as well.
Normally, any initial value differences between the events will be maintained – i.e. the values will change by the same amount. If you press [Ctrl]/[Command] when you edit, however, all events will get the same value.

▪ **For SysEx (system exclusive) events, you can only edit the position (Start) in the list.**
However, clicking the Comment column opens the MIDI SysEx Editor, in which you can perform detailed editing of system exclusive events – see page 239.

Editing in the event display

The event display allows you to edit the events graphically using the tools on the toolbar. You can edit single events as well as several selected events simultaneously.

▪ To move an event, click and drag it to a new position.
Note that moving the event past any other event in the display will re-sort the list (the list always shows the events in the order they are played back). As a result, the vertical position of the event in the display will change as well.

▪ To make a copy of an event, press [Alt]/[Option] and drag it to a new position.

▪ To resize a note, select it and drag its end point with the Arrow tool as in the Project window.
This only works with notes.

▪ To mute or unmute an event, click on it with the Mute tool.
You can mute or unmute several events in one go by enclosing them in a selection rectangle with the Mute tool.

▪ You can select a color scheme for the events with the Colors pop-up menu on the toolbar.
This affects how all MIDI events are shown in the List, Key and Drum editors – see .

▪ To delete an event, select it and press [Backspace] or [Delete], or click on it with the Eraser tool in the event display.

Filtering

Clicking the "Show Filter View" button on the toolbar opens an additional filter bar that allows you to hide specific event types from view. For example, it may be hard to find note events if the part contains a lot of controllers. By hiding these the list becomes more manageable.

To hide an event type, tick its checkbox on the filter view. To see one event type only (hide all other event types), press [Ctrl]/[Command] and click its checkbox. If you [Ctrl]/[Command]-click again, all checkboxes are cleared (all events will be visible).

▪ **The event types remain hidden even if you close the filter view.**
To make sure you see all events, open the filter view and check that all checkboxes are deactivated.

▪ **The filter view does not remove, mute or in any other way change the events.**

Masking
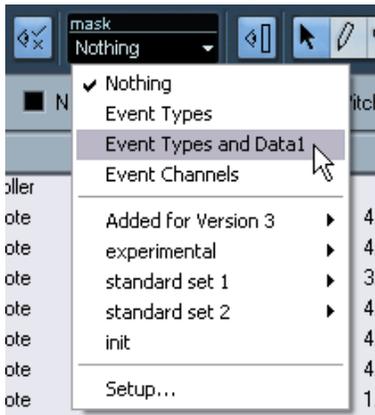
The Mask function is similar to the filter view but allows you to hide events based on other criteria as well. Proceed as follows:

1. Select an event (or several events) of the type you want to view.

2. Pull down the Mask pop-up menu on the toolbar and select one of the options.
The results are as follows:

Option	Description
Event Types	Only events with the type of the selected event will be shown. This does the same as the filter view but is quicker if you only want to view a single event type.
Event Types and Data 1	Only events of the same type and with the same "Data 1" value will be shown. For example, if a note event is selected, only notes with the same pitch will be shown. If a controller event is selected, only controllers of the same type will be shown.
Event Channels	Only events with the same MIDI channel value as the selected event will be shown.

In addition to the above options, the menu also gives you access to the same presets available in the Logical Editor (see page 215). Furthermore, the "Setup..." item on the Mask pop-up menu gives you direct access to the Logical Editor, with the aid of which you can create very complex masking settings.

When you apply any of the presets from the Logical Editor or use the Logical Editor to create masking settings yourself, only the events that meet the criteria specified will be visible.

▪ To deactivate the Mask function, select "Nothing" from the Mask pop-up menu.

The most typical usage of the Mask function is to view a certain type of controller only (e.g. Modulation, Breath Control, etc.). Since these are all the same event types (controller), this would not be possible using the filter view. With the "Event Types and Data 1" option on the Mask pop-up menu, it is!

Editing in the value display

The value display to the right of the event display is a tool for quick viewing and editing of multiple values, e.g. velocities or controller amounts. The values are shown as horizontal bars, with the bar length corresponding to the value.
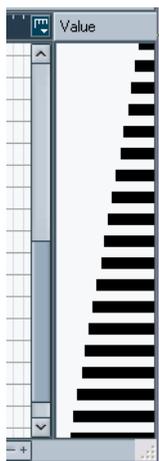
A velocity ramp in the value display.

You edit the values by clicking and dragging. Note that the pointer automatically takes on the shape of the Pencil tool when you move it into the value display – you don't have to select the Pencil tool for this.

Exactly which value is shown for an event depends on the event type. The following table shows what is displayed and edited in the Data columns and the value display:

Event type	Data 1	Data 2	Value display
Note	Pitch (note number)	Velocity	Velocity
Controller	Controller type	Controller amount	Controller amount
Program Change	Program number	Not used	Program number
Aftertouch	Aftertouch amount	Not used	Aftertouch amount
Pitch Bend	Bend amount	Not used	Bend amount
SysEx	Not used	Not used	Not used

- The value display can be hidden from view by clicking the "Show List Value View" button on the toolbar, so that it is not lit.
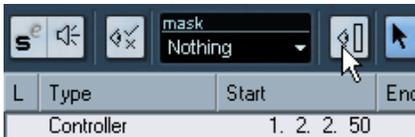
Common MIDI editor options and settings

Snap

Snap activated on the toolbar.

The Snap function helps you find exact positions when editing in a MIDI editor. It does this by restricting horizontal movement and positioning to certain positions. Operations affected by snap include moving, duplicating, drawing, sizing, etc.

- How Snap works depends on the Snap mode pop-up menu next to the Snap button.
  See the chapter "The Project window" in the Operation Manual.

- When the "Bars+Beats" display format is selected in the ruler, the snap grid is set by the quantize value on the toolbar.
  This makes it possible to snap not only to straight note values but also to swing grids set up in the Quantize Setup dialog (see page 59).

- When any of the other display formats is selected in the ruler, positioning is restricted to the displayed grid, i.e. you can snap in finer increments by zooming in and in coarser increments by zooming out the display.

Coloring notes and events

By using the Colors pop-up menu on the toolbar, you can select a color scheme for the events in the editor. The following options are available:

Option	Description
Velocity	The notes get different colors depending on their velocity values.
Pitch	The notes get different colors depending on their pitch.
Channel	The notes get different colors depending on their individual MIDI channel values.
Part	The notes get the same color as their respective part in the Project window. Use this option when you are working with two or more tracks in an editor, to make it easier to see which notes belong to which track.
GridMatch	The notes get different colors depending on their time position. This mode makes it easy to see e.g. if the notes in a chord start at the exact same beat.

When any of the options (apart from "Part") is selected, you can select "Setup" from the Colors pop-up menu. This opens a dialog in which you can specify which colors should be associated with which velocities, pitches or channels, respectively.

4

MIDI devices

Background

The MIDI Device Manager allows you to specify and set up your MIDI devices, making global control and patch selection easy.

But the MIDI Device Manager also features powerful editing functions that can be used to create MIDI device panels. MIDI device panels are internal representations of external MIDI hardware, complete with graphics. The MIDI device panel editor provides all the tools you need to create device maps where every parameter of an external device can be controlled and automated from inside Nuendo.

For descriptions of how to create device maps and the powerful device panel editing features, see .

MIDI devices – general settings and patch handling

On the following pages, we will describe how to install and set up preset MIDI devices, and how to select patches by name from within Nuendo. This section also describes how to create a MIDI device from scratch.

About program change and bank select

To instruct a MIDI instrument to select a certain patch (sound), you send a MIDI Program Change message to the instrument. Program Change messages can be recorded or entered in a MIDI part like other events, but you can also enter a value in the Program (prg) field in the Inspector for a MIDI track. This way, you can quickly set each MIDI track to play a different sound.

With Program Change messages, you are able to select between 128 different patches in your MIDI device. However, many MIDI instruments contain a larger number of patch locations. To make these available from within Nuendo, you need to use Bank Select messages, a system in which the programs in a MIDI instrument are divided into banks, each bank containing 128 programs. If your instruments support MIDI Bank Select, you can use the Bank (bnk) field in the Inspector to select a bank, and then the Program field to select a program in this bank.

Unfortunately, different instrument manufacturers use different schemes for how Bank Select messages should be constructed, which can lead to some confusion and make it hard to select the correct sound. Also, selecting patches by numbers this way seems unnecessarily cumbersome, when most instruments use names for their patches nowadays.

To help with this, you can use the MIDI Device Manager to specify which MIDI instruments you have connected, by selecting from a vast list of existing devices or by specifying the details yourself. Once you have specified which MIDI devices you're using, you can select to which particular device each MIDI track should be routed. It is then possible to select patches by name in the track list or Inspector.

Opening the MIDI Device Manager

Select MIDI Device Manager from the Devices menu to bring up the following window:

This is the list of MIDI devices you have connected. The first time you open the MIDI Device Manager, this list will be empty.

These buttons let you manage the list of installed devices.

This button opens a selected device.
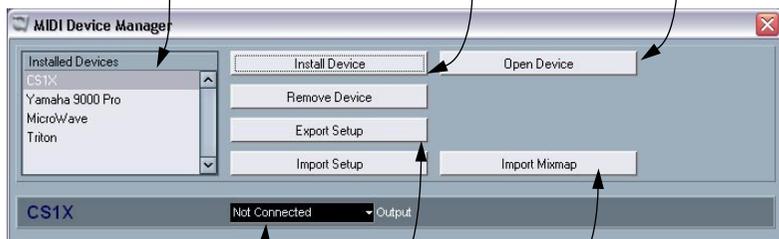
Here you specify to which MIDI output the selected device is connected.

These buttons are used to import/export XML Device setups.

This button allows you to import Mixmaps.

When you open the MIDI Device Manager for the first time, it will be empty (because you haven't installed any devices yet). On the following pages we describe how to add a pre-configured MIDI device to the list, how to edit the settings and how to define a device from scratch.

Installing a MIDI device

There is an important difference between installing a preset MIDI device and importing a MIDI device setup:

▪ The presets available in the Install Device dialog do not include any device mapping of parameters and controls and no graphic panels.
They are simply patchname scripts. When you install a preset MIDI device it is added to the Installed Devices list.

▪ A device setup can include device mapping, panels and/or patch information.
Device setups are also added to the list of installed devices when imported.

To install a preset MIDI device, proceed as follows:

1. Click the Install Device button.
A dialog appears listing all pre-configured MIDI devices. For now we assume that your MIDI device is included in this list.

2. Locate and select the device in the list and click OK.

▪ If your MIDI device isn't included in the list but is compatible with the GM (General MIDI) or XG standards, you can select the generic GM or XG Device options at the top of the list.
When you select one of these options, a name dialog will appear. Enter a name for the instrument and click OK.

Now the device appears in the Installed Devices list to the left.

3. Make sure that the new device is selected in the list and pull down the Output pop-up menu.

4. Select the MIDI output that is connected to the device.

5. Click the Open Device button.
Now a separate window opens for the selected device, showing a node structure in the left half of the window. At the top of this structure is the device itself, and below it the MIDI channels used by the device.

6. Select Patch Banks from the pop-up at the top of the window.

The Patch Banks list in the left half of the window shows the patch structure of the device. This could simply be a list of patches, but it's usually one or several layers of banks or groups containing the patches (much like a folder structure on a hard disk for example).
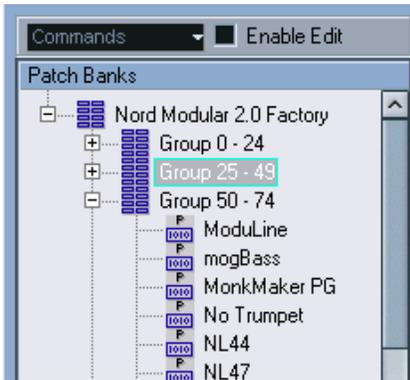
• You can rename a device in the Installed Devices list by double clicking and typing – this is useful if you have several devices of the same model, and want to separate them by name instead of by number.

• To remove a device from the Installed Devices list, select it and click Remove Device.

About Patch Banks

Depending on the selected device, you may find that the Patch Banks list is divided in two or more main banks. Typically, these are called Patches, Performances, Drums etc. The reason for having several patch banks is that different "types" of patches are handled differently in the instruments. For example, while "patches" typically are "regular" programs that you play one at the time, "performances" may be combinations of patches, which could e.g. be split across the keyboard, layered or used for multitimbral playback.

For devices with several banks, you will find an additional item labeled Bank Assignment. Selecting this opens a window in which you can specify for each MIDI channel which bank it should use.

The selection here will affect which bank is displayed when you select programs by name for the device in the track list or Inspector (see below). For example, many instruments use MIDI channel 10 as an exclusive drum channel, in which case you would want to select the "Drums" (or "Rhythm Set", "Percussion", etc.) bank for channel 10 in this list. This would then let you select between different drum kits in the track list or Inspector.

Selecting a patch for an installed device

If you return to the Project window at this point, you will find that the installed device has been added to the MIDI Output menus (in the track list and the Inspector). Now you can select patches by name, in the following way:

1. **Pull down the Output menu (in the track list or Inspector) for a track that you want to play the installed device, and select the device.**
   This directs the track to the MIDI output specified for the device in the MIDI Device Manager. The bank and program fields in the track list and Inspector are replaced by a single Programs field that currently reads "Off".

2. **Click the Programs field to display a pop-up menu, hierarchically listing all the patches in the device.**
   The list is similar to the one displayed in the MIDI Device Manager. You can scroll the list up and down (if required), click the plus/minus signs to show or hide subgroups, etc.
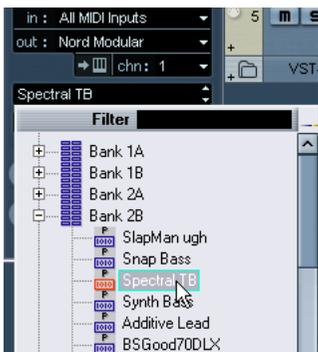
3. **Click a patch in the list to select it.**
   This sends the appropriate MIDI message to the device. You can also scroll the program selection up or down, as with any value.

Renaming patches in a device

The pre-configured devices list is based on the factory-preset patches, i.e. the patches included in the device when you first bought it. If you have replaced some of the factory presets with your own patches, you need to modify the device so that the patch name list matches the actual device:

1. In the MIDI Device Manager, select the device in the Installed Devices list.

2. Click Open Device.
   Make sure that Patch Banks is selected on the pop-up at the top of the window.

3. Activate the Enable Edit checkbox.
   When this is turned off (default) you cannot edit the pre-configured devices.

4. Use the Patch Banks display to locate and select the patch you want to rename.
   In many instruments, the user-editable patches are located in a separate group or bank.

5. Click on the selected patch in the Patch Banks list to edit its name.

6. Type in the new name and click OK.

7. Rename the desired patches in this way, and finish by deactivating Enable Edit again (to avoid modifying the device by accident).

▪ **It's fully possible to make more radical changes to the patch structure in a device as well (adding or deleting patches, groups or banks).**
   For example, this would be useful if you expanded your MIDI device by adding extra storage media such as RAM cards, etc. The available editing functions are described below.

Defining a new MIDI device

This section describes how to define a new MIDI device.

If your MIDI device is not included in the list of pre-configured devices (and is not a "plain" GM or XG device), you need to define it manually to make it possible to select patches by name.

1. In the MIDI Device Manager, click the Install Device button.
The Add MIDI Device dialog appears.

2. Select "Define New..." and click OK.
The "Create New MIDI Device" dialog appears. For a description of all the options in this list, see .

3. Activate the MIDI channels you would like the device to use in the Identical Channels" list.
This means that the device will receive Program Change over any MIDI channel. Identical and Individual channels are described on .

4. Enter a name of the device at the top of the dialog, click [Enter] and then OK.
The device appears in the Installed Devices list.

5. Select the device in the list and click on the Open Device button.
The device node structure for the device is shown.

6. Select Patch Banks from the pop-up at the top of the window.
As you can see, the list is currently empty.

7. Make sure the Enable Edit checkbox is activated.
Now you can use the functions on the Commands pop-up menu to the left to organize the patch structure of the new device.

A patch structure is made out of the following components:

- Banks are the main categories of sounds – typically patches, performances and drums, as described above.
- Each bank can contain any number of groups, represented by folders in the list.
- The individual patches, performances or drum kits are represented by presets in the list.

The Commands pop-up menu contains the following items:

Create Bank

Creates a new bank at the highest hierarchical level of the Patch Banks list. You can rename this by clicking on it and typing a new name.

New Folder

Creates a new subfolder in the selected bank or folder. This could correspond to a group of patches in the MIDI device, or just be a way for you to categorize sounds, etc. When you select this item, a name dialog will appear, allowing you to name the folder. You can also re-name the folder afterwards by clicking it and typing in the list.

New Preset

This adds a new preset in the selected bank or folder.

You can rename the preset by clicking it and typing a new name.

When the preset is selected, its corresponding MIDI events (Program Change, Bank Select, etc.) are shown in the event display to the right. The default setting for a new preset is Program Change 0 – to change this, use the following procedures:

For details on which MIDI events are used for selecting patches in the MIDI device, consult its documentation.

• To change which Program Change value should be sent out to select the patch, adjust the number in the Value column for the Program Change event.

- To add another MIDI event (e.g. Bank Select) click directly below the last event in the list and select a new event from the pop-up menu that appears.
  After adding a new event, you need to set its value in the Value column, as with Program Change.

- To replace an event, click on it and select another event from the pop-up menu.
  For example, a MIDI device may require that a Bank Select message is sent first, followed by a Program Change message, in which case you would need to replace the default Program Change message with a Bank Select message and add a new Program Change after that.

- To remove an event, select it and press [Delete] or [Backspace].

Different devices use different schemes for Bank Select. When you insert a Bank Select event, you should check the device's documentation to find whether to choose "CC: BankSelect MSB", "Bank Select 14 Bit", "Bank Select 14 Bit MSB-LSB Swapped" or possibly some other option.

Add Multiple Presets

This opens a dialog, allowing you to set up a range of presets to be added in the selected bank or folder.
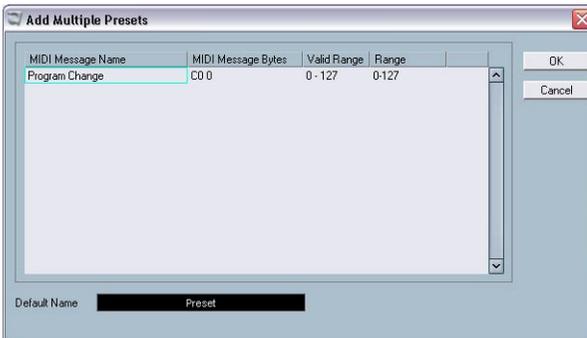
Proceed as follows:

1. Add the event types required for selecting a patch in the MIDI device.
This is done just as when editing the settings for a single event: clicking in the event display brings up a pop-up menu from which you can select an event type.

2. Use the Range column to set up either a fixed value or a range of values for each event type in the list.

This requires some explanation:

If you specify a single value in the Range column (e.g. 3, 15 or 127), all added presets will have an event of this type set to the same value.

If you instead specify a value range (a start value and an end value, separated by a dash, e.g. 0-63), the first added preset will have an event set to the start value, the next value will be incrementally raised by one and so on, up to and including the end value.

▪ **The number of added presets depends on the Range setting.**
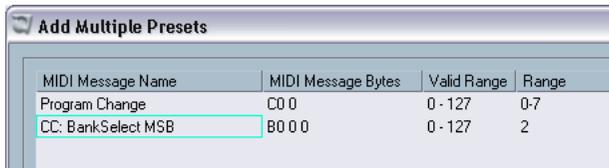
MIDI Message Name	MIDI Message Bytes	Valid Range	Range
Program Change	C0 0	0 - 127	0-7
CC: BankSelect MSB	B0 0 0	0 - 127	2

Add Multiple Presets

This example will generate eight presets, each with a Bank Select event set to 2, but with different Program Change events (ranging from 0 to 7).

3. Specify a Default Name below the event display.

The added events will get this name, followed by a number. You can rename presets manually in the Patch Banks list later.

4. Click OK.

A number of new presets are now added in the selected bank or folder, according to your settings.

Other editing functions

▪ You can move presets between banks and folders by dragging them in the Patch Banks list.
▪ You can remove a bank, folder or preset by selecting it in the Patch Banks list and pressing [Backspace].
▪ If you specify more than one bank, a Bank Assignment item will be added to the pop-up menu at the top of the window. Use this to assign banks to the different MIDI channels (see).

The Create New MIDI Device dialog

When you select "Define New" in the Add MIDI Device window, the
Create New MIDI Device dialog opens.

▪ **The dialog contains the following settings:**

Item	Description
Identical/Individual Channels	Here you can specify which MIDI channels you wish the device to use. Identical channels share channel settings and parameters, whereas Individual channels are "exclusive". An example for this are GM/XG devices – in these devices, the channels are all identical, except channel 10, which is always the drum channel.
Channel Settings	This specifies which MIDI messages should be supported by the MIDI device (for each Identical channel).
Preset Type	Preset References contain the patch name and a corresponding MIDI message (typically Program Change/Bank Select). Snapshots also contain a patch name but in addition complete parameter settings, which are reset when such a preset patch is recalled.
Global Settings SysEx Parameters	Activate this checkbox if you wish the device to use System Exclusive messages.
Global Settings Snapshots	This specifies whether the device supports global snapshots, which memorize all parameters in a device.

About Device panels

On the following pages we will describe how to use MIDI Device panels and the powerful MIDI device panel editing features of the MIDI Device Manager.

Basic concept

The panel editing features in the MIDI Device Manager can be seen as a separate application or entity within Nuendo. It allows you build device maps complete with control panels, with all parameters controllable from within Nuendo. Building more complex device maps requires that you are familiar with SysEx programming (see page 193). But you can also create simpler panels by assigning MIDI Control Change messages to control objects, which does not require any programming skills.

Although these powerful editing features are there if you need them, you do not have to use them to use MIDI devices.

Cubase users may recall the MIDI Mixer, which allowed you to create similar control setups, called Mixer maps. Third-party developers created Mixer Maps for hundreds of popular devices at that time.

But now, this concept has been taken to a higher level, offering a much deeper and more intuitive integration of the control features in the program.

Overview

Device panels in the program

In this section we shall take a look at a pre-configured MIDI device panel to illustrate how it can be used in Nuendo. Several device set-ups complete with panels are included with the program.

▪ On the PC, these are located in the "Device Maps" folder inside the application folder.

▪ On the Mac they can be found in the following location: (Startup Volume)/Library/Application Support/Steinberg/Nuendo 3/Device Maps.

Opening a device setup

Proceed as follows to open a MIDI device setup:

1. Open the MIDI Device Manager from the Devices menu.

2. Click the "Import Setup" button.

A file dialog opens, where you can select XML files (the file format used for device setups) for import by navigating to the Device Maps folder (see above).

3. When you select a device setup XML file and click Open, the Import MIDI Devices dialog appears where you can select a device for import.
A device setup file can contain one or several MIDI devices.

4. When you select a device and click OK, the device is added to the list of installed devices in the MIDI Device Manager. Select the correct MIDI output from the Output pop-up menu, select the device in the list and click "Open Device".

The device control panel opens in a separate window. The Edit ("e") button at the top opens the Edit Panel window, the main edit window, see page 170.

A device control panel representing an Access Virus synth.

5. Close the Device panel and return to the Project window.

6. Select the device from the "Out" pop-up menu for a MIDI track.
Note that for some devices, you may have to set the MIDI channel to "ANY".
Now the Device panel can be opened by clicking the Open Device button in the Inspector or in the channel strip for the corresponding track in the Mixer.

• Note that [Ctrl]/[Command]-clicking the Open Device button allows you to open a subpanel via the panel browser pop-up menu.

Showing panels in the Inspector

1. In the Inspector, open the User Panel tab and click the arrow.
A "Panels" folder is shown with the selected device in a node structure below it. If you open all the folders, you can select any individual panel from the device that "fits" into the User Panel space.
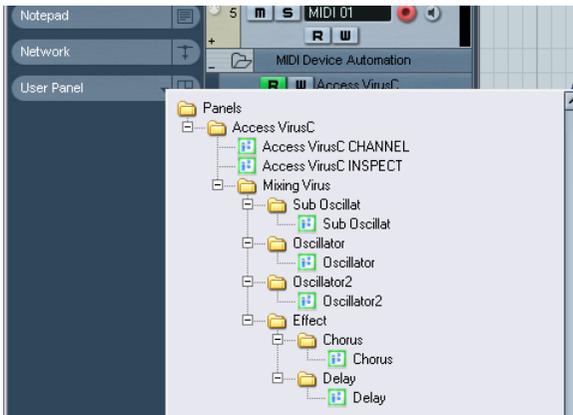
▪ **Select a panel by double-clicking it in the list.**
The panel opens in the Inspector.

Showing panels in the Mixer

1. Open the Mixer, and make sure the extended channel view is shown.

2. Open the View options pop-up for the MIDI channel connected to the device and select "User Panel".
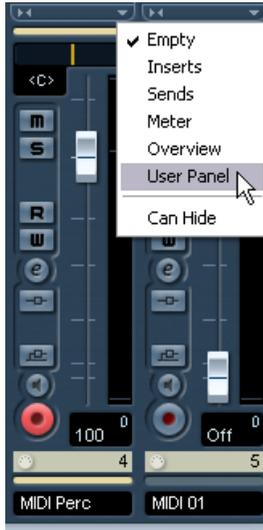
3. Click the icon shown in the extended section of the channel strip.
The Panels folder is displayed like in the Inspector, but with different available panels. Just like in the Inspector, the panel has to "fit" into the available space to be selectable.

4. Double-click to select a panel.
The panel is now shown in the extended section of the channel strip.

Automating device parameters

Automation works just like for normal audio and MIDI tracks:

1. Open the device control panel by clicking the "Open Device" button in the Inspector.

2. Activate Write automation on the device panel.
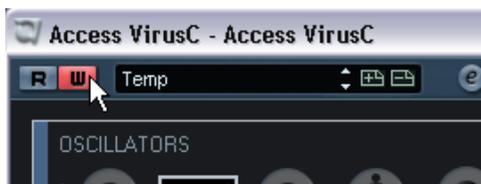
3. If you now go back to the Project window, there will be a MIDI Device Automation track in the Track list.

If you click in the name field, all parameters in the device are shown and can be selected for automation. You can automate the device by either moving knobs and sliders on the control panel itself or by drawing curves on the automation track for a selected parameter.

The main edit windows

To edit device panels you use two main windows; the Device window and the Edit Panel window. In this section we will describe the main working areas of these edit windows, and what they are used for.

The Device window

1. Select a device in the Installed Devices list in the MIDI Device Manager dialog and click Open Device.
   The Device window opens with a node structure in the left half of the window. In this example, the top node represents the device and the subnodes the MIDI channels used by the device.

2. Click on a node.

   Now three areas appear in the main window: Device Node, Panels and Variables.
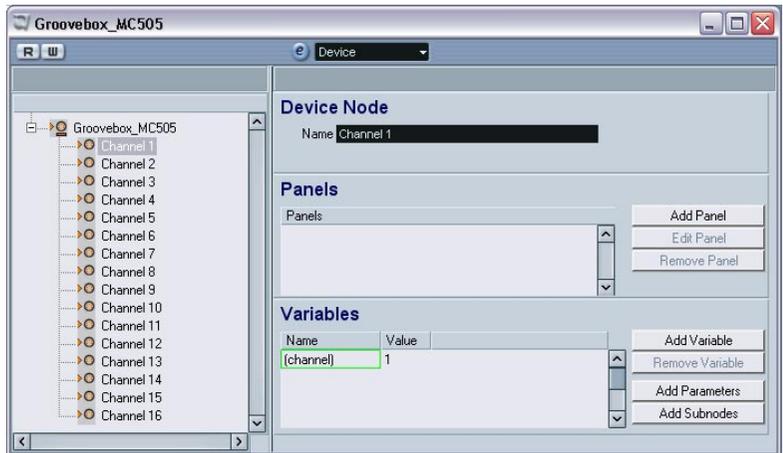
The Device window.

Device structure

On the left is a hierarchical view of the device's structure, which can consist of nodes, subnodes and parameters. By default, the structure of a newly created device (or a device with no panels added yet) will either be based on the MIDI channels that have been activated in the Create New Device dialog (see), or as in this case, one of the preset devices, which all have the same structure (all 16 MIDI channels activated).

Device node

This shows the name of the selected node. You can rename some or all nodes, for example if the device is a typical GM-compatible synth you may want to rename "Channel 10" to "Drums".

Panels

In the Panels window area a list of panels assigned to the selected node will be shown (currently no panels are assigned).

▪ The "Add Panel" button opens the Add Panel dialog, see .

▪ When an existing panel is selected in the Panels window area, the "Edit Panel" button will open the panel for editing in the Edit Panel window, see .

Variables

▪ The "Add Variables" button lets you define variables. Variables are useful when you're working with multiple instances of the same panel. A typical example is when you have a multi-timbral synthesizer with 16 parts, where each part is identical in terms of features and functions, and all that distinguishes them are the MIDI channel numbers. So you create multiple subnodes where the variable is named "part" and the variable range is 1-16. This way you can repeat the same objects and parameters across all parts.

- The "Add Parameters" button opens the "Add Parameter" dialog where you define the parameters that will be used in the Panel. A parameter defines how the setting of the connected device can be modified, what the valid range is and what the current state of the parameter is. Parameters are assigned to objects (see), i.e. knobs, faders, switches or data entry fields on a panel.

- The "Add Subnodes" button lets you create subsidiary nodes. This is useful when you wish to create multiple panels for one node. When you build a device panel you may want to break it up in several parts, or "subpanels" – e.g. one for the Envelope section, one for the Filter section and so forth. By creating all panel sections under separate subnodes, you can show the different sections in the Inspector or channel strip. From these subpanels you can later build a large main panel using the subpanels.

The Add Panel Dialog
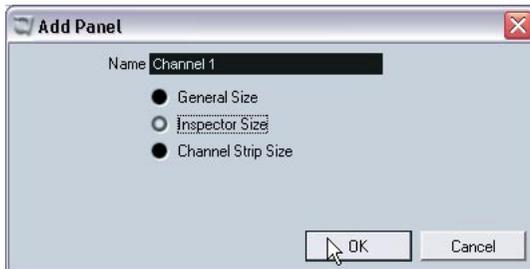
Clicking the "Add Panel" button in the Device window opens a dialog where you select the size and enter a name for the new panel. You have three default sizes to chose from:

- General Size (352*352 pixels by default).
This is the largest view, which is to be used in a separate Panel window. The size is customizable, as you often need more than 352 by 352 pixels to fit all controls of an entire instrument into one screen.

- Inspector Size (157*342 pixels).
The standard size for a Panel to be used in the Inspector.

- Channel Strip Size (84*322 pixels).
The standard size for a panel to be used in a Mixer channel strip.

The Edit Panel window

After selecting a name and a panel size in the Add Panel dialog, click OK to open the Edit Panel dialog. When a panel has been added you can switch between all edit windows (Device/Edit Panel/Patch Banks) by using the pop-up menu at the top of the window for an open device.
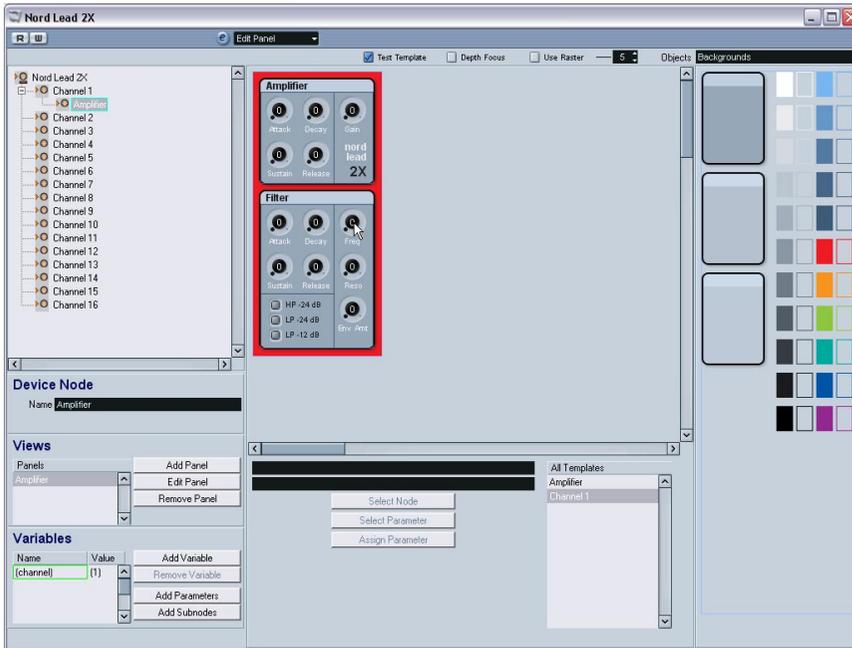
The Edit Panel window contains the following sections:

Device structure (top left)

This is the device "tree" where you can navigate the device structure and its nodes, subnodes and parameters. This is the same as shown in the Devices window.

Edit area (top middle)

This is the "stage" where you build the panel from various object components. Above the edit area are the Panel Edit settings which affect the operations you perform in the edit area.

Objects area (right)

This area contains the predefined objects which can be dragged and dropped into the edit area. At the top of this area there is a pop-up menu where you can select Object categories; backgrounds, faders, knobs, data entry, switches and labels, see page 172.

Device item properties (bottom left)

This contains all data and options pertaining to the currently selected node, subnode or parameter.

- When a node or subnode is selected in the device structure, you can rename it and add or remove parameters, variables and subnodes.
- When a parameter is selected in the device structure, you can edit its name, value and transmission type (Control Change or SysEx messages).

At the top you can see and edit the node name. In the Views area, you see the list of panels assigned to the current node. Using the buttons to the right of the list, you can add a new (blank) panel to a node, and edit or remove and existing panel. The way to reach a particular panel or subpanel is to select a node in the device structure area, and then select the desired panel in the Views window area. If you click the Edit Panel button, the panel will open in the edit area.

- It is also possible to drag a subnode's panel from the "Views" area into the panel of a parent node.

Control to parameter assignment (bottom middle)

This is where you couple parameters with controls. Once you have added a control object (knob, data entry, fader or switch), you can either edit its parameter options directly, or – if you have defined parameters already – assign any of those parameters to your new control by first selecting the control, then selecting a Parameter in the Device structure area, then clicking on the Assign Parameter button.

All Templates list (bottom right)

As panels are created, they are added to the All Templates list.

- You can switch between templates, copy objects that you need, switch back to the Panel you're currently editing and paste the objects into that panel.

The available objects

On the Objects pop-up in the top right corner you can select between object categories. Faders, knobs, data entry and switches are control objects, i.e. you have to define a parameter assignment to them when inserted into the edit area, whereas labels and backgrounds are only graphic elements. The object categories are as follows:

Object category	Description
Backgrounds	Here you can select various background colors and borders.
Faders	There are four basic horizontal and vertical fader/slider types, each with three options: basic, with title field, and with title field and min-max values.
Knobs	Various types of knobs, with and without title fields and min-max values.
Data entry	Various types of data entry fields for entering values. There are data entry fields for direct entry, and data entry types for using up/down arrows or sliders (or both) to set values.
Switches	Switches can only send two values. There are three basic types of switches: on/off, momentary and one shot. Momentary switches change to the second value as long as the switch is pressed and revert back when released. One shot switches activate a command, e.g. resetting a value to a default value.
Labels	Labels of various sizes and styles.

Operations in the Edit Panel window

On the following pages, we will describe the basic operations in the Edit Panel window. For a more "hands on" description of how to create panels, see page 178.

Creating a panel

1. Either create a new MIDI Device (see page 152), or select a preset device from the Add MIDI Device dialog, see page 168.

2. In the MIDI Device Manager dialog, select the device in the Installed Devices list and click the "Open Device" button.

   Now the Devices window opens with the Device structure to the left.

3. Select the node, subnode or parameter you wish to add a panel to.

4. Click the Add Panel button, and select a name and size for the panel, see page 169.
   The Edit Panel window opens.

   When you have created a new panel you will see a light blue rectangle which defines the size of the Panel. When you click on the rectangle, resize handles will appear. These allow you to customize the Panel size.

▪ **If you are creating a specific Inspector or Channel Strip panel you should not resize the panel.**

Adding objects and assigning parameters

You build a panel by dragging objects from the Objects area on the right hand side of the window into the rectangle in the edit area.

When you add graphic objects (backgrounds and labels) these are simply added to the edit area, but when you add control objects (switches, faders etc.), the Control Parameter Assignment dialog appears:
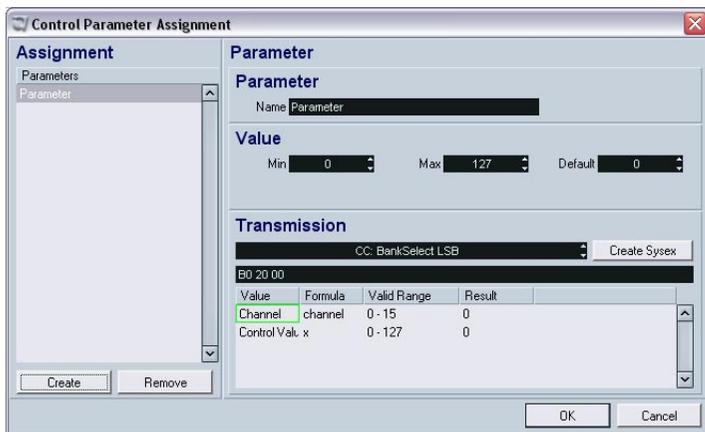
In this dialog you can create and define a name for the parameter and set the parameter value range and a transmission message (see below). When you have set up the parameters as desired, click OK to close the dialog.

Parameter value

In the "Min" and "Max" fields you can set the value range for the parameter. The Default value determines what the value will be when you open the device.

Transmission

Here's where you set the parameter assignment. Clicking in the value field opens a pop-up menu where you can select either "Channel Messages" i.e. MIDI Control Change messages, or SysEx messages.

If you wish to create custom SysEx messages, click the "Create Sysex" button to open the respective dialog.

For information on SysEx and SysEx editing, see page 193 and the chapter "Working with System Exclusive messages".

Object handling

Selecting objects

You select an individual object by clicking on it.

▪ Select multiple objects by pressing [Shift] and clicking on each object in turn.
▪ You can also click in an empty area and drag a selection rectangle around one or more objects, to select them.

Moving objects

Simply click-drag an object to a new location and drop it.

▪ You can also use the arrow keys to move a selected object one pixel horizontally or vertically.
▪ If you press [Shift] the arrow keys will move the object in steps of 10 pixels.

Using cut/copy/paste

You can use standard key commands ([Ctrl]/[Command]+[X], [Ctrl]/[Command]+[C], [Ctrl]/[Command]+[V]) or the corresponding Edit menu items to cut, copy and paste selected objects.

Deleting objects

Select any object(s) and hit [Backspace] or [Delete] or select "Delete" from the context menu.

Resizing objects

Click on any object to make resize handles appear. Click and move the handles to resize the object.

Sending objects to front/background

Select an object and right-click/[Ctrl]-click to bring up the context menu.

▪ Choose "To Front" to make the selected object the topmost one.
▪ Choose "To Background" to place the object behind all other objects.

Editing text

Double-click on any text (text object or text label on a control object) and enter the text.

Aligning objects horizontally/vertically

Select multiple objects, then right-click/[Ctrl]-click to open the context menu.

- For horizontal alignment, your options are Left, Centre and Right.
- For vertical alignment, you can choose Top, Middle and Bottom.

Spacing objects evenly

Select multiple Objects and open the context menu. Select "Space Evenly Horizontally" or "Space Evenly Vertically" to place the objects in a row or column with identical distances between the objects.

Making objects the same size

Select multiple Objects and resize one of them. All selected Objects will be resized in accordance with the source Object.

Import Bitmap

You can use bitmaps (pictures) as backgrounds as well. Open the context menu and select "Import Bitmap…". You can import custom bitmaps in the following formats: PNG (Portable Network Graphics), PSD (Photoshop) or BMP (Windows bitmap).

Edit Object Parameter

Double-click on a control object (knob, fader, data entry, switch) to open the Control Parameter Assignment window. In this window you can also assign previously defined parameters to an object by choosing one from the Assignment list, or create new parameters.

Panel Edit Settings
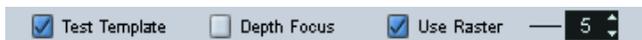
Test Template

Puts the currently edited panel into live test mode. All controls will be fully functional, transmitting MIDI data to the device. Activate this mode when you want to try out the panel to make sure that all parameters are set up correctly. You cannot edit objects while in test mode, so make sure to deactivate Test Template when you're done testing.

Depth Focus
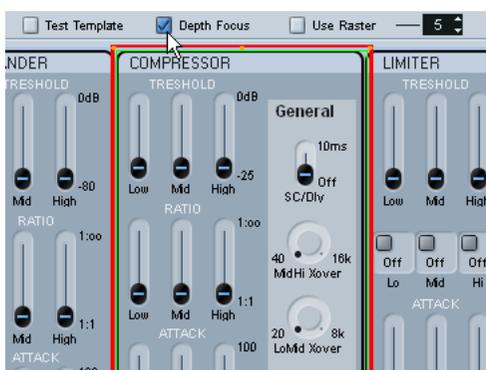
This is useful when editing very complex panels, or panels featuring nested views (subpanels). By enabling Depth Focus, you get a red rectangle around the area whose level is currently in edit focus. By double-clicking inside a subpanel, the red rectangle will mark the boundaries of the subpanel and you can only edit objects inside the focus area. For each double-click you go down one level. To go up one level, press [Return].

Use Raster

This activates an invisible grid that objects will snap to when moved. The value (5 by default) dictates the resolution of the grid. With a value of 20, the raster will be made up of squares of 20*20 pixels in size. The raster is anchored in the top left corner of the actual panel (not in the edit area).

Building a control panel – a tutorial

In this tutorial we will create a simple control panel for a device:

1. Open the MIDI Device Manager window, and click the Install Device button.
Here you can choose from a list of pre-defined devices, or define a custom device. In this example we will use a Korg Triton preset.
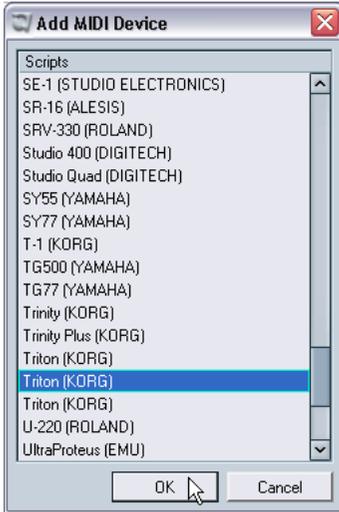
2. Once you have installed the Triton device, select it by clicking on its name in the Installed Devices list and click the "Open Device" button.

Now you will see the Device structure to the left of the window. In this example, we will select Channel 1.

3. Select the Channel 1 node and click the Add Panel button.
Now you can set a size for the panel - see for details.

4. For this tutorial, select "Inspector size" and click OK.

The main Panel Edit window will now open. The blue rectangle is the panel edit area.
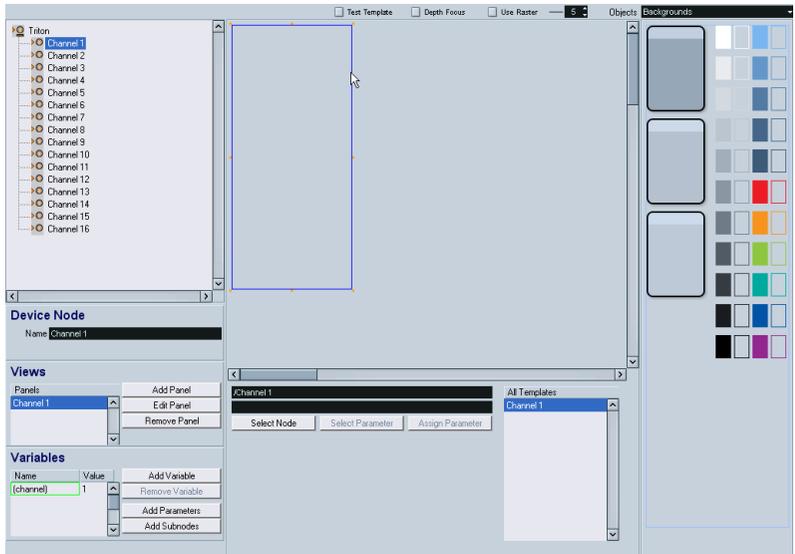
Now you can begin adding objects to the Panel. Let's start with a suitable background. Backgrounds are selected from the area to the right of the edit area.

5. Drag a background object into the blue rectangle (in the edit area) and release the mouse button.
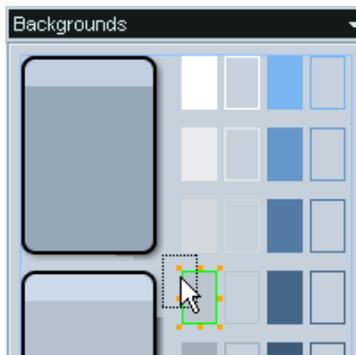
Once an object is selected you can adjust its size to your liking using the resize handles.

6. Stretch this background so that it covers the entire Panel area.
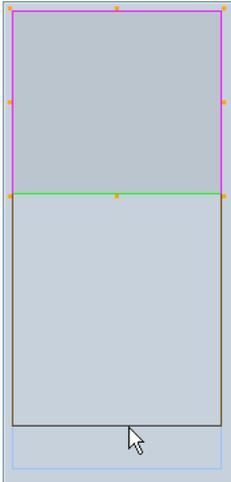
All objects, both backgrounds and other, can overlap. By right-clicking/ [Ctrl]-clicking the object you can bring up a context menu with the items "To Front" and "To Background". If you select an object and then select "To Front", it will become the foremost object (while "To Background" results in the opposite). This is useful when you're dealing with backgrounds, labels and controls sharing the same panel space.

Now that the panel has a background, we can move on to control objects.

7. Select "Knobs" from the Objects pop-up menu.
This brings up an assortment of rotary knobs.

8. Select one and drag it into the panel.

Once you have dropped a control into the edit area, the Control Parameter Assignment dialog will open. In this window you can define the parameters and other data pertaining to the control.

9. Click the Create button in the bottom left corner.

10. Enter a name.

Note that this is not the name of the control object itself, but the name of the actual parameter, an item which exists independently from objects. A logical and intuitive naming convention will help!

Now it's time to select the Control Change number in the Transmission field. At this point it may be required to consult the MIDI Implementation Chart of the device you're creating the panel for.

In the case of Korg Triton, we find that LPF Cutoff corresponds to Control Change 74, "Brightness".

11. Select Brightness from the Transmission pop-up menu.
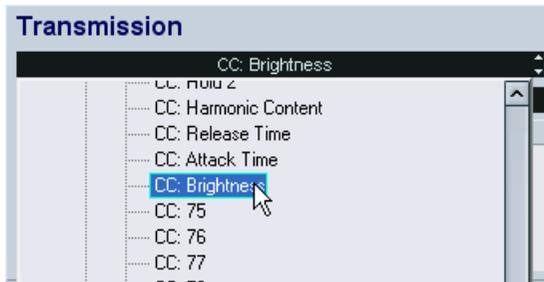
12. At this point we're done with the Parameter window, so just click OK.

13. If the Knob type you have chosen has a text label, you can edit this by double-clicking on the label under the knob. Enter an appropriate Title in the window that appears.

Now the Knob is finished, and we can use it as a starting point for additional Knobs.

14. Select the knob and select Copy from the Edit menu.

15. Select Paste from the Edit menu to paste in another instance of the knob.

A pasted object will be placed at the same coordinates as the original object. Use the arrow keys or the mouse to move the new knob to an empty space.

Since the new knob needs a different name and a different parameter assigned to it, we need to do some editing:

16. Double-click on the copied knob to open the Parameter window.

Here you will notice that the assigned Parameter is LPF Cutoff (the only parameter we've created so far).

17. Click the Create button again to define a new Parameter, "Resonance".

18. Enter this name in the Parameter name field.

According to the Triton MIDI Implementation Chart, Resonance corresponds to Controller 71 (CC: Harmonic Content).

19. Select controller 71 (CC: Harmonic Content) from the Transmission pop-up menu and click OK.

20. Double-click on the name Label to edit the label text.

21. Enter "Resonance" and click OK.

Done! Now you have two knob controls with different parameters assigned to them.

You may find that the Knobs aren't properly aligned, horizontally and/or vertically. The Panel editor can assist you with this.

22. Press [Shift] and click on both knobs to select them.

23. Right-click/[Ctrl]-click to open the context menu, and you will see a range of alignment and spacing commands.

In this case we're interested in vertical alignment, so we'll choose Align Bottoms.
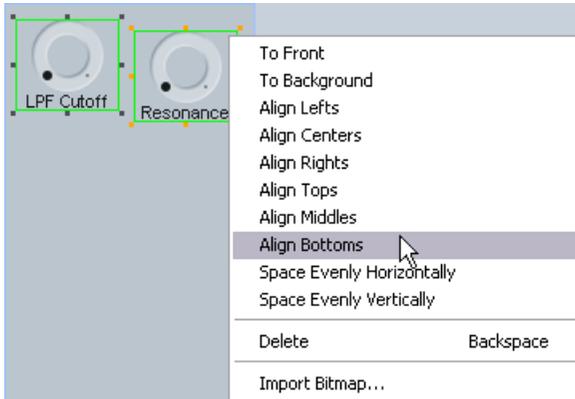
Now the bottom edges of the two Objects are aligned vertically.

We're going to create two more control knobs, but this time we'll define the parameters first. As stated earlier, parameters exist independently from objects and can be created in a separate process, which is useful when you have the MIDI Implementation Chart in front of you anyway.

In the main window of the Editor, below the Device "tree" (known as the Device structure), you'll see an area called Variables. In this area you'll find the Add Parameters button.

24. Click this to open the Parameter window and create two new parameters, "EG Intensity" (CC 79) and "EG Release" (CC 72).

25. When you're done, duplicate the two existing knobs and place the copies in an empty space.

You can select multiple knobs and use the alignment and spacing commands to get all the controls in neat and tidy rows and columns.
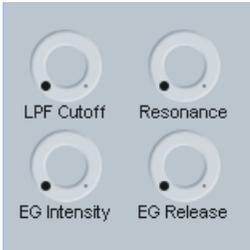
These four Knobs are known as "Realtime Controls A" on the Korg Triton. It might be a good idea to add a Title Object to this group, for easy identification.

26. Switch to Labels on the Objects menu, pick a title object and drag it to the edit area.
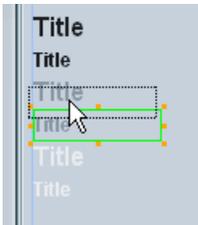
27. Double-click on it, enter "Realtime Controls A" in the text dialog and click OK.

It's starting to look good, but perhaps we should add some kind of frame around this group of controls to distinguish them from others.

28. Go back to Backgrounds on the Objects menu and drag one of the backgrounds to the edit area.

Since the most recently added object automatically ends up on top of all others, we must rearrange the order here.
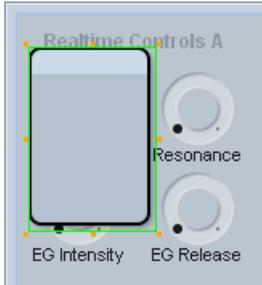
29. Select the object you just added, then right-click/[Ctrl]-click to open the context menu.

30. Choose "To Background" – this will send the object to the back.

At this point the Object is no longer visible, simply because it ended up behind the large grey Background that we added in the beginning.

31. To solve this problem, click on the grey background to select it, then open the Context menu again and select "To Background" once more.

Now the Objects are in the correct order, and you can go on to resize the additional Background so that it encompasses the Title and the knobs.

Now let's create a second group of controls.

32. Drag another Background like the one we just added and drop it in the empty space below the existing group.
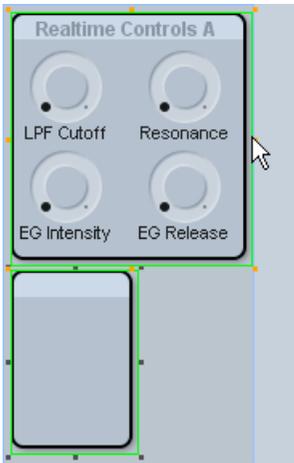
33. To make the new background the same size as the first one, press [Shift], select both objects and then use the resize handles of the original object.

The second object will assume the same height and width as the first.

The obvious thing to do now is to make the second group "Realtime Controls B", but since we've gone over rotary knobs already let's try a few other Korg Triton controls.

The Triton has a slider called "Value" (commonly known as a data entry slider), whose function is doubled by two buttons, increase and decrease. To mimic these controls we need a Fader and a Data Entry object.

34. Switch to Faders on the Objects menu, then drag and drop a vertical fader into the edit area.
The Parameter window appears.

35. Create a new Parameter called "Value" (CC 18, General Purpose 3).
To edit the "min" and "max" labels on the fader, double-click on each label and enter "0" and "127", respectively.

36. Select Data Entry from the Objects menu.

37. Pick one of the objects featuring up/down arrows and drag it to your Panel.

In the Parameter window that pops up, don't create a new parameter.

38. Instead, click on the previously defined Parameter "Value" in the list and then click OK.
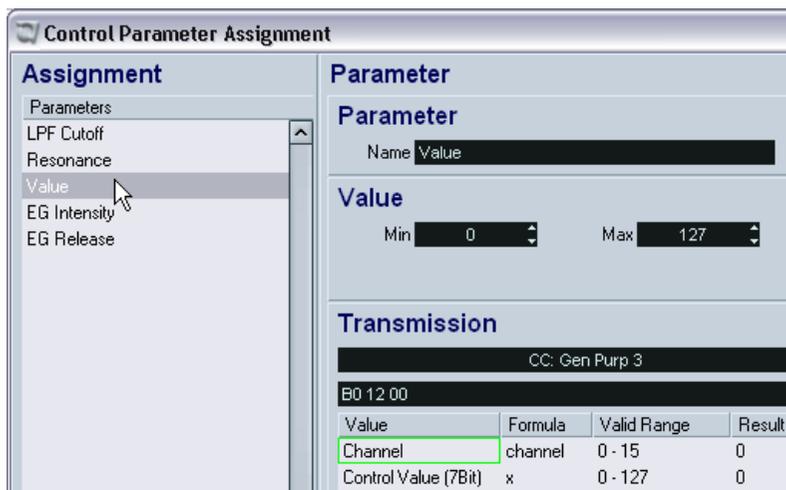
When the same Parameter is assigned to two or more controls, the Controls become linked so that when you move one of them, they all follow.
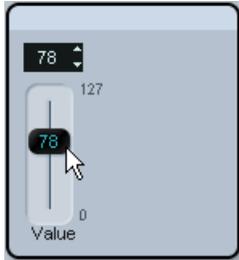
We're almost done. Let's add a couple of switches as well.

39. Select Switches from the Objects Menu and drag a switch from the On/Off subcategory to the edit area.

Unlike faders, knobs and data entry objects, the switches can only send two values. Normally, hardware controls that function like Switches only respond to 0 and 127, or 0 and 64. The Min and Max values in the Parameter window correspond to the two alternate states (on/off) of the switch.

The Korg Triton's realtime controls SW1 and SW2 respond to CC 80 (General Purpose 5) and CC 81 (General Purpose 6), respectively.

40. Define the two Parameters and assign them to the switches, SW1 and SW2.

Now we're nearly there, but before we might want to test it.

41. Activate the test mode by checking the "Test Template" option at the top of the edit area.

This will make the Panel "go live" and transmit MIDI data over the output port when you move the controls.
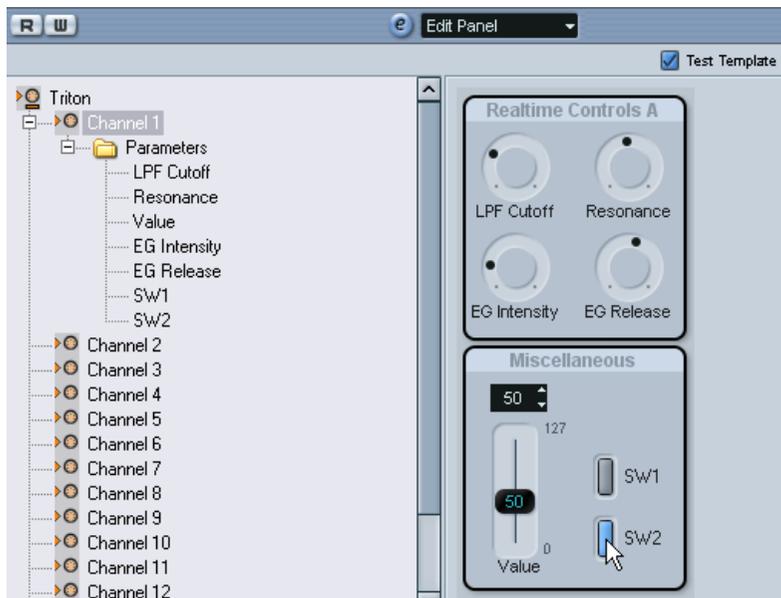
If everything appears to be functioning OK, we can consider the Panel completed, and it's time to start using it!

42. Click the Exit button on the Panel Edit window, and click Save in the dialog that appears.

To use the new panel in the Inspector, go back to the main Project window, create a MIDI track and assign its output to the device the panel was made for, i.e. Triton.

43. Now click the User Panel tab at the bottom of the Inspector.
Click the arrow to open the Device structure and choose the appropriate panel.

Done! Now the device panel is displayed in the Inspector and ready
for automation recording.

Exporting and importing device setups

Clicking the Export Setup button allows you to export your complete MIDI device setup as a separate XML file. The file can then be imported using the Import Setup button. This is useful if you move to another studio, install the program on a new computer, etc.

▪ **When you import a stored setup with the Import Setup function, a dialog will appear, listing all devices included in the stored setup.**
Select the device(s) you wish to import and click OK.

▪ **Importing will not overwrite any currently installed devices.**
If the current list contains a device with the same name as a device to be imported, a number will be added to the name of the imported device.

Defining a SysEx device – a tutorial

On the following pages, the basic concepts of the MIDI devices are described, so that you will be able to create your own ones later.

If you want to define a SysEx device, it is absolutely vital that you have the manual for the hardware device, which describes its MIDI definitions. Usually, these settings are described on the last few pages of the manual: watch out for small letters and lots of tables referencing each other. If the MIDI definitions are not provided in the manual for your device, you should search on the manufacturer's website for the necessary documentation.

It is often necessary to convert hexadecimal numbers to decimals and vice versa, so you'd better have a translation-table or a calculator (that is able to make this conversion) ready. Under Windows, you can use the calculator found under Start/Programs/Accessories.

In the following example, we will define a MIDI device that provides access to the parameters of a Roland JV-1080.

1. To create a new MIDI device, pull down the Devices menu, open the MIDI Device Manager and click on "Install Device".

2. In the dialog that appears, select "Define New…" and click OK.

3. The Create New MIDI Device dialog appears. Set it up as shown in the following picture:
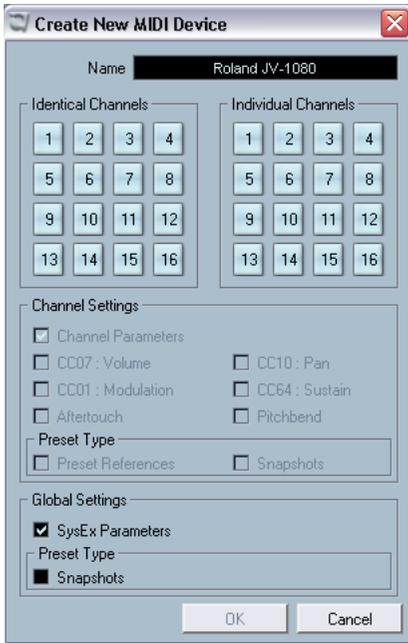
4. Click OK.
Now, the device editor will open with an empty Roland JV-1080 device displayed to the left.

This is the "root" of the device, which stands for the device as a whole.

5. Now, you need to create subsections (Device Nodes) for the device. Click the "Add Subnodes" button and in the dialog that appears, type in "System" in the Name field.
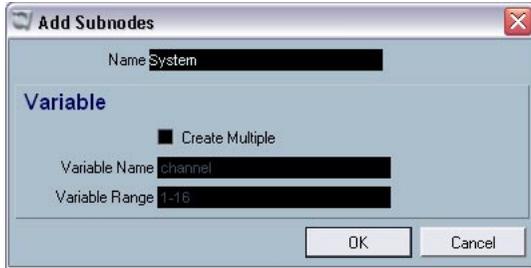
• "System" can be found as a separate table in the MIDI definition part of the JV-1080 manual. It's almost always a good idea to create a separate device node for each table in the MIDI definition of a device.

6. When you click OK, the new subnode is added in the device editor.

7. Repeat the two steps above to create the subnode "System Common", which is also a separate table in the MIDI Definition section in the JV-1080 manual and is referenced by the "System" table.

The "System" table contains 17 references to another table called "Scale Tune". So we need to add 17 more subnodes, but this time, we will proceed differently: we'll create 17 similar subnodes at once.

8. Click the "Add Subnodes" button again.

In the dialog that appears, enter Scale Tune as name, check the Create Multiple check-box, enter "Part" as Variable name and set the Variable range to 1-17. When you click OK, 17 new subnodes are created:
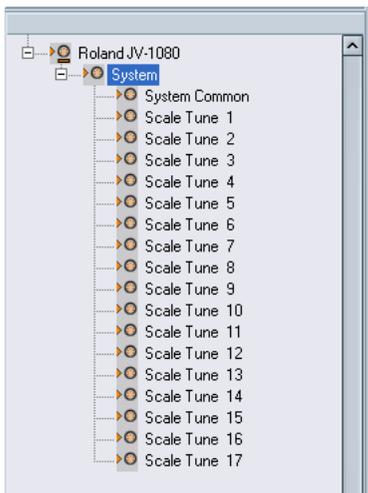
The added subnodes all have a Variable called "Part", set to different "Values".

9. Rename the subnode Scale Tune 17 to "Scale Tune Patch Mode" (according to the System table), by selecting the node and entering the new name in the Name field.

All of these "Scale Tune" nodes behave like alias copies in many aspects (this is described later).

10. Now you'll create parameters for the "Scale Tune" nodes. Click the "Add Parameters" button.

The "Add Parameters" dialog appears.

11. According to the MIDI definition, the "Scale Tune" table contains 12 parameters. All of them are named "Scale Tune for XX", where XX stands for the different notes in an octave. The parameter range of these parameters is from 0 to 127 and all are set to the default value 64. Fill in the Name, Min, Max and Default fields accordingly. Next, activate the "Create Multiple" checkbox and set the Variable Range to "0-11", which is the address range of the 12 parameters.

- Some devices can be edited by MIDI channel messages like Control Change, RPNs or NRPNs. In that case you'd only have to select the desired message by clicking in the MIDI message field next to the Create Sysex button and browse for it. But that is not true for the JV-1080. You need to define the MIDI sysex message that allows you to access these parameters, therefore:

12. Click the Create Sysex button…

…and be prepared for a dive into the deep waters of ancient MIDI mythology. You'd better take a deep breath before…
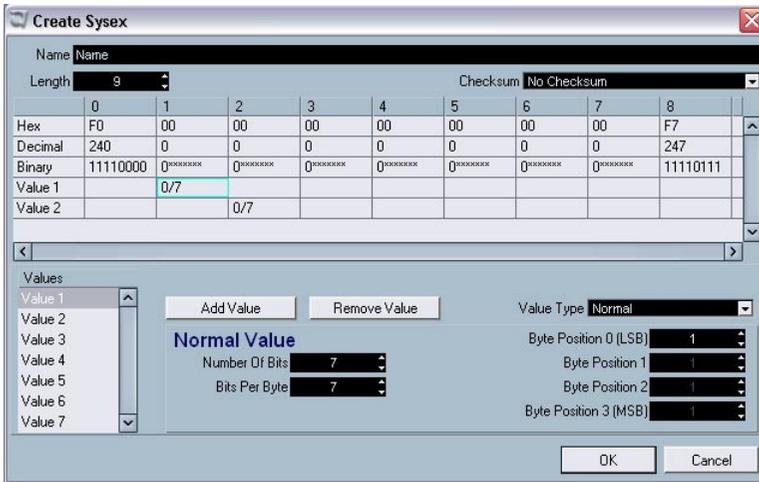
…the "Create Sysex" dialog appears.

▪ In the MIDI definition part of the MIDI device's manual, you should be able to find sysex message definitions. Look out for messages that allow you to set individual parameters according to the tables mentioned earlier. In case of the JV-1080, you'll find this definition 1 or 2 pages before the tables. The message is called "Data Set1 (DT1)", which is a message that is used by many, if not all, of Roland's MIDI devices. The next step is to translate this definition to the Create Sysex dialog.

13. Type in "Roland JV-1080 DataSet1 7Bit" in the Name field and select the checksum from the Checksum pop-up menu.

Now the number of bytes necessary for this message have to be evaluated. Looking at the table in the JV-1080 manual, do not be confused by the entry "…". It means that it is possible to transfer more than one MIDI byte (7bit) in the message in one go, by sending multiple data bytes. But right now you don't need this because about 99% of the device's parameters are in the range of up to 128 states, which can be transmitted with one data byte. So if you count the bytes, when using only one data byte you get a count of 12.

14. Enter "12" in the Length value box.

- **It is important to set "Length" and "Checksum" at the beginning, otherwise you may need to do the additional steps again.**

  If you look at the sysex definition table, you'll notice upper and lower case letters in the "Status" column. Upper case letters stand for static hexadecimal numbers (indicated by the "H" suffix). Lower case letters stand for variable numbers that depend on the context. In the "Create Sysex" dialog, "Values" are used for these variable numbers. For the static ones, there is no need for "values", you can simply enter the respective number.

  All System exclusive messages always begin with F0H and end with F7H, with an arbitrary number of bytes in between. This cannot be changed.

15. In our example, the first byte after that is "41H", which is static. Therefore, delete "Value 1" by selecting it and clicking on "Remove Value" and click in the position 1 field in the "Hex" row.

16. Enter "41".

   You see that the number is automatically converted to decimal and binary format. You can also enter decimal or binary numbers by clicking into the appropriate rows.
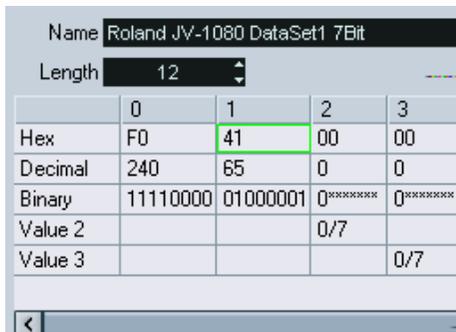
17. Next is the "device ID" which is a dynamic value (depending on what is set as the "device ID" in the receiving JV-1080). Double-click on "Value 2" in the Values list and rename it to "DevID".

18. Reduce the number of bits to "4" and enter "10" in the Hex row at position 2, because the device ID ranges from 10H to 1FH.
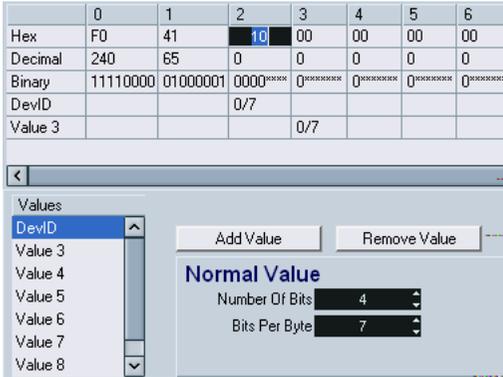
19. Next, remove Value 3 and Value 4 and enter the right Values (6A and 12) in the Hex row.

20. Finally, rename Values 5 to 9 according to the Sysex definition table.
The dialog should now be set up like this:
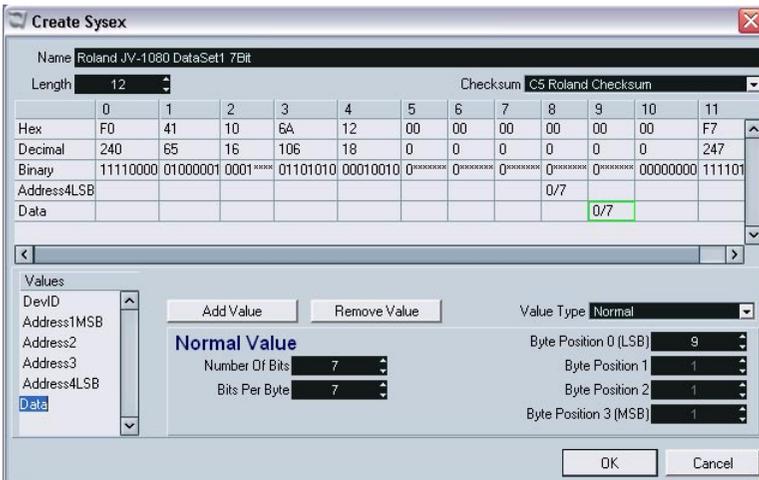
21. Now, click OK, to return to the world of the living…

▪ All the values that have been defined now appear in the Add Parameters dialog and can be assigned to a so called "Formula".

22. Click in the Formula column for the DevID and enter "DevID", to set this value to a variable called "DevID".
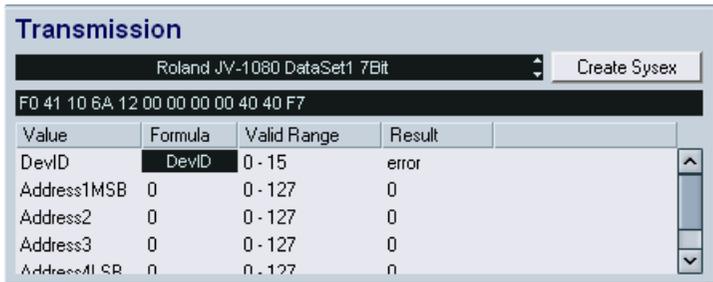
As there is no "DevID" variable defined yet, you get "error" as a result. For now, this can be ignored. We will define the "DevID" variable later.

23. Now you need to set the right address. In the Scale Tune table of the manual, "Address1MSB" and "Address2" are set to 0 for all parameters of the "Scale Tune" nodes. Therefore, leave them as they are: already set to 0.
"Address3" indicates the part which is affected by each Scale Tune and ranges from 10H to 20H. Remember: you created the 17 Scale Tune nodes by using a variable called "Part" which ranged from 1-17, so if you add 15 to this "Part" variable, you get the desired range of 10H-20H, which is 16-32 in decimal. To achieve this, simply type in "Part+15" in the "Formula" column for "Address3". (You can also use other operations in the "Formula" column: "-" (subtraction), "*" (multiplication) and "()" (parentheses) for small calculations.)

24. Finally, enter "index" in the Formula column for "Address4LSB" because this variable will be used to create multiple (12) parameters at once, as set in the "Variable" section of the "Add Parameters" dialog. Again, "error" is displayed in the Result field, because there is no such variable defined yet. In fact "index" is no real variable, because it simply will be replaced by each of the values in the defined range after completion of the dialog.

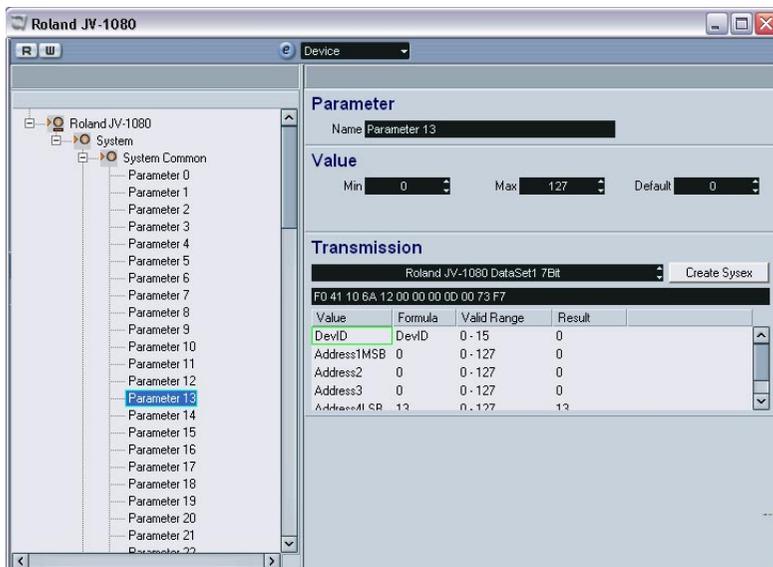The dialog should now be set up as follows:

Transmission

| | Roland JV-1080 DataSet1 7Bit | | | Create Sysex |

F0 41 10 6A 12 00 00 10 00 40 30 F7

Value	Formula	Valid Range	Result	
AddressTMSB	0	0 - 127	0	
Address2	0	0 - 127	0	
Address3	Part+15	0 - 127	16	
Address4LSB	index	0 - 127	error	
Data	x	0 - 127	64	
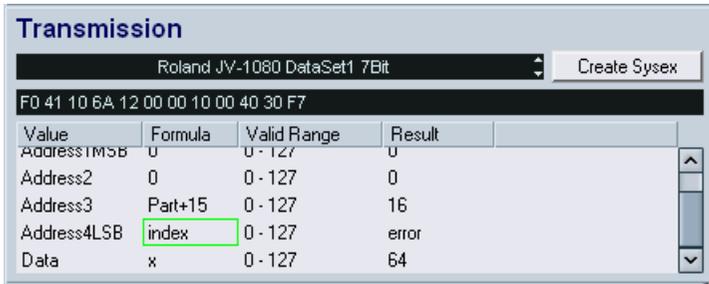
As you may have noticed, the variable "x" is automatically assigned to the "Data" value. "x" stands for the value that is represented by this parameter and is always defined individually by each parameter. If you later assign a control like a fader to this parameter, this fader will control and modify "x". "x" is automatically assigned to the last value of the message, but can be freely assigned to any other value.

25. Click OK to close the dialog.

In the device editor, small plus symbols are now displayed next to the Scale Tune nodes, indicating further content.

Before looking into these nodes, you should add the missing "DevID" variable to the root of the device, because this is a global value that affects the device as a whole.

26. Select the "Roland JV-1080" node, click the "Add Variable" button and rename it to "DevID". Normally, you can keep the default value setting of "0", except if your hardware device is set to another value.

27. Now, let's look into the Scale Tune 1 node by clicking its plus symbol.
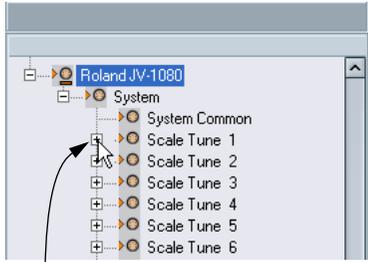
Click here…

…to display the parameters
for the node.
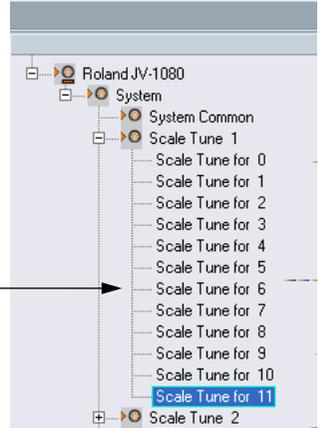
You can now browse the parameters, to verify that the correct MIDI
messages are transmitted. You can of course also do this for any of
the other nodes.

28. The next step is to rename the parameters according to the "Scale
Tune" table of the device's manual by selecting each of the 12 para-
meters and entering their correct name in the "Name" field.
Now, the parameters should be displayed as follows:
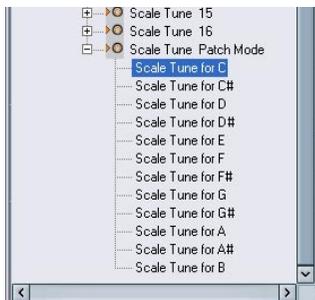
- If you open any of the other Scale Tune nodes now, you'll see that the names of the parameters have also changed. This is what was meant by "alias copies" in the beginning. Furthermore, you will notice that if you add a panel to one of the Scale Tune nodes (see), it will be added to all of them, which makes it much easier to create panels with repeating sections.

29. Now, you need to add parameters to another node, "System Common". In the list to the left, select "System Common".

30. Click the Add Parameters button and select the Sysex message "Roland JV-1080 DataSet1 7 Bit" you created earlier.
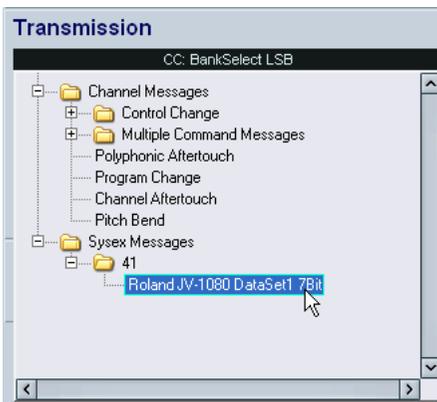
31. Now set set up the DevID as described before.
See .

32. Activate the Create Multiple checkbox and enter a range of 0-81, be-
cause the System Common table in the manual of the JV-1080 con-
tains 82 parameters, starting with an index of "0".
Address1MSB, Address2 and Address 3 are all 0 for all System Common parameters,
so leave them as they are. Enter "index" in the Formula column for Address4LSB to ad-
dress each of the 82 parameters separately. The dialog should now look like this:

When you click OK, you will notice that 82 new parameters have been added to the System Common node.

You can now set the Names, Min, Max and Default values for each of the parameters according to the specifications in the System Common table, as described earlier.

You should now be familiar enough with the basic procedures to continue with other parameter settings and adjustments and to finally create your own specific devices.

About Studio Connections

Studio Connections is the name of an initiative led by Steinberg and Yamaha. The initiative intends to create industry standards for totally integrated system environments using software and hardware products.

First implementation stage of the Studio Connections open standard is the integration and support of Yamaha's Studio Manager 2 and Total Recall for compatible hardware devices.

If you have a SM2 component installed, there is an additional menu item in the Devices menu for the Yamaha Studio Manager window.
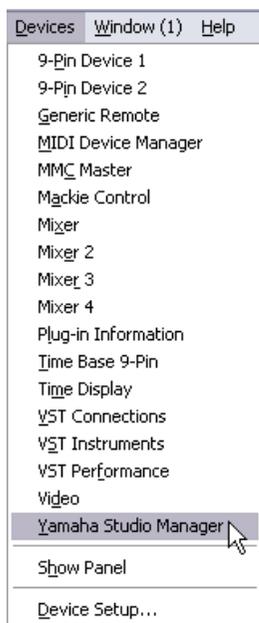
Total Recall

Total Recall means that you can save and recall all settings of your hardware and software products by opening one integrated file in a DAW such as Nuendo or Cubase. Also you will have instant and organized access to hardware editors.

When you load a project or switch to another active project that contains SM2 data, the Total Recall Synchronization dialog appears:
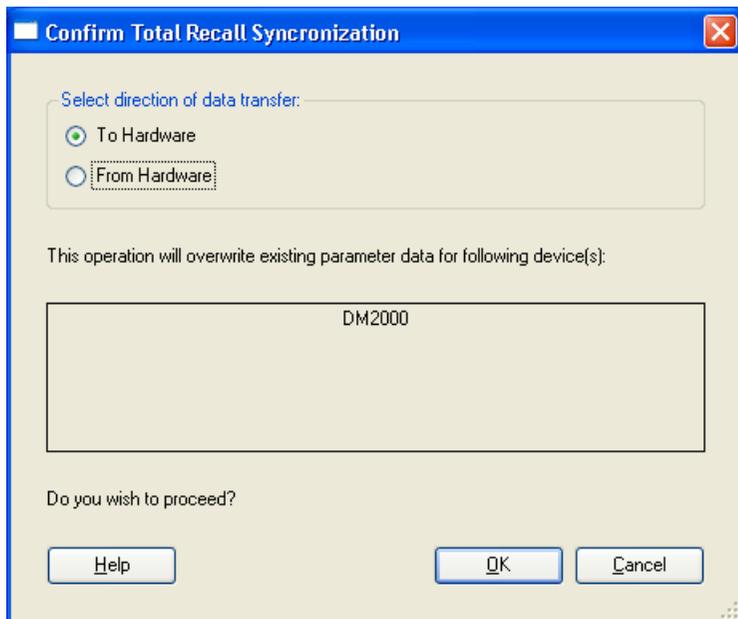
This dialog can also be opened any time from the Studio Manager's Synchronize menu. Click OK for the Dump to start.

Virtual MIDI Devices

If you have a new OPT component (e.g. the DM2000) which uses a new special interface, you can access these components as virtual MIDI Devices in the MIDI track's out port selection.

When a MIDI Track is routed to such a device, the "Panel" Button becomes available.

Click the Panel button…
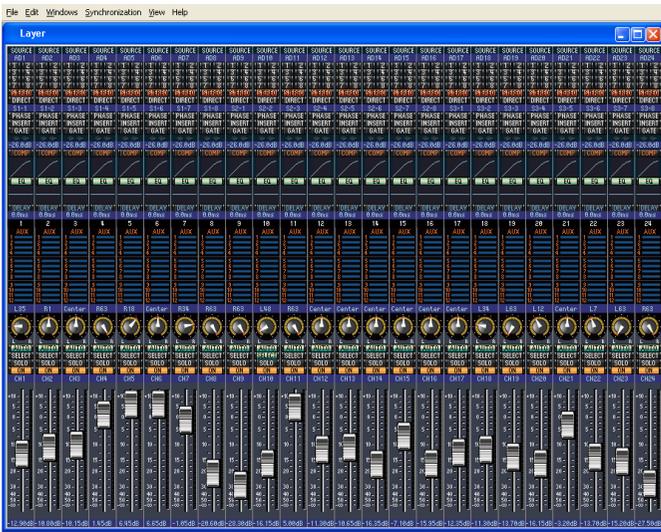
…to open the editor window for the device.

▪ **Please also refer to the separate Yamaha documentation.**

5

The Logical Editor, Transformer and Input Transformer

Introduction

Most of the time you will probably perform your MIDI editing graphically, from one of the main graphic editors. But there are times when you want more of a "search and replace" function on MIDI data, and that's where the Logical Editor comes in.

The principle for the Logical Editor is this:

- **You set up *filter conditions* to find certain events.**
  This could be events of a certain type, with certain attributes or values or on certain positions, in any combination. You can combine any number of filter conditions and make composite conditions using AND/OR operators.

- **You select the basic *function* to be performed.**
  The options include Transform (changing properties of the found events), Delete (removing the events), Insert (adding new events based on the found events' positions) and more.

- **You set up a list of *actions*, which specify exactly what should be done.**
  This is not necessary for all functions. For example, the Delete function does not require any additional action specifications – it simply removes all found events. The Transform function on the other hand requires that you specify which properties should be changed and in which way (transpose notes by a certain amount, adjust velocity values, etc.).

By combining filter conditions, functions and the specific actions, you can perform very powerful processing.

To master the Logical Editor you need some knowledge about how MIDI messages are structured. However, the Logical Editor also comes with a rich selection of presets, allowing you to access its processing powers without delving into its more complicated aspects, see .

Studying the included presets is an excellent way to learn the workings of the Logical Editor! Many of them can also be used as starting points when you set up your own editing operations using the Logical Editor.

About the Transformer MIDI effect

The Transformer effect is a real-time version of the Logical Editor, allowing you to apply editing to the events played back from a track "on the fly". The Transformer contains virtually the same settings and functions as the Logical Editor – where there are differences between the two, this is clearly stated on the following pages.

About the Input Transformer

Again, this is very similar to the Logical Editor. Just like the Transformer effect, the Input Transformer works in real time. However, the Input Transformer filters out and transforms MIDI data as it is recorded. In other words, the settings you make in the Input Transformer will affect the actual MIDI events you record.

The Input Transformer is described on page 235. However, we recommend that you make yourself familiar with the Logical Editor first, since they share many features and principles.

Opening the Logical Editor

1. Select the desired parts or events.
What will be affected by the operation depends on the current selection:

▪ In the Project window, edits using the Logical Editor are applied to all selected parts, affecting all events (of the relevant types) in them.

▪ In the MIDI editors, edits using the Logical Editor are applied to all selected events. If no events are selected, all events in the edited part(s) will be affected.

You can change the selection while the Logical Editor window is open.

2. Select "Logical Editor…" from the MIDI menu.

▪ **For details on how to open the Transformer (and other MIDI effects), see the chapter "MIDI realtime parameters and effects".**

Window overview

This is the filter condition list, specifying which events to look for.

This is where you select a function (Transform, Delete, etc.). The field to the right shows an additional explanation of the selected function.

This is the action list, specifying e.g. how to change the found events.
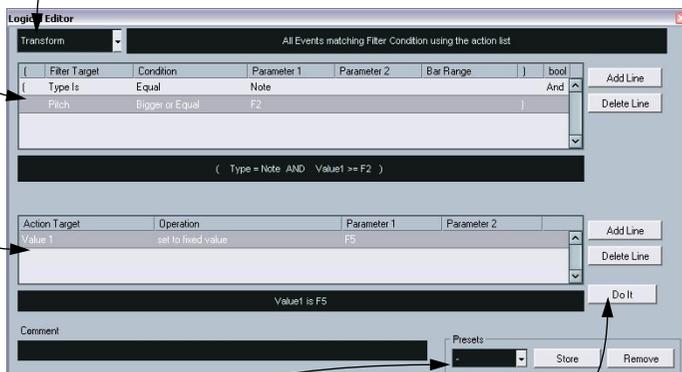
This is where you load, store and handle presets. See page 234.

The "Do It" button performs the task you have set up (not available in the Transformer).

Selecting a preset

To understand the Logical Editor, it might be a good idea to start with exploring the included presets. These are found on the Presets pop-up menu at the bottom of the window, to the right.

▪ To load a preset, select it from the Presets pop-up menu.
The window will show the settings stored in the preset. As the preset is not applied to the MIDI events yet, you can load different presets just to study them without affecting any events. You can also edit the preset before applying it.

▪ To apply the loaded preset (i.e. to perform the operations defined in the Logical Editor), click Do It.

▪ **You can also select Logical Editor presets directly from the MIDI menu.**
This allows you to apply a preset to the selected MIDI part directly, without having to open the Logical Editor.

▪ **It is also possible to select and apply Logical Editor presets directly in the List Editor (from the Mask menu). You can also open the Logical Editor from the List Editor.**

For information on how to create and handle your own presets, see page 234.

Setting up filter conditions

General procedure

(	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	)	bool	
[	Type Is	Equal	Note				And	
	Pitch	Bigger or Equal	F2			)		

(Type = Note AND Value1 >= F2)
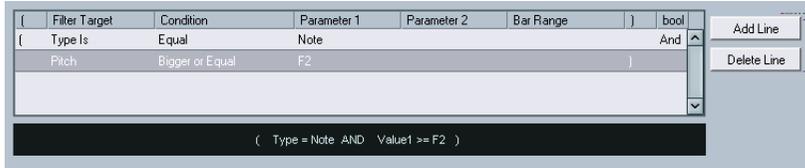
The upper list is where you set up the filter conditions, determining which events to find. The list contains one or several conditions, each on a separate line.

▪ **If you want to start from scratch (as opposed to basing your settings on an existing preset) you may want to initialize the settings by selecting the Init option from the Presets pop-up menu.**

▪ To add a new line (condition) click the Add Line button to the right.
The new line is added at the bottom of the list. If there are many lines, you may need to use the scrollbar to the right to view them.

▪ To remove a line, click anywhere on it to select it and click the Delete Line button to the right.

You set up a filter condition line by clicking in the columns and selecting options from the pop-up menus that appear. Here is a brief description of the columns:

Column	Description
Left bracket	This is used for "bracketing" several lines together when creating conditions with multiple lines and the boolean operators And/Or. See page 225.
Filter Target	Here you select which property to look for when finding events. Your choice here affects the available options in the other columns as well, see below!
Condition	This determines how the Logical Editor should compare the property in the Filter Target column to the values in the Parameter columns (Equal, Unequal, Bigger, etc. – see the separate table below). The available options depend on the Filter Target setting.
Parameter 1	Here you set which value the event properties should be compared to (a numeric value, a position or a choice from a pop-up menu, depending on the Filter Target). For example, if the Filter Target is "Position" and Condition is "Equal", the Logical Editor will look for all events starting at the position you specify in the Parameter 1 column.
Parameter 2	This column is only used if you have selected one of the "Range" options in the Condition column. Typically, this allows you to find all events with values inside (or outside) the range between Parameter 1 and Parameter 2.
Bar Range	This column is only used if the Filter Target is "Position" and one of the "Bar Range" options is selected in the Condition column. In these cases, you use the Bar Range column to specify "zones" within each bar (allowing you to find e.g. all events on or around the first beat of every bar). See page 219.
Right bracket	This is used for "bracketing" several lines together. See page 225.
bool	This allows you to insert the boolean operators And/Or, when creating conditions with multiple lines. See page 225.

▪ You can also set up filter conditions by dragging MIDI events directly into the upper list.
If the list contains no line entries, a MIDI event dragged into this section will form conditions including the state and type of the event. If it contains entries, the dragged event(s) will initialize the matching parameters. E.g. if a length condition is used, the length will be set according to the event length.

Conditions

The options in the Condition column have the following meaning (note that the available Condition options depend on the Filter Target setting):

Condition	Events will be found if their Filter Target property…
Equal	…has the exact same value as set up in the Parameter 1 column.
Unequal	…has any value other than the one set up in the Parameter 1 column.
Bigger	…has a value higher than the one set up in the Parameter 1 column.
Bigger or Equal	…has a value that is the same as or higher than the one set up in the Parameter 1 column.
Less	…has a value lower than the one set up in the Parameter 1 column.
Less or Equal	…has a value that is the same as or lower than the one set up in the Parameter 1 column.
Inside Range	…has a value that is between the values set up in the Parameter 1 and Parameter 2 columns. Note that Parameter 1 should be the lower value and Parameter 2 the higher.
Outside Range	…has a value that is not between the values set up in the Parameter 1 and Parameter 2 columns.
Inside Bar Range	…is within the "zone" set up in the Bar Range column (Position only), in each bar within the current selection.
Outside Bar Range	…is outside the "zone" set up in the Bar Range column (Position only), in each bar within the current selection.
Before Cursor	... is before the song cursor position (Position only).
Beyond Cursor	... is after the song cursor position (Position only).
Inside Track Loop	... is inside the set track loop (Position only).
Inside Cycle	…is inside the set cycle (Position only).
Exactly matching Cycle	…exactly matches the set cycle (Position only).
Note is equal to	…is the note specified in the Parameter 1 column, regardless of octave (Pitch only). Lets you find e.g. all C notes, in all octaves.

▪ **The Conditions for the "Property" filter target are different, see .**

Below, the different Filter Targets (and their corresponding Condition and Parameter options) are described in more detail.

Searching for events at certain positions

Selecting Position in the Filter Target column lets you find events starting at certain positions, either relative to the start of the song or within each bar.

▪ If you select any condition other than the Range or Bar Range options, you set up a specific position (in bars, beats, sixteenth notes and ticks) in the Parameter 1 column.
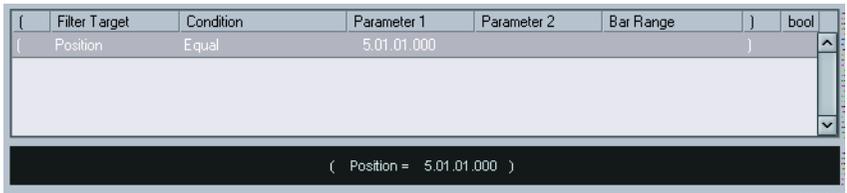
Here, the Logical Editor will find all events at 5.1.1. in the project.

▪ If you select the Inside or Outside Range option in the Condition column, you set the start position of the range in the Parameter 1 column and the end position in the Parameter 2 column.
The Logical Editor will then find all events inside or outside this position range.

▪ If you select one of the Bar Range options in the Condition column, the Bar Range column will show a graphic bar display. You specify the range within the bar by clicking and dragging in the bar display (the specified Bar Range is indicated in blue).
The Logical Editor will then find all events starting inside or outside this Bar Range, in all bars (within the current selection).
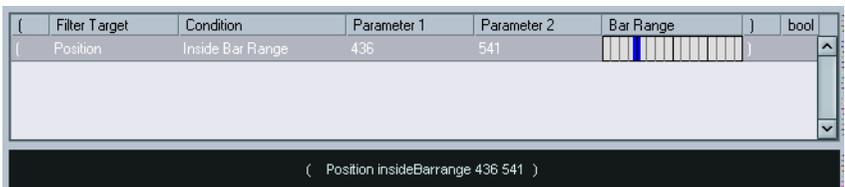
Here, the Logical Editor will find events starting around the second beat in each bar.

Searching for notes of certain lengths

Only note events have lengths (actually, a note is made up of separate note-on and note-off events but in Nuendo it's considered as a single event with a length). Therefore, the "Length" Filter Target is only valid if you're specifically searching for notes – there has to be another condition line with the Filter Target "Type", Condition "Equal" and Parameter 1 set to "Note". See for more about using multiple filter conditions.

Searching for Value 1 or Value 2

A MIDI event is composed of several values. The meanings of value 1 and 2 depend on the type of event:

Event type	Value 1	Value 2
Notes	The Note Number/Pitch.	The velocity of the note.
PolyPressure	The key that was pressed.	The amount of pressure for the key.
Controller	The type of Controller, displayed as a number.	The amount of Control Change.
Program Change	The Program Change number.	Not used.
Aftertouch	The amount of pressure.	Not used.
Pitchbend	The "fine tune" of the bend. Not always used.	The coarse amount of bend.

▪ **System Exclusive events are not included in the table above, since they don't use value 1 and 2.**

Since value 1 and 2 have different meanings for different events, searching for e.g. value 2 = 64 would both find notes with the velocity 64 and controllers with the amount 64, etc. If this is not what you want, you can add an additional filter condition line with the Filter Target "Type", specifying which type of events to find (see below).

This is particularly useful when searching for note pitch or velocity values, as described below.

The general procedures when searching for value 1 or 2 are:

- If you select any Condition other than the Range options, you set up a specific value in the Parameter 1 column.

(	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	}	bool
(	Value 2	Less	80			}	
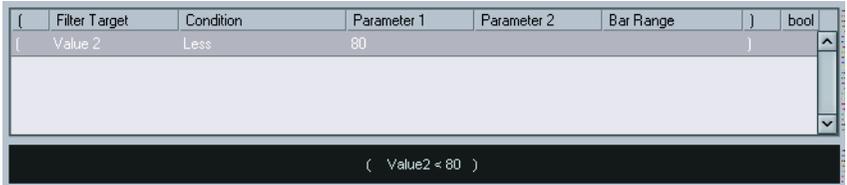
(Value2 < 80)

Here, the Logical Editor will find all events with a value 2 less than 80.

- If you select the Inside or Outside Range option in the Condition column, the range consists of the values between Parameter 1 and Parameter 2.
  Note that Parameter 1 should have the lower value.

Searching for note pitch or velocity

If you add another condition line with the Filter Target "Type", Condition "Equal" and Parameter 1 set to "Note", the Logical Editor will "know" you are searching for pitch or velocity. This has the following benefits:

- The Filter Targets Value 1 and Value 2 will be displayed as "Pitch" and "Velocity" respectively, making it easier to grasp the function of the filter condition.
- Pitch values in the Parameter columns will be displayed as note names (C3, D#4, etc.). When entering pitch values you can either type a note name or a MIDI note number (0-127).
- When Value 1 (pitch) is selected as Filter Target, an additional option appears in the Condition column: "Note is equal to". When this is selected, you specify a note name in the Parameter 1 column but without any octave number (C, C#, D, D#, etc.). The Logical Editor can then find all notes of a certain key, in all octaves.

See for more info on working with multiple filter condition lines.

Searching for controllers

There is similar extended functionality when searching for controllers: If you've added an additional "Type = Controller" condition line, the Logical Editor will "know" you are searching for controllers. The Parameter 1 column will then show the names of the MIDI controllers (Modulation, Volume, etc.) when Value 1 is selected as Filter Target.

Searching for MIDI channels

Each MIDI event contains a MIDI channel setting (1-16). Normally, these settings are not used, since the MIDI event plays back on the MIDI channel set for its track. However, you can come across MIDI parts with events set to different channels in the following scenarios for example:

- If you have recorded MIDI from an instrument sending on several different channels (e.g. a master keyboard with different key zones).
- If you have imported a MIDI file of type 0 (with a single track, containing MIDI events with different channel settings).

Searching for MIDI channel values is straightforward; you select a Condition and enter a MIDI channel (1-16) in the Parameter 1 column (and, if you've selected one of the Range Conditions, a higher channel in the Parameter 2 column, creating a value range).

Searching for event types

Selecting Type as the Filter Target allows you to find events of a certain type only.

- The Condition column contains only three options: Equal, Unequal and All Types.
- Clicking the Parameter 1 column displays a pop-up menu, listing the available event types (Note, PolyPressure, Controller, etc.).

The Logical Editor will find all events matching or not matching the selected type (depending on the Condition).

As mentioned above, selecting Type = Note or Type = Controller adds some additional functionality to the Logical Editor. You should make it a habit to add a Type condition when applicable.

Searching for properties

On the Filter Target pop-up menu you will find an option called Property. This allows you to search for properties that are not part of the MIDI standard but rather event-specific Nuendo settings.

When the Property option is selected, the Condition column has two options: "Property is set" and "Property is not set". Which property to look for is selected in the Parameter 1 column. The options are "muted" and "selected". Two examples:

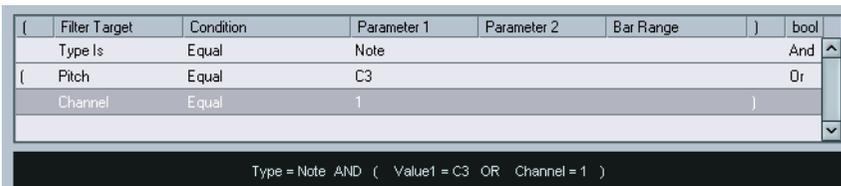| (	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	)	bool
(	Property	Property is set	Event is muted			)	

Here, the Logical Editor will find all muted events.

(	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	)	bool
(	Property	Property is set	Event is selected				And
	Property	Property is not set	Event is muted			)	

Here, the Logical Editor will find all events that are selected but not muted.

Searching for event contexts

On the Filter Target pop-up menu you will find an option called "Last Event". This can be used to perform context dependant searches (especially useful in the Input Transformer).

"Last Event" indicates the state of an event which has already passed the Input Transformer/Logical Editor. The condition has to be combined with Parameter 1 and Parameter 2.

A few examples on how the Last Event filter target can used:

Here, the action will only be performed when sustain pedal is down:

Fiter Target	Condition	Parameter 1	Parameter 2
Last Event	Equal	MIDI Status	176/Controller
Last Event	Equal	Value 1	64
Last Event	Bigger	Value 2	64

In this example, the action will be performed when the note C1 is pressed (the "Note is playing" condition is only available in the Input Transformer and in the Transformer effect):

Fiter Target	Condition	Parameter 1	Parameter 2
Type is	Equal	Note	
Last Event	Equal	Note is playing	36/C1

In this example, the action will be performed after playing the C1 note:

Fiter Target	Condition	Parameter 1	Parameter 2
Last Event	Equal	Value 1	36/C1

Combining multiple condition lines

As described above, you can add condition lines by clicking the Add Line button to the right of the list. The result of combining condition lines depends on the boolean And/Or operators and the brackets.

The bool column

By clicking in the "bool" column to the right in the list, you can select a boolean operator: "And" or "Or". A boolean operator separates two condition lines and determines the result in the following way:

▪ **If two condition lines are separated by a boolean And, both conditions must be fulfilled for an event to be found.**

The Logical Editor will only find events that are notes and start at the beginning of the third bar.

▪ **If two condition lines are separated by a boolean Or, one of the conditions (or both) must be fulfilled for an event to be found.**

The Logical Editor will find all events that are notes (regardless of their position) and all events starting at the beginning of the third bar (regardless of their type).

When you add a new condition line, the boolean setting defaults to And. Therefore, if all you want to do is set up two or more conditions that all must be met for an event to be found, you don't have to think about the boolean column – just add the required lines and make the usual filter settings.

Using brackets

The bracket (parenthesis) columns let you enclose two or more condition lines, dividing the conditional expression into smaller units. This is only relevant when you have three or more condition lines and want to use the boolean Or operator. This is how it works:

• **Without brackets, the conditional expressions are evaluated according to their order in the list.**
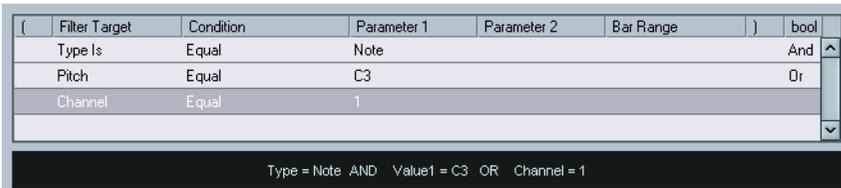
(	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	)	bool
	Type Is	Equal	Note				And
	Pitch	Equal	C3				Or
	Channel	Equal	1				

Type = Note AND   Value1 = C3 OR   Channel = 1

In this case we have the expression Type = Note AND Pitch = C3 OR Channel = 1, without brackets. This means that the Logical Editor will find all MIDI notes with the pitch C3, as well as all events (regardless of their type) set to MIDI channel 1.

Maybe you wanted to find all notes that either had the pitch C3 or the MIDI channel 1 (but no non-note events)? Then you need to add some brackets:

(	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	)	bool
	Type Is	Equal	Note				And
(	Pitch	Equal	C3				Or
	Channel	Equal	1			)	

Type = Note AND   (Value1 = C3 OR   Channel = 1   )

Here the expression is Type = Note AND (pitch = C3 OR Channel = 1), which will find what you want. The rule behind this is:

• **Expressions within brackets are evaluated first.**
If there are several layers of brackets, these are evaluated "from the inside out", starting with the innermost brackets.

You add brackets by clicking in the bracket columns and selecting an option. Up to triple brackets can be selected.

Editing filter conditions as text

(	Filter Target	Condition	Parameter 1	Parameter 2	Bar Range	)	bool
	Type Is	Equal	Note				And
(	Pitch	Equal	C3				Or
	Channel	Equal	1			)	

Type = Note AND (Value1 = C3   OR   Channel = 1   )

The area directly below the filter condition list shows you the current filter conditions as text. It also allows you to enter and edit the filter conditions in textual form. For tips on the syntax, please study the included presets.

▪ **There is no additional functionality involved when editing filter conditions as text; it is simply another way to make settings.**
When you enter something in the text field you will see the corresponding settings appear in the filter condition list (provided that you have used the correct syntax).

Selecting a function

The pop-up menu in the top left corner of the Logical Editor is where you select the function – the basic type of editing to be performed. When you select an option from the pop-up menu, the field to the right displays a clarifying text, making it easier to see what the function does.

In the Logical Editor, processing isn't performed until you click the Do It button. When using the Transformer MIDI effect there is no Do It button – the current settings are automatically applied in real time during playback or live playing.

Below, the available options are listed. Note that some options are available in the Logical Editor only – not in the Transformer effect.

Delete

Deletes all events found by the Logical Editor. In the case of the Transformer, this function will remove (or "mute") all found events from the "output stream" – the actual events on the track are not affected.

Transform

Changes one or several aspects of the found events. You set up exactly what should be changed in the action list, as described on .

Insert

This will create new events and insert these into the part(s) (Logical Editor) or the output stream (Transformer). The new events will be based on the events found by the Logical Editor's filter conditions, but with any changes you have set up in the action list applied.

Another way of expressing this is that the Insert function copies the found events, transforms them according to the action list and inserts the transformed copies among the existing events.

Insert Exclusive

This will transform the found events according to the action list. Then, all events that were not found (that didn't meet the filter conditions) are deleted (Logical Editor) or removed from the output stream (Transformer).

Copy (not available in the Transformer)

This will copy all found events, transform them according to the action list and paste them into a new part on a new MIDI track. The original events are not affected.

Extract (not available in the Transformer)

This works like Copy, but will cut the found events instead. Or in other words, Extract will transform all found events and move them to a new part on a new MIDI track.

Select (not available in the Transformer)

This will simply select all found events, highlighting them for further work in the regular MIDI editors.

Specifying actions
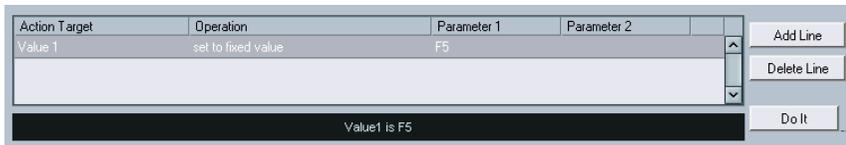
The lower list in the Logical Editor window is the action list. This is where you specify any changes that should be made to the found events (relevant for all function types except Delete and Select).

The handling of the action list is similar to the filter condition list, but without the brackets and booleans. You simply add lines by clicking the Add Line button to the right, and fill out the columns as required. To remove a superfluous action line, select it and click the Delete Line button.

Action Target

This is where you select the property that should be changed in the events:

Option	Description
Position	Adjusting this value will move the events.
Length	Lets you resize the events (notes only).
Value 1	This adjusts value 1 in the events. As described on page 220, the meaning of value 1 depends on the event type. For notes, value 1 is the pitch.
Value 2	This adjusts value 2 in the events. As described on page 220, the meaning of value 2 depends on the event type. For notes, value 2 is the velocity value.
Channel	Allows you to change the MIDI channel setting. See page 222.
Type	Allows you to change an event from one type to another, e.g. transform aftertouch events to modulation events.
Value 3	This adjusts value 3 in the events, which is used for handling of Note-off-velocity when searching for properties. See page 223.

Operation

This setting determines what to do with the Action Target. The options on this pop-up menu are different depending on the selected Action Target. Below, all available operations are listed:

Add

Adds the value specified in the Parameter 1 column to the Action Target.

Subtract

Subtracts the value specified in the Parameter 1 column from the Action Target.

Multiply by

Multiplies the Action Target value with the value specified in the Parameter 1 column.

Divide by

Divides the Action Target value by the value specified in the Parameter 1 column.

Round by

This "rounds" the Action Target value using the value specified in the Parameter 1 column. In other words, the Action Target value is changed to the closest value that can be divided by the Parameter 1 value.

For example, if the Action Target value is 17 and Parameter 1 is 5, the result of rounding will be 15 (the closest value that can be divided by 5). Another word for this type of operation would be "quantizing", and it's actually possible to use it for this, by setting the Action Target to "Position" and specifying a quantize value with Parameter 1 (in ticks, with 480 ticks per quarter note).

Set Random Values between

This will set the Action Target value to a random value within the range specified with Parameter 1 and 2.

Set Relative Random Values between

This will add a random value to the current Action Target value. The added random value will be within the range specified with Parameter 1 and 2. Note that these can be set to negative values.

For example, if you set Parameter 1 to -20 and Parameter 2 to +20, the original Action Target value will get a random variation, never exceeding ±20.

Set to fixed value

This sets the Action Target to the value specified in the Parameter 1 column.

Add Length

This is only available when Action Target is set to Position. Furthermore, it is only valid if the found events are notes (and thus have a length). When Add Length is selected, the length of each note event will be added to the Position value. This can be used for creating new events (using the Insert function) positioned relative to the end positions of the original notes.

Transpose to Scale

This is only available when Action Target is set to Value 1, and when the filter conditions are specifically set up to find notes (a "Type = Note" filter condition line has been added). When "Transpose to Scale" is selected, you can specify a musical scale using the Parameter 1 and 2 columns. Parameter 1 is the key (C, C#, D, etc.) while Parameter 2 is the type of scale (major, melodic or harmonic minor, etc.).

Each note will be transposed to the closest note in the selected scale.

Use Value 2

This is only available when Action Target is set to Value 1. If this option is selected, the Value 2 setting in each event will be copied to the Value 1 setting.

For example, this would be useful if you are transforming all Modulation controllers to Aftertouch events (since controllers use Value 2 for their amount, while Aftertouch uses Value 1 – see the table on).

Use Value 1

This is only available when Action Target is set to Value 2. If this option is selected, the Value 1 setting in each event will be copied to the Value 2 setting.

Mirror

This is only available when Action Target is set to Value 1 or Value 2. When this option is selected, the values will be "mirrored" or "flipped" around the value set in the Parameter 1 column.

In the case of notes, this will invert the scale, with the key set in the Parameter 1 column as "center point".

Linear Change in Loop Range

This will affect events within the loop range (between the left and right locators) only. It will create a linear "ramp" of values (replacing the original values) starting at the value in the Parameter 1 column and ending at the Parameter 2 value.

This can be used for creating linear controller sweeps, velocity ramps, etc.

Relative Change in Loop Range

As with the previous option, this will create a ramp of values, affecting events in the cycle loop range only. However, here the changes are "relative", meaning that values will be added to the existing values.

In other words, you set up a value ramp starting at Parameter 1 and ending at Parameter 2 (note that the Parameter values can be negative). The resulting value ramp is then added to the existing values for the events within the cycle loop range.

For example, if you apply this to note velocities with Parameter 1 set to 0 and Parameter 2 set to -100, you create a velocity fade-out, keeping the original velocity relations:
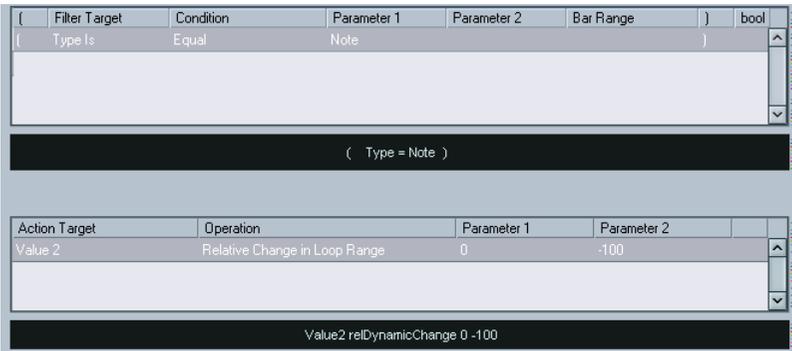
Applying the defined actions

Once you have set up filter conditions, selected a function and set the required actions (or loaded a preset), you apply the actions defined with the Logical Editor by clicking the Do It button.

Logical Editor operations can be undone just like any other editing.

▪ **Again, when using the Transformer MIDI effect there is no Do It button. The processing is applied to the events played back from the track (or played live "thru" the track) as soon as you set it up.**
Since no existing events on the track are affected by the Transformer setting, there is no need for undo.

Working with presets

The Presets section in the bottom right section of the window allows you to load, store and manage Logical Editor presets. A preset contains all settings in the window, which means you can simply load a preset and click Do It.

▪ **To load a preset, select it from the Presets menu.**

Storing your own settings as a preset

If you have made Logical Editor settings that you want to use again, you can store them as a preset:

1. You can enter some explanatory text in the Comment field.
   An extra description of the preset can be useful, especially if the settings are complex.

2. Click the Store button in the Presets section.
   A dialog for specifying a name for the new preset is displayed.

3. Enter a name for the preset and click OK.
   The preset is stored.

▪ **To remove a preset, load it and click the Remove button.**

Organizing and sharing presets

The Logical Editor presets are stored as individual files within the Nuendo program folder, in the presets\Logical Edit subfolder. While these files cannot be edited "manually", you can reorganize them (e.g. putting them in subfolders) like any files.

This also makes it easy to share presets with other Nuendo users, by transferring the individual preset files.

▪ **The list of presets is read each time the Logical Editor is opened.**

The Input Transformer

This function allows you to selectively filter out and change MIDI data coming to a MIDI track before it is recorded. The Input Transformer is very similar to the Transformer MIDI effect, but contains four independent "modules", for which you can set up different filtering and actions if you like. You can activate any or all of these four modules.

Here are some of the things the Input Transformer allows you to do:

- Set up split keyboard combinations for recording left and right hands separately.
- Turn a controller like a foot pedal into MIDI notes (for playing bass drum the right way).
- Filter out one specific type of MIDI data on one MIDI channel only.
- Turn aftertouch into any controller (and vice versa).
- Invert velocity or pitch.

And again: four of these things can be done at the same time.

Opening the Input Transformer

To open the Input Transformer for a MIDI track, select the track and click the Input Transformer button in the Inspector to open the pop-up menu:

- Select Global to make Input Transformer settings that affect all MIDI inputs (and thereby all MIDI tracks).

- Select Local to make Input Transformer settings for this track only.

In both cases, the button lights up and the Input Transformer opens.
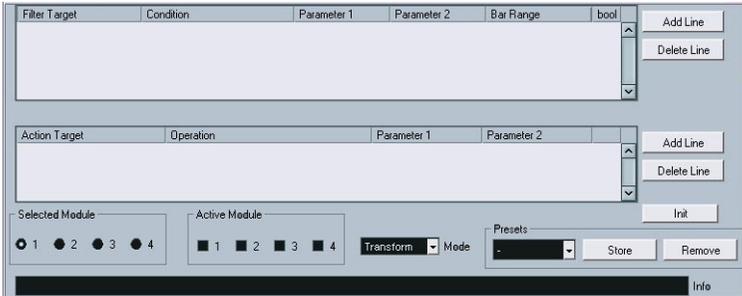
Handling the four modules

The Input Transformer is really four separate transformers, or modules.

- You select which module to view and make settings for by clicking its button in the Selected Module section.
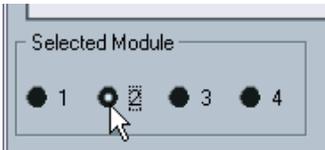
Module 2 selected for viewing and editing.

- The checkboxes in the Active Module section determine which module(s) are active.
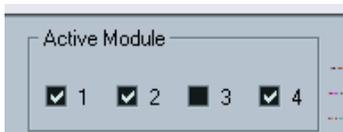
Here, modules 1, 2 and 4 are active.

The two modes

The Mode pop-up menu contains two options: Filter and Transform.

▪   In Filter mode, only the filter conditions (the upper list) are taken into account. All events matching the conditions set up will be filtered out (excluded from the recording).

▪   In Transform mode, events matching the filter conditions will be transformed according to the settings in the action list (the lower list).

Setting up filtering and actions

This is done just like in the Logical Editor. Here is a brief rundown:

▪   Click the Add Line buttons to add lines to the filter condition list or action list.
To remove a line, click it to select it and click the Delete Line button to the right.

▪   Clicking the columns in the filter condition list opens pop-up menus allowing you to specify the conditions to match.

▪   Clicking the columns in the action list opens pop-up menus allowing you to specify what should be done to the found events (when Transform mode is selected).

For detailed descriptions of the filter conditions and action columns, see .

▪   Selecting the Init option from the Presets pop-up menu will reset the selected module, removing all filter condition and target list lines.

▪   The Input Transformer has no "Do It" button – the settings are active as soon as you activate an Active Module checkbox.
The settings made in the activated modules will affect all MIDI data you record on the track.

▪ **Closing the Input Transformer window does *not* turn it off – you need to deactivate all Active Module checkboxes for this!**
A lit Input Transformer button in the Inspector indicates that one or more modules are active.

6

Working with System Exclusive messages

Introduction

System Exclusive (SysEx) is a special type of MIDI message used to send things that only make sense to a unit of a certain make and type. Every major MIDI manufacturer has its own SysEx identity code. System Exclusive messages are typically used for transmitting patch data, i.e. the numbers that make up the settings of one or more sounds in a MIDI instrument.

Nuendo allows you to record and manipulate System Exclusive data in various ways. This chapter points to various features that help you manage and create System Exclusive data.

Bulk dumps

Recording a bulk dump in Nuendo

In any programmable device, all settings are stored as numbers in computer memory. Change those numbers, and you will change the settings.

Normally, MIDI devices allow you to dump (transmit) all or some settings in the device's memory, in the form of MIDI System Exclusive messages. Return these messages, and you get the settings back. This is (among other things) a way of making backup copies of the settings of any instrument.

If your instrument allows the dumping of a few or all of its settings via MIDI by activating some function on the front panel, this dump will most probably be recordable in Nuendo.

1. Open the Preferences dialog from the File menu (on the Mac, this is located on the Nuendo menu) and select the MIDI–MIDI Filter page.
This allows you to govern which MIDI event types should be recorded and/or thru-put.
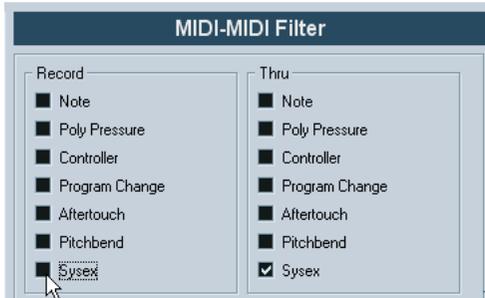
2. Deactivate the Sysex checkbox in the Record section, but make sure the Sysex checkbox in the Thru section is activated.
With this setting (shown in the figure above) SysEx messages will be recorded but not echoed back out to the instrument (which could lead to strange results).

3. Activate recording on a MIDI track and initiate the dump from the front panel of the instrument.

4. When done recording, select the new part and open the List Editor from the MIDI menu.
This allows you to check that the System Exclusive dump was recorded – there should be one or several SysEx events in the part/event list.

If your MIDI instrument doesn't offer a way to initiate a dump "by itself", you have to send a Dump Request message from Nuendo to start the dump. You will then have to use the MIDI SysEx Editor (see page 244) to insert the specific Dump Request message (see the instrument's documentation) at the beginning of a MIDI track. When you activate recording, the Dump Request message will be played back (sent to the instrument), the dump will start and be recorded as above.

Transmitting a bulk dump back to a device

1. Make sure the MIDI track with the System Exclusive data is routed to the device.
You may want to check your device's documentation to find details about which MIDI channel should be used, etc.

2. Solo the track.
This might not be necessary, but it is a good safety measure.

3. Make sure the device is set up to receive System Exclusive data (often, the reception of SysEx is turned off by default).

4. If necessary, put the device in "Standby to Receive System Exclusive" mode.

5. Play back the data.

Some advice

▪ Don't transmit more data than you need. If all you want is a single program, don't send them all, it will only make it harder to find the one you want. Usually, you can specify exactly what you want to send.

▪ If you want the sequencer to dump the pertinent sounds to your instrument each time you load a project, put the SysEx data in a silent "count-in" before the project itself starts.

▪ If the dump is very short (for instance, a single sound) you can put it in the middle of the project to re-program a device on the fly. However, you can achieve the same effect by using Program Change. This is definitely preferable, since less MIDI data is sent and recorded. Some devices may be set up to dump the settings for a sound as soon as you select it on the front panel.

▪ If you create parts with useful "SysEx dumps", you can put these on a special muted track. When you want to use one of them, drag it to an empty unmuted track and play it back from there.

▪ Do not transmit several SysEx dumps to several instruments at the same time.

▪ Make a note of the current device ID setting of the instrument. If you change this, the instrument may refuse to load the dump later.

Recording System Exclusive parameter changes

Often you can use System Exclusive to remotely change individual settings in a device, open up a filter, select a waveform, change the decay of the reverb etc. Many devices are also capable of transmitting changes made on the front panel as System Exclusive messages. These can be recorded in Nuendo, and thus incorporated into a regular MIDI recording.

Here's how it works: let's say you open up a filter while playing some notes. In that case, you will record both the notes and the System Exclusive messages generated by your opening of the filter. When you play it back, the sound changes exactly like it did when you recorded it.

1. Open the Preferences dialog from the File menu (on the Mac, this is located on the Nuendo menu), select the MIDI–MIDI Filter page and make sure that System Exclusive is recorded.

2. Make sure the instrument is actually set to transmit front panel control movements as System Exclusive data.

3. Record normally.
   When you're done, you can check that the events were recorded properly in the List Editor.

Editing System Exclusive messages

While System Exclusive events are shown in the List Editor/Project Browser, their entire content is not (only the beginning of the message is displayed in the Comment column for the event). Furthermore, you cannot edit the event (other than moving it) as you can with other event types in the List Editor.

Instead, you use the MIDI SysEx Editor for this.

▪ To open the MIDI SysEx Editor for an event, click in the Comments column for the event in the List Editor/Project Browser.
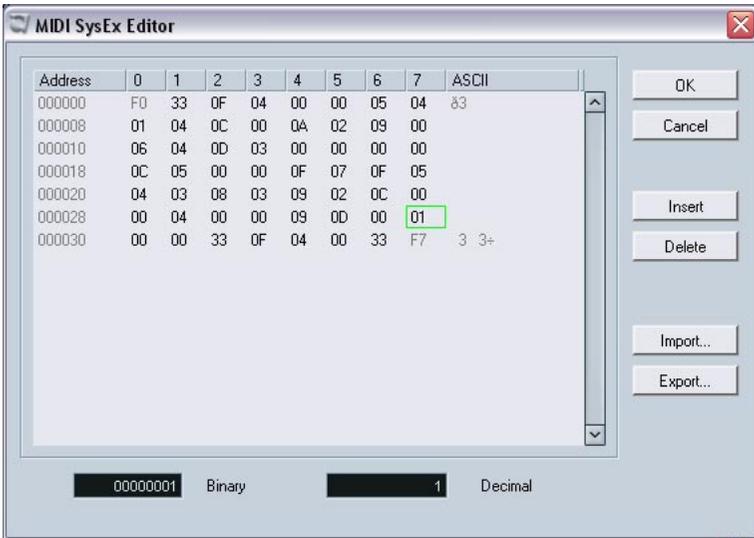
The display shows the entire message on one or several lines. All System Exclusive messages always begin with F0 and end with F7 with a number of arbitrary bytes in between. If the message contains more bytes than fit on one line, it continues on the next. The Address indication to the left helps you find out on which position in the message a certain value resides.

Selecting and viewing values

To select a value, either click on it or use the cursor keys. The selected byte is indicated in various formats:

- In the main display, values are shown in hexadecimal format.
- To the right of this, values are shown in ASCII format.
- At the bottom of the dialog, the selected value is shown in binary and decimal formats.

Editing a value

The selected value can be edited directly in the main display or in the decimal and binary displays. Just click on it and type in the desired value as usual.

Adding and deleting bytes

Using the Insert and Delete buttons, or their corresponding computer keyboard keys, you can add and delete bytes from the message. Inserted data will appear before the selection.

Importing and exporting data

The Import and Export buttons allow you to get SysEx data from disk and to export the edited data to a file. The file format used is called "MIDI SysEx" (.SYX), in which data is saved exactly as is, in a binary file. Only the first dump in a .SYX file will be loaded.

This format should not be confused with MIDI files.

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VST Instruments

Introduction

VST Instruments are software synthesizers (or other sound sources) that are contained within Nuendo. They are played internally via MIDI, and their audio outputs appear on separate channels in the mixer, allowing you to add effects or EQ, just as with audio tracks.

Some VST Instruments are included with Nuendo, others can be purchased separately from Steinberg and other manufacturers. The following VST Instruments are included and installed with Nuendo:

- A1 – a software synthesizer powered by Waldorf.

- VB-1 – a virtual bass instrument built on real-time physical modelling principles.

- Embracer - a simple but powerful polyphonic synthesizer designed entirely for producing pads and accompaniment sounds.

- Monologue - a monophonic analog synthesizer based on physical modeling technology.

- LM-7 – a 24 bit drum machine.

- **This chapter describes the general procedures for setting up and using VST Instruments.**
  For descriptions of the included VST Instruments and their parameters, see the separate pdf document "Audio Effects and VST Instruments".

Activating and using VST Instruments

1. Pull down the Devices menu and select VST Instruments.
The VST Instruments panel appears with 64 slots.

2. Pull down the pop-up menu for an empty slot in the panel and select the desired instrument.
The instrument is loaded and activated, and its control panel is automatically opened.

▪ If you look in the Project window, you will find that a special "folder" for the chosen instrument has been added, within a "VST Instruments" folder (where all your VST Instruments will appear).
The separate folder for the added instrument contains two or more automation tracks: one for automating the plug-in parameters and one for each mixer channel used by the VST Instrument. For example, if you add a VST Instrument with four separate outputs (four separate mixer channels), the folder will contain five automation tracks. To keep the screen less cluttered, you may want to close the folder for the VST Instrument until you need to view or edit any of the automation tracks.
For more about automation, see the chapter "Automation" in the Operation Manual.

3. Select the mixer channel automation track(s) for the VST Instrument and use the "Out" pop-up menu in the Inspector to route them to the desired output channels or groups.
You can also do this from the mixer.

4. Select an unused MIDI track in the Project window.

5. Pull down the output pop-up menu for the MIDI track in the Track list or in the Inspector.
The pop-up menu will now contain an additional item, with the name of the activated VST Instrument.
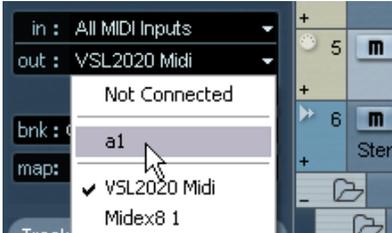
6. Select the VST Instrument on the MIDI output pop-up menu.
The MIDI output from the track is now routed to the selected instrument.

7. Depending on the selected instrument, you may also need to select a MIDI channel for the track.
For example, a multi-timbral VST Instrument can play back different sounds on different MIDI channels – check the instrument's documentation for MIDI implementation details.

8. Make sure the option "MIDI Thru Active" is activated in the Preferences dialog (MIDI page).

9. Click the Monitor button for the MIDI track (in the Track list, Inspector or mixer).
When this is activated (or when the track is record enabled, see the chapter "Recording" in the Operation Manual) incoming MIDI is passed on to the selected MIDI output (in this case the VST Instrument).

10. Open the mixer.
You will find one or more additional channel strips for the instrument's audio outputs. VST Instrument channel strips have the same features and functionality as group channel strips, with the addition of an Edit button at the bottom of the strip for opening the VST Instrument control panel. You will also find output routing pop-up menus at the top of the channel strips, for routing the VST Instrument channel(s) to output channels or groups.

11. Play the instrument from your MIDI keyboard.
You can use the mixer settings to adjust the sound, add EQ or effects, etc. – just as with regular audio channels. Of course, you can also record or manually create MIDI parts that play back sounds from the VST Instrument.

You can have up to 64 VST Instruments activated at the same time, different models or several instances of the same instrument. However, software synthesizers can consume quite a lot of CPU power – keep an eye on the VST Performance window to avoid running out of processor power. See also .

About latency

Depending on your audio hardware and its ASIO driver, the latency (the time it takes for the Instrument to produce a sound when you press a key on your MIDI controller) may simply be too high to allow comfortable real-time VST Instrument playback from a keyboard.

If this is the case, a workaround is to play and record your parts with another MIDI Sound Source selected, and then switch to the VST Instrument for playback.

▪ **You can check the latency for your audio hardware in the Device Setup dialog (VST Audiobay page).**
The input and output latency values are shown under the ASIO Driver pop-up menu. For live VST Instruments playing, these values should ideally be a few milliseconds (although the limit for "comfortable" live playing is a matter of personal taste).

Constrain Delay Compensation

Nuendo features full delay compensation throughout the entire audio path. This means that any delay inherent in the VST plug-ins you use will automatically be compensated for during playback, so that all channels are kept in perfect sync (see the chapter "Audio effects" in the Operation Manual).

However, when you play a VST Instrument in real time or record live audio (with monitoring through Nuendo activated), this delay compensation may sometimes result in added latency. To avoid this, you can click the Constrain Delay Compensation button on the Project window toolbar. This function tries to minimize the latency effects of the delay compensation, while maintaining the sound of the mix as far as possible.
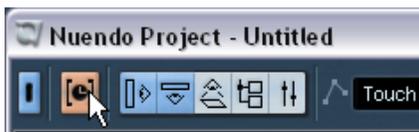
- In the Preferences dialog (VST page) you will find a setting called Delay Compensation Threshold. Only plug-ins with a delay higher than this setting will be affected by the Constrain Delay Compensation function.

- VST plug-ins (with higher delay than the threshold value) which are activated for VST Instrument channels, audio track channels that are record enabled, group channels and output channels will be turned off when you activate Constrain Delay Compensation.

- VST plug-ins activated for FX channels are not turned off but their delay is disregarded by the program (delay compensation is turned off).

After recording or using a VST Instrument with Constrain Delay Compensation, you should turn off the function to restore full delay compensation.

Selecting patches and making settings

▪ To select a patch for a VST Instrument, use its patch pop-up menu in the VST Instruments window.
The available patches depends on the VST Instrument. Not all VST Instruments come with pre-made patches.

▪ To access the parameters for the VST Instrument, click the Edit button in the VST Instruments window or in its channel strip (at the bottom of the fader strip) in the mixer.
This opens a "control panel" for the VST Instrument.

▪ **For descriptions of the included VST Instruments and their parameters, see the separate pdf document "Audio Effects and VST Instruments".**

Selecting patches from the Project window

When a VST Instrument is selected as MIDI output for a track, you can also select patches by name, using the program pop-up menu in the Track list or Inspector. Although this is set up automatically and transparently, there are a couple of things to note:

▪ If the VST Instrument supports the VST 2.1 standard (or later), selecting a patch will cause Nuendo to send MIDI Program Change and Bank Select messages to the VST Instrument, just as with "real" physical MIDI instruments.
A consequence of this is that you can enter Program Change events in MIDI parts anywhere on the track, having the VST Instrument change patch at the desired locations ("automating" the patch selection).

- If the VST Instrument supports the original VST 2.0 standard only, only limited support of patch selection is offered.
  In this case, selecting a patch will actually ask the VST Instrument to change "Plug-in Program", which is not the same as selecting a "Patch" by sending MIDI Program Change and Bank Select messages.

Automating a VST Instrument

- Automation of the VST Instrument channel settings is done in the same way as automating regular channels.

- Automation of the specific parameters for a VST Instrument is done in the same way as automating VST effect parameters.

  See the chapter "Automation" in the Operation Manual.

The Instrument Freeze function

Like all plug-ins, VST Instruments can sometimes require a lot of processor power. If you are using a moderately powerful computer or if you are using a large number of VST Instruments, you may come to a point where your computer cannot handle all VST Instruments playing back in real time (the CPU overload indicator in the VST Performance window lights up, you get crackling sounds, etc.).

Enter the Instrument Freeze function! This is how it works:

- When you freeze a VST Instrument, the program renders an audio file of its output (taking into account all unmuted MIDI parts routed to that VST Instrument). This file is placed in the "Freeze" folder within the Project folder.
- All MIDI tracks routed to the VST Instrument are muted and locked (the controls for these tracks will appear "greyed-out" in the Track list and Inspector).
- When you play back, the rendered audio file is played back from an "invisible" audio track, routed to the VST Instrument's mixer channel. Thus, any effects, EQ or mixing automation will still be applied.
- If you like, you can choose to freeze the VST Instrument's mixer channel(s) as well. This freezes any pre-fader insert effects for the channels, just as when you freeze an audio track (see the chapter "Audio effects" in the Operation Manual).

The result of all this is that you get exactly the same sound as before, but the computer processor doesn't have to calculate the sound of the VST Instrument in real time.

- If you need to edit the MIDI parts routed to the VST Instrument or adjust the settings on the instrument itself, you need to unfreeze the instrument first. This removes the rendered file and restores the MIDI tracks and VST Instrument. Once you have made the necessary adjustments you can freeze the instrument again.

Performing the Freeze

1. Set up the Project so that the VST Instrument plays back the way you want it.
This includes editing the MIDI parts routed to the VST Instrument and making parameter settings for the VST Instrument itself. If you have automated parameter changes for the VST Instrument, make sure the Read (R) button is activated.

2. Open the VST Instruments window from the Devices menu.

3. Click the Freeze button for the VST Instrument (the button to the left of the VST Instrument slot).
A dialog appears with some options for the Freeze operation:

- Select "Freeze Instrument Only" if you don't want to freeze any insert effects for the VST Instrument channels.
If you are using insert effects on the VST Instrument channel(s) and want to be able to edit, replace or remove these after freezing the VST Instrument, you should select this option.

- Select "Freeze Instrument and Channels" if you want to freeze all pre-fader insert effects for the VST Instrument channels.
If your VST Instrument channels are set up with the desired insert effects and you don't need to edit these, you can select this option.

- Activate the "Unload Instrument when Frozen" option if desired.
  This unloads the frozen VSTInstrument from the computer's memory. This is useful if you are freezing an instrument that uses a lot of RAM, e.g. a sampler plug-in. By unloading the instrument, the RAM becomes available for other plug-ins, etc.

4. Click OK.
   A progress dialog is shown while the program renders the VST Instrument audio to a file on your hard disk.

   The Freeze button lights up and the power, bypass and edit buttons for the VST Instrument are greyed out (and the control panel closes if it was open). If you check the Project window at this point you will find that the relevant MIDI tracks have greyed out controls in the Track list and Inspector. Furthermore, the MIDI parts are locked and cannot be moved.

5. Try playing back the project.
   You will hear exactly the same sound as before Freezing the VST Instrument – but the CPU load will be considerably less!

6. If you selected "Freeze Instrument and Channels", any insert effects used by the VST Instrument are also frozen (except for the post-fader inserts). However, you can always adjust level, pan, sends and EQ for frozen VST Instruments.

Unfreezing

If you need to make adjustments (either to the MIDI tracks, to the VST Instrument parameters or to the VST Instrument channels if these were frozen) you need to unfreeze the VST Instrument:

1. Click the Freeze button for the VST Instrument slot again.
   You will be asked whether you really want to unfreeze the instrument.

2. Click "Unfreeze".
   The MIDI tracks and VST Instrument are restored and the rendered "freeze file" is deleted.

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