

Are you looking for a plug-in that allows you to tune your vocal recordings, apply special effects and add natural sounding harmonies when mixing your track? Look no further, Mu Voice is the plug-in for you. The proprietary spectral analysis and synthesis techniques of Mu Technologies set new standards in vocal processing providing a unique tool for your recording studio. An internal delay of only 5.8 ms makes Mu Voice the ideal vocal processor to perform live on stage.

Real-time Vocal  
Processing Plug-in

Tuner - Harmonizer - Effects

For Studio ...  
... and Live



## Mu Voice 1.3

More Control More Fun

### Key Features

- Intelligent 4 track harmonizer that takes into account chord and scale info.
- Chord selector with scale, chord and modifier options.
- Preset manager for applying, saving and naming presets.
- Chord scheme editor for defining chord and preset sequences.
- Automated sequencing.
- Tuner with parametric impact, operating in chromatic and scale mode.
- XML based file format for parameters, presets, plug-in state and chords.
- Configurable MIDI keyboard for chord recognition, direct tuning, playing harmonies, selecting presets and navigating the chord scheme.
- MIDI controller support with mapping to multiple parameters.
- Playlist configuration.
- MIDI navigation controls with MIDI learning.



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the official



www.youtube.com/mutechnologies

# Mu Technologies

presents

## Mu Voice -user Manual-



Taking you to the edge of vocal processing ...

# Mu Voice

## - User Manual -

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## 1. Why Mu Voice?

Thank you for choosing **Mu Voice**, one of the most powerful real-time vocal processors on the market. **Mu Voice** is an award winning plug-in that combines tuning, harmonizing and effects. It is a unique tool that can be used both for studio work and live performance.

"Editor's Choice"  
Beat Magazine 01/09



"Performance Award"  
Computer Music 08/08



### 1.1 Keep it Real(-Time)!

Many vocal processors nowadays claim to be real-time but when taking a closer look, they do the analysis off-line on a prerecorded audio buffer. Therefore, the synthesis is real-time, but the analysis is not. With **Mu Voice** both the analysis and synthesis are real-time and the low latency allows you to get instantaneous results. As far as we know, **Mu Voice** is the only native plug-in that can be used for live performance.

### 1.2 No more tedious pitch curve editing!

Harmonizing with a pitch curve based approach takes many hours because you have to create the arrangement manually. **Mu Voice** will make an arrangement for you based on chord and scale information. Put the chords and presets in the chord scheme, sequence it to the host and you're all set.

### 1.3 Why 5 plug-ins if you can have one that does it all?

We believe strongly in integration of new functionality as opposed to bundling plug-ins with limited functionality. This gives better performance and lower latency. In addition, the algorithms are fully optimized with special processor instructions sets like SSE for Intel and AltiVec for PowerPC.

### 1.4 Minimum System Requirements

#### Windows

Operating System: Windows XP  
Processor Clock: > 1 Ghz  
Memory: > 512MB

#### Mac

Operating System: OS 10.4.0 or higher  
Processor Clock: > 1 Ghz  
Memory: > 512MB

### 1.5 Authorization and Installation

**Check the Mu Voice Installation Guide!**

## 2. The Mu Voice Concept

Usability and user-friendliness were major considerations in the design of Mu Voice. After all, real-time harmonizing is quite a complex task. This section explains why certain design choices were made, and how you can best use Mu Voice in a live or studio setting.

### 2.1 The Problems with Traditional Parameter Control

With a full complement of sliders, knobs and buttons that control over 70 parameters, Mu Voice is a deep and immensely programmable processor. Unlike many plug-ins, in which a static configuration of parameters can be used for the duration of a song, Mu Voice is dynamic. It changes scales, chords and harmonies over time.

For simple plug-ins, host-based automation is a useful way to change a few parameters over time. But Mu Voice requires complex automation and interaction of its many parameters and, as such, host-based automation techniques are not the most efficient way to work with Mu Voice.

Obviously, presets (or programs) are one way to change many parameters simultaneously. For Mu Voice, however, even this is not a complete solution because you would need presets that contained both voicing and chord information. And, since songs may contain so many voice and chord combinations, even simple songs would require a large number of presets.

### 2.2 Chord / Preset Scheme

To keep things manageable, the Mu Voice design team decided to treat chord and voicing information separately.

#### 1. Preset Creation

All the voicing parameters are stored in presets. By defining a preset name, and pressing the Save button on the Preset Panel, a preset is saved. Creating presets is the first step when using Mu Voice. Section 6 (p. 15) covers preset management in greater detail.





## 2. Scheme Editing

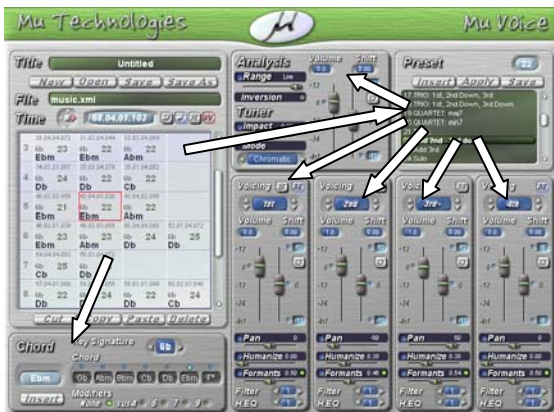
Chords can be added to the chord scheme by pressing the Insert button on the Chord Panel or double clicking the chords.

Presets are added by pressing the Insert button on the Preset Panel. The scheme editor allows you to cut, copy, paste and delete selections.



## 3. One Click Control!

Once the chord scheme is defined, it can be used to control chords and presets simultaneously. By clicking on one of the scheme elements, the chord and preset are applied. Also MIDI controllers can be used to navigate the chord scheme.



## 2.3 Full Automation

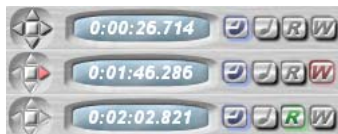
### 4. No hands!

Mu Voice playback is automatically synchronized to the host-sequencer's time.

Edit Mode

Write Mode

Read Mode

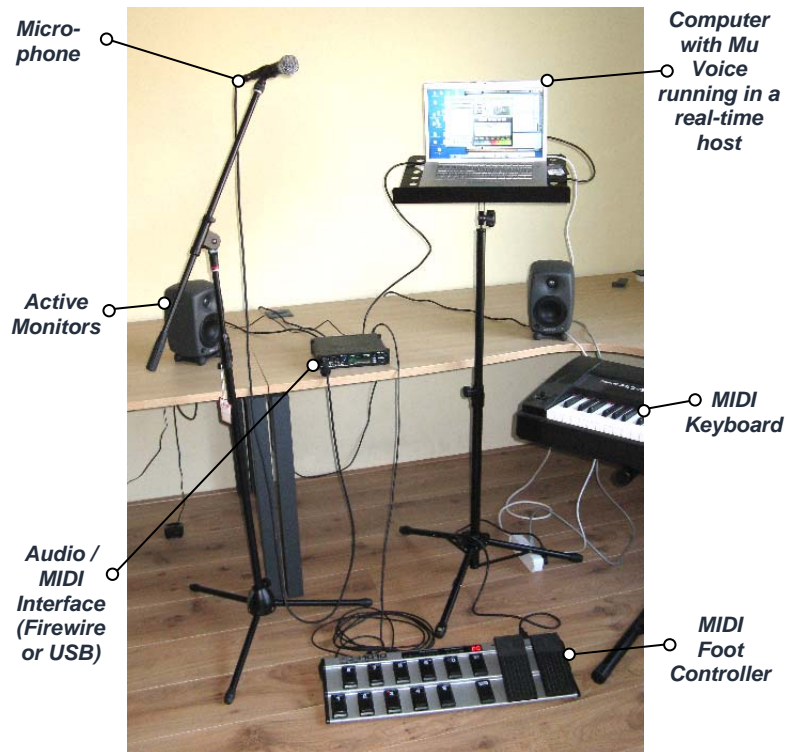


Once all Chord and Preset combinations are added to the scheme, you can sequence their timing by putting the plug-in in write mode and clicking the right button that has turned red. Once the sequence is written, simply set the plug-in to Read mode and will synchronize itself automatically to the host time.

**Note: Setting presets from the plug-in or host is disabled in read mode.**

## 2.4 A Live Setup

While sequencing the plug-in is great for studio use, a live performer would choose to control everything from MIDI controllers. Using the plug-in live requires a real-time host to run. Both soft- and hardware solutions are on the market nowadays. The extensive MIDI support includes Note Events, Control Change Events and Program Change Events (see section 10, p. 20).



The picture above shows a live setup for Mu Voice:

1. The audio and MIDI input come from the **Microphone** and **MIDI Foot Controller** (or **MIDI Keyboard**) respectively which are connected to the **Audio Interface**.
2. The **Audio Interface** sends audio and/or MIDI signals to the **Computer** and receives the processed audio and/or MIDI back over the **Firewire/USB Cable**.
3. Finally, the **Audio Interface** sends the audio to the **Active Monitors**.

### 3. Mu Voice Panels

Here is an overview of the different Mu Voice control panels. The next sections will discuss these control panels in detail.

NOTE: A good way to learn more about the various parameters is to browse the numerous Mu Voice presets.

#### File Panel

The plug-in parameters, chord scheme and presets can be saved to a file. The **File Panel** allows you to set a project title, create a new file, open a file and save to an existing or new file.

#### Analysis Panel

The analysis and tuner parameters are set in the **Analysis Panel**. A global volume control and shift slider are included that operate on all harmonies simultaneously.

#### Preset Panel

All plug-in parameters can be stored in a preset. The **Preset Panel** allows you to apply, save and name presets. Mu Voice comes with over 30 standard presets and users can create many more.

The 'Insert'-button adds a preset to the chord scheme.

#### Chord Scheme Panel

Presets and chords are added to the **Chord Scheme Panel** by pressing the Insert buttons in the Preset and Chord Panels, respectively.

You can select different cells in the scheme and perform standard editing tasks like cut, copy, paste and delete.

When the plug-in is in write mode, the timing of the sequencer is added to the scheme. Then, when the plug-in is switched to read mode, it synchronizes itself with the host.

NOTE: XML files can be opened by dropping them on the chord scheme.

#### Harmony Channels

The four channel harmonizer is configured by choosing the voicing and octave. For each channel one can control the mute [M], bypass [B], shift, shift range, shift quantization, panning, humanizing, formants, formant activation, filter and harmonic EQ presets.

#### Chord Panel

The Chord panel provides a convenient interface for selecting chords. By selecting a key signature, the diatonic series is displayed. Chord modifiers like sus4, 6, 7 and 9 are also included.

#### MIDI Display Switch Button

Mu Voice offers extensive MIDI configuration possibilities. Because of space limitation these panels are drawn over the harmony channels. The different MIDI Panels are shown on the next pages. The MIDI Display Switch makes these panels (dis)appear.







### MIDI Navigation Controls

The MIDI Navigation Controls section is a set of six MIDI assignable buttons (see section 10.7, p. 27). They allow to navigate the chord scheme incrementally or by anchor point and to switch between different songs in the Playlist.

### MIDI Panel Switch

The MIDI Panel Switch allows you to choose between "Controls", "Playlist" and "MIDI2Pitch" display.

### "Controller" Display

The "Controller" display in Mu Voice maps a single controller to any number of parameters and defines a mapping curve for each parameter.

### MIDI Keyboard

The MIDI keyboard allows you to do chord recognition, tune the lead, play a harmony, select presets and navigate the chord scheme. You can choose the number of octaves for each task.

### "Playlist" Display

Chords schemes of different songs can be managed in the "Playlist" display. The order of the songs can be arranged and the playlists can be saved to a file.

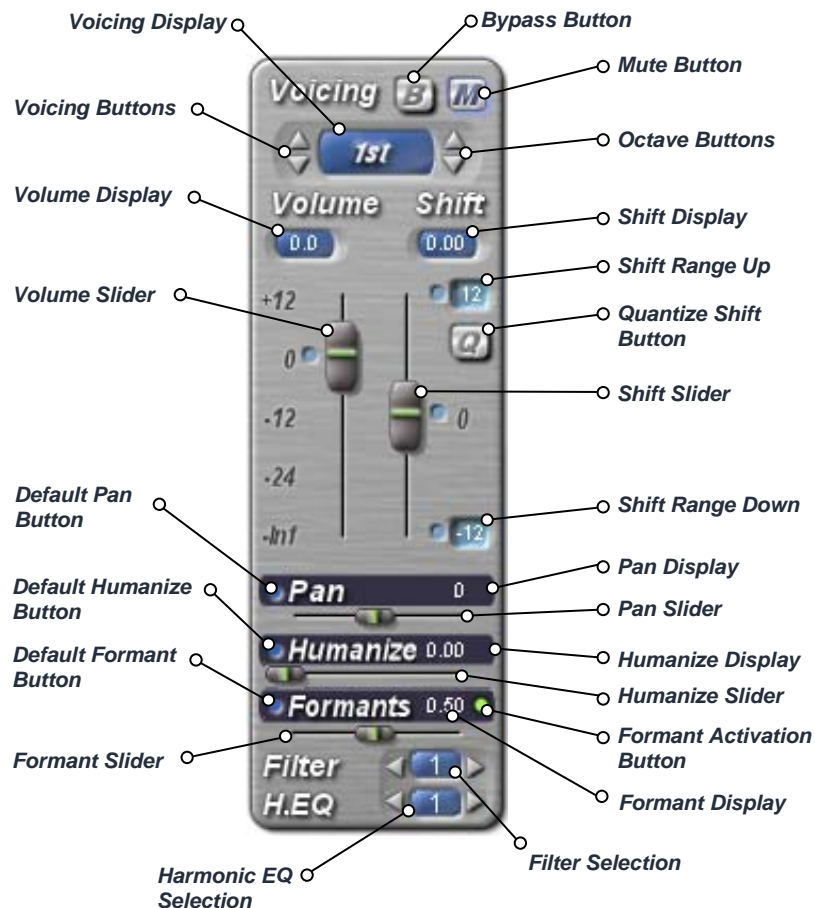


### "MIDI2Pitch" Display

When a channel is put in MIDI mode (see section 4.2, p. 10), the orange key range is used to tune the notes on these channels. The "MIDI2Pitch" display allows you to automate parameters in function of the pitch of the harmony or the interval between the lead and the harmony.

## 4. The Harmony Channels

### 4.1 Overview



### 4.2 Voicing

Creating harmonies that sound musical and natural cannot be realized by a simple pitch shift. This is because the intervals between vocal harmonies change over time. The pitch of the harmonies is determined from both chord information and voicing configuration.

The **Voicing Display** shows which harmony is assigned to each channel. Consider, for example, the case where one wishes to harmonize according to the C chord in the scale C major.

- When the first voice (**1st**) is selected, no pitch shifting will be applied.
- When the second voice (**2nd**) is selected, the lowest note above the leading note is chosen that matches the musical context. For example, when the lead voice sings C, the second voice will sing E. When the lead voice sings G, the second voice will sing C.
- When the third voice (**3rd**) is selected, the second lowest note above the lead voice is chosen. When the lead voice sings C, the third voice will sing G. When the lead voice sings G, the third voice sings E.
- The fourth voice (**4th**) is simply the octave of the lead voice when there are no modifiers applied to the chord. When the chord modifiers 6, 7 or 9 are selected, they will be applied to the fourth voice.
- A channel can also be put in MIDI mode (**MIDI**). In this case note events from the orange keyboard range are sent to all channels that are in MIDI mode (see section 10).

You can change the voicing with the **Voicing Buttons** on the left hand side of the **Voicing Display**. If these buttons were the only controls to configure the voicing, the harmonies would always sound higher than the lead voice. Therefore, **Octave Buttons** are provided to the right of the **Voicing Display**. They allow the harmonies to be shifted up and down by one or two octaves. The octave shift is displayed with plus and minus signs. For example, if you selected the second voice and an octave down, the **Voicing Display** would depict this as



Since the number of desired harmonies can change over time, there is also a **Mute Button** to switch the channel on and off.

The **Bypass Button**, which is present only on the first channel, allows the incoming voice to pass through the channel unprocessed. When bypassed, only the channel's volume and pan controls work—all other parameters are bypassed.

### 4.3 Mixing

The **Volume Slider** allows you to mix the different channels. Its value is displayed in dB on the **Volume Display**. You may edit the **Volume Display** directly by clicking it and typing the desired value. To quickly set the volume to its default value (0.0 dB), click the blue button to the left of the **Volume Slider**.

## 4.4 Pitch Shifting

Although the voicing configuration provides a convenient way to harmonize your vocals, you may want to apply a manual pitch shift or perform glissandos. For this reason, Mu Voice includes a **Pitch Shift Slider**.

The range of this slider is parametric and is set in the **Shift Range Up** and **Shift Range Down** displays. You should first set the desired range by clicking the **Up** and **Down** range displays and typing the desired values. The range values are expressed in half tones. So, for example, if you want the upper range to be a minor third, set its value to 3. Note that the range up parameter is always positive and the range down is always negative.

Once you have set the desired pitch range, you can start using the slider. The actual value is displayed in the **Shift Display**, which is also editable. The blue buttons at the top, middle and bottom of the slider set its value to the upper range, zero and lower range respectively. If you want the shift interval to always be an integer value, click the **Quantize Shift Button**, and the shift will always round to the nearest half tone.

### Note!

The shift is added to the pitch of the harmonics. Don't forget to put voicing on the other channel to 1<sup>st</sup> if you only want to apply the pitch shift.

## 4.5 Panning

Normally panning only adjusts the balance between the left and right channel. Not so in Mu Voice, where a binaural spatialization technique is used. This technique uses interaural delays and volume differences obtained from psychoacoustic measurements. It is an effective method to set the perceived angle of a given vocal harmony.

The panning is controlled with the **Pan Slider** and ranges from -90 to 90 degrees azimuth. This value is displayed in the **Pan Display**, which is editable. Click the **Default Pan Button** to the left of the slider to set this control to its default value.

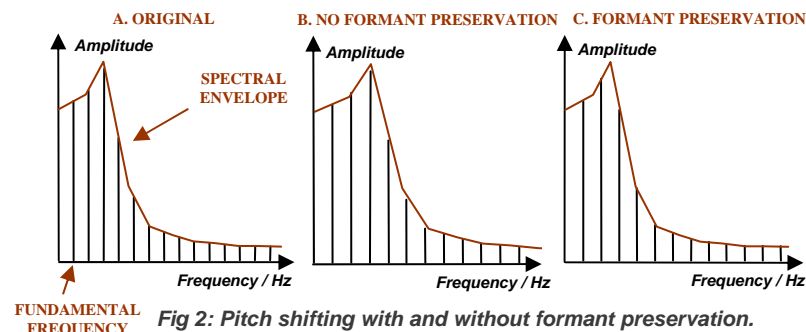
## 4.6 Humanizing

When a harmony is added to the leading voice, interference might occur if the pitches are coupled too tightly. To make sure that both are perceived as independent voices, a slight pitch randomization is added to the harmonics. The **Humanize Slider** controls both the amount of pitch variance and the amount of additional delay. The pitch variance ranges from zero to a third of a half tone over the first third of the slider. The delay ranges from zero to 34 ms over the full range of the slider. You can also click directly on the **Humanize Display** to type the desired value, and you can click the **Default Humanize Button** to set the value to zero.

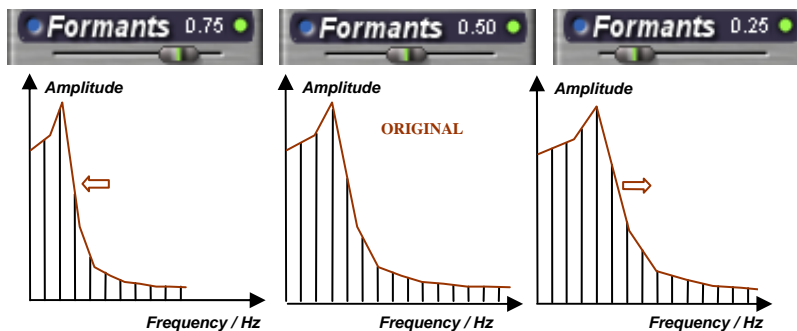
## 4.7 Formant Control (Gender)

In order to understand the **Formant Slider**, it helps to understand what the spectrum of a singing voice looks like. The spectrum is a representation of the signal that shows the intensity of each harmonic frequency. Specifically, for a periodic sound source, the spectrum consists of a series of peaks (harmonics) that are positioned at multiples of the fundamental frequency. Mu Voice uses its proprietary state-of-the-art spectral analyzer to determine the amplitude of each harmonic. The curve that connects all these values is called the spectral envelope or "formant curve." This curve defines the timbre of a sound, and is different for each vowel.

Figure 2.A shows the spectral envelope and fundamental frequency of a spectrum. If you were to shift the pitch without correcting the formant curve (Fig. 2.B), all the harmonic values would shift and the timbre would change in an unnatural sounding way. In order to shift pitch without altering the voice's timbre, the formant curve needs to be preserved (Fig. 2.C).



Timbre preservation can be switched on and off with the **Formant Activation Button**. When formant correction is switched on, the timbre can be changed independently from the pitch by the **Formant Slider**. When moving the slider, the spectral envelope is scaled (Fig. 3) but the fundamental frequency (or pitch) stays the same.





Formant control is often called “gender” since it can make a voice sound more masculine, feminine or child-like.

The **Formant Display** shows the value of the formant slider, which you can also edit directly. Reset the value to its default by clicking the **Default Formant Button**.

4.8 Filters

Mu Voice has 10 built-in filter settings that can be applied to each harmony channel individually. The button to the right of the display increments the filter number, and the button to the left decrements it. The following filter types are available:

- 1. No filtering.
- 2. A low pass filter that applies 6dB of attenuation above 4000Hz.
- 3. A high pass filter that applies 6dB of attenuation below 4000 Hz.
- 4. A bandpass filter that decreases frequencies below 400 Hz and above 4000 Hz, sounding like a “telephone line.”
- 5. A comb filter with resonance every 300 Hz.
- 6. An inverse comb filter with resonances every 300 Hz (5 and 6 are depicted in Fig. 4).
- 7. A comb filter with resonance every 600 Hz.
- 8. An inverse comb filter with resonances every 600 Hz.
- 9. A comb filter with resonance every 1200 Hz.
- 10. An inverse comb filter with resonances every 1200 Hz.

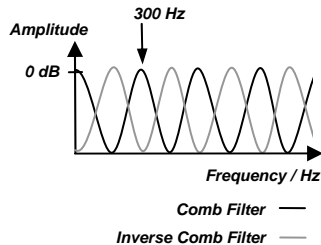


Fig. 4: Comb and Inverse Comb Filters

4.9 Harmonic EQ

Mu Voice can attenuate or amplify each harmonic individually, which we call *harmonic equalizing* (denoted H. EQ). This is, in fact, a filter that is based on the index of the harmonic instead of the frequency. Mu Voice contains an H.EQ preset derived from each filter type. The attenuation factor was computed from the frequency response of the filters for all multiples of 150Hz. These factors are multiplied with the amplitudes of the harmonics. For the comb and inverse filter at 600 Hz, this results in the following attenuation factors.

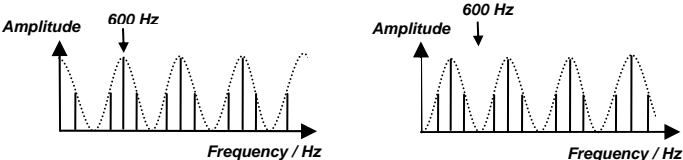
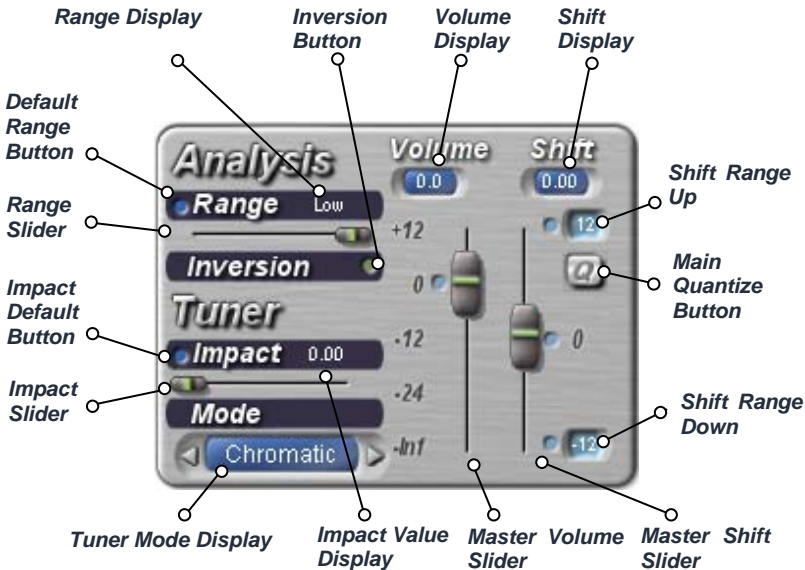


Fig. 5: Comb and Inverse Comb Harmonic EQ

5. Analysis and Tuner Panel



5.1 Analysis

Use the **Range Display** to set the response range of the analyzer. A low frequency range is used by default, and is recommended for most vocal performances and other low pitched instruments. Sometimes, however, a high frequency range might prove beneficial for avoiding artifacts with high-pitched sounds. Click the **Default Range Button** to set the range to its default state.

The pitch estimator detects the beginning of each period. However, if the input signal is inverted, the detector might get confused. Click the **Inversion Button** to solve this.

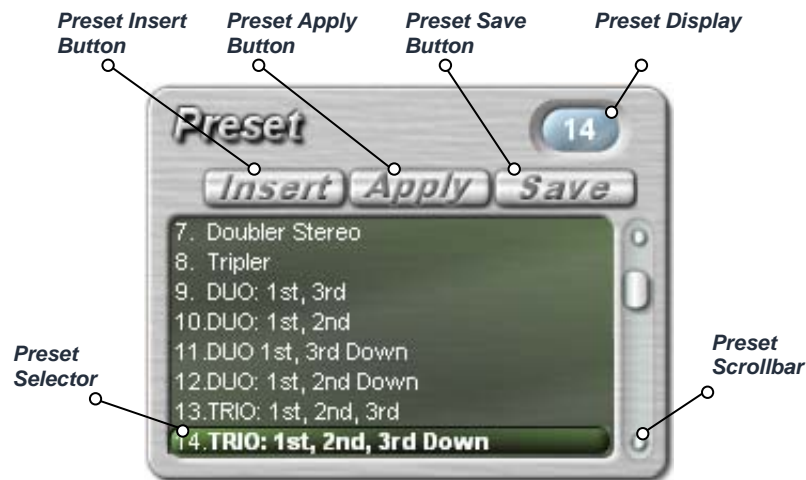
5.2 Tuner

The **Tuner Mode** can be set to either “Chromatic” (which tunes the note to the nearest half tone) or “Scale” (which tunes it to the nearest note in the scale). The impact of the tuner can be adjusted by the **Impact Slider**. When the impact is one, the pitch is rounded to the exact value—a value that, though mathematically accurate, will likely result in the loss of expression and create discontinuous jumps between notes. Therefore, it’s best to set this value below one, balancing accuracy with expression and natural inflection.

## 5.3 Volume and Shift, part 2

The analysis panel also contains volume and shift slider. These controls work exactly like those in the harmony channels except that the effect is applied globally and, thus, affects all four channels simultaneously.

## 6. Preset Panel



### 6.1 Applying a Preset

Use the **Preset Scrollbar** to browse through the different presets. Select a preset from the **Preset Selector** by clicking it. Then, press the **Preset Apply Button** to let it take effect. A preset can also be applied by double clicking it. The **Preset Display** shows the number of the current (applied) preset.

### 6.2 Changing a Preset Name

Click a preset in the **Preset Selector** to highlight it. Click it a second time to make the preset name editable, then click once more to set the cursor. After changing the name, press enter.

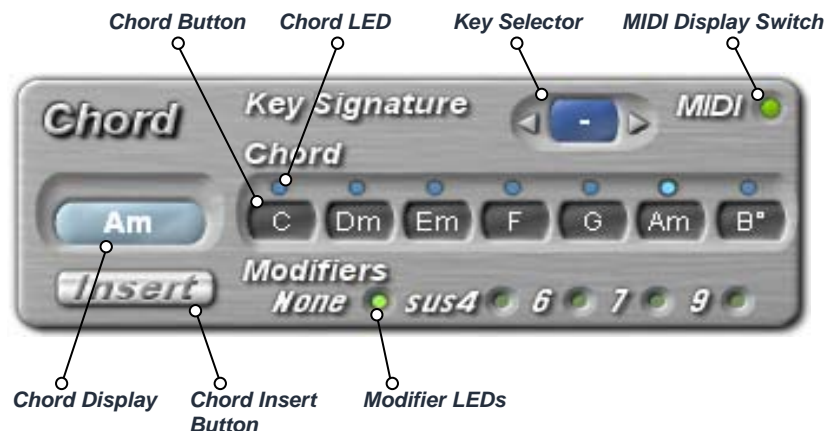
### 6.3 Saving a Preset

After choosing a preset name, all parameters can be set by adjusting the sliders and knobs. When the **Preset Save Button** is pressed, these settings are saved to the preset that is currently selected from the **Preset Selector**.

## 6.4 Inserting a Preset

Presets can be added to the chord scheme in the following way. First, select one from the **Preset Selector**. Then add it to the scheme by pressing the **Preset Insert Button**. The cursor in the scheme is incremented after the insert.

## 7. Chord Panel



### 7.1 Selecting a Chord

Use the **Key Selector** to set the key signature. The key signature is denoted by a number and a 'b' or a '#' indicating how many flats or sharps are in the signature. Press the right triangular button to add a sharp (or subtract a flat). Press the left triangular button to add a flat (or subtract a sharp).

When a key is selected, the diatonic series of chords appears on the **Chord Buttons**. When a chord is selected, its **Chord LED** switches on and it is used for the harmonization of the vocals. You can apply modifiers to these chords by pressing the **Modifier LEDs**. The result of the choice of key, chord and modifiers is depicted in the **Chord Display**.

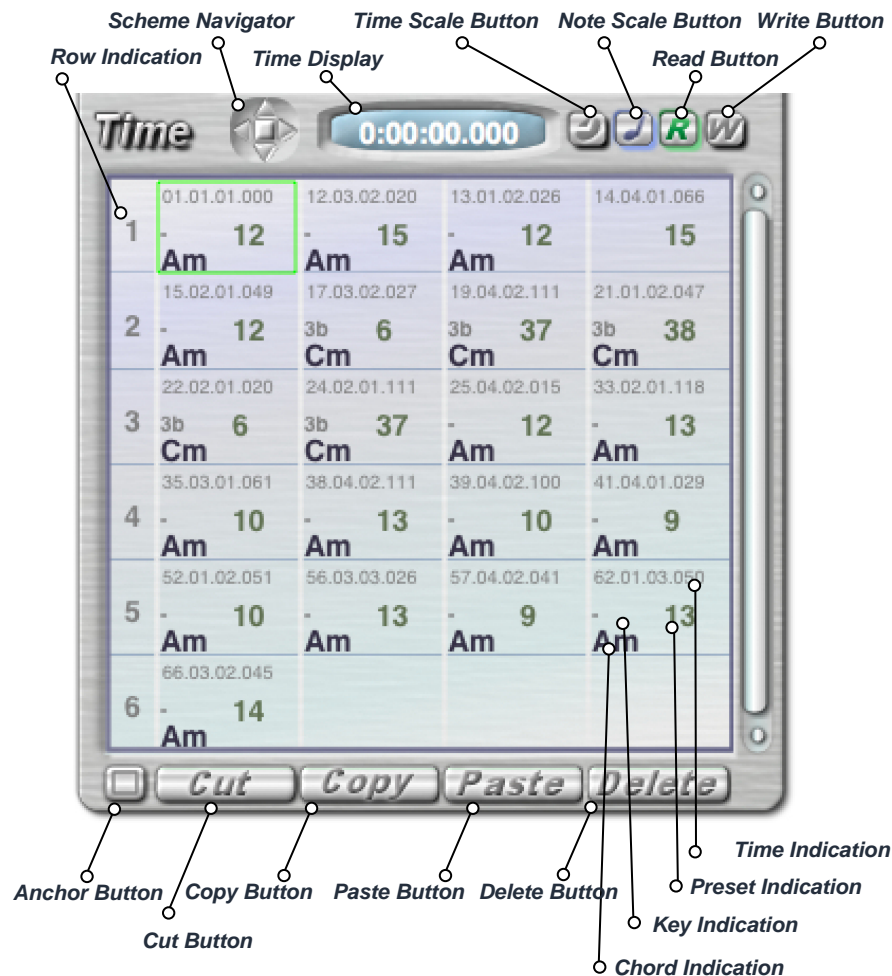
Chords can also be recognized from the MIDI keyboard (section 10.3, p. 22). The MIDI keyboard can be made to (dis)appear by pressing the **MIDI Display Switch**.

### 7.2 Inserting a Chord

There are two ways to add a chord to the chord scheme. One way is to press the **Chord Insert Button** after choosing a chord. Another way is to double click the **Chord Buttons**. When a chord is added the scheme, the position of the scheme cursor is incremented so another chord can be added right away.

## 8. Chord Scheme Editor

Think of the chord scheme as Mu Voice's central control center. The scheme contains both chord and preset information. When the cursor is placed on a given cell, the corresponding preset and/or chord are applied (see section 2.3).



### 8.1 Chord Scheme Data Cell

Each cell in the chord scheme editor contains four data elements. On the bottom we find the **Chord Indication**. On the middle-left is the **Key Indication**, and on the middle-right is the **Preset Indication**. The top of the cell displays the **Time Indication**, which is the time at which this cell will automatically become active (when the Chord Scheme is in Read mode).

### 8.2 Setting the Mode

At the top of the chord scheme editor is the **Time Display**, which shows the host sequencer's current time. You can choose between two time representations by pressing the **Time Scale Button** or the **Note Scale Button**, which also affects the time displayed within the chord scheme cells.

The plug-in has three states: Edit, Read and Write. Edit mode is active when neither the Read nor Write buttons are active. When in Edit mode, you can add Chords and Presets to the scheme. Write mode is active when the Write button is lit, and is used to select cells as your host sequencer plays. Read mode is active when the Read button is lit, and is used to play back cells in sequence with your host application.

### 8.3 Navigating the Chord Scheme

In Write and Edit modes, you can move between cells using the arrow keys on your computer keyboard. However, since not all hosts will pass key events through to a plug-in, a **Scheme Navigator** control is also provided. Press the navigator's up, down left and right arrows to move between cells. Press the square button in the center of the navigator if you wish to select multiple cells. Note that, in Read mode, the navigator buttons are disabled since the position of the cursor is set automatically.

### 8.4 Editing the Chord Scheme

Sections 6.4 and 7.2 discussed, respectively, how to add a preset and a chord to the chord scheme. You may also cut, copy, paste and delete cells using the dedicated **Cut**, **Copy**, **Paste** and **Delete** buttons at the bottom of the Chord Scheme editor. If your host application is able to pass keyboard events to plug-ins, then you may also use the standard Mac or Windows cut, copy, paste and delete key combinations to perform these tasks.

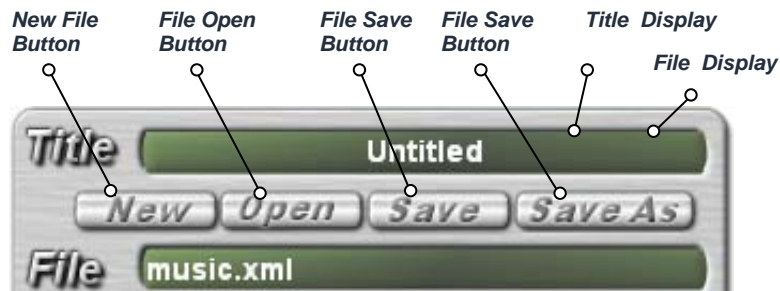
The **Anchor Button** configures the current position as an anchor position. Anchor positions are used to navigate the chord scheme with MIDI controls (see section 10.9, p. 27).

#### Note!

Empty positions in the chord scheme are ignored. This means that in Write and Read modes, they are skipped.



## 9. File Panel



### 9.1 File Management

Use the **File Panel** to open and store your data files. Click the **Title Display** to enter a suitable description of your track. Open a new file by pressing the **File Open Button**. The **Save Button** stores the data to the current file, and the **Save As Button** stores the data to a new file. To clear all data and return Mu Voice to its default settings, click the **New File Button**.

#### Note!

When pressing “Save” or “Save As”, **Mu Voice** stores the values of all presets that have been stored. Do not forget to press “Save” in the Preset Panel before you press “Save” in the File Panel otherwise the preset will be lost!

### 9.2 XML

Mu Technologies developed an XML based file format for storing plug-in information. This information consists of the current value of all parameters, all presets, the chord scheme and user interface related parameters. The advantage of using an XML format is that it is editable and portable over different platforms and hosts.

#### Note!

When a session is saved, Mu Voice makes sure that the host stores the XML path for the plug-in and the playlist (see section 10.7). When the plug-in is opened, it will get the paths from the host and load the files. Make sure you use different XML files for each project!

### 9.3 Drag and Drop

Files can also be opened by dragging a file and dropping it on the chord scheme. Also, selections of multiple files can be added to the playlist (see section 10.7, p. 25).

## 10. MIDI Controls

### 10.1 Sending MIDI to Mu Voice

When using a MIDI controller, the first thing you need to make sure is that the plug-in receives the MIDI events. Every host application has its own way of integrating plug-ins, so Mu Technologies suggests you to read your host's manual to learn how to configure its audio and MIDI I/O. We'll discuss MIDI routing for some of the popular hosts to get you started.

#### VST (Cubase)

The left hand side of figure 6 shows a MIDI channel in Cubase. Mu Voice is loaded as an insert on a different audio track (not in the picture). When the plug-in is selected as the output bus of the MIDI track, it will receive the MIDI events.

#### RTAS (Pro Tools)

The right hand side of figure 6 shows a similar setup in Pro Tools. The plug-in is loaded as an insert on an audio track (the right track) and the MIDI track is on the left. The plug-in is selected as the output bus of the MIDI track.

#### AU (Logic)

Apple has made the design choice in Logic that only instrument tracks can handle MIDI events. Therefore Mu Voice must be loaded as an “AU MIDI-controlled Effects” on an instrument track. The audio is routed to the plug-in by selecting the side-chain channel in the upper right corner above the plug-in.

#### Real-time hosts (Ableton / Mainstage)

The VST and AU version of Mu Voice has been tested in Ableton Live 7. In Apple Mainstage, the AU version can be used as an effect. MIDI controlled effects are not yet supported in Mainstage, but are expected in a subsequent release.

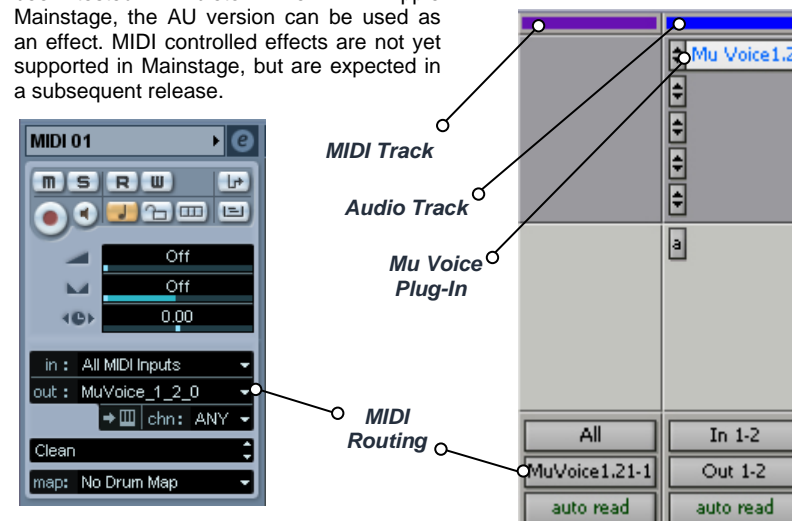


Fig. 6: Examples of MIDI routing in Cubase and Pro Tools.

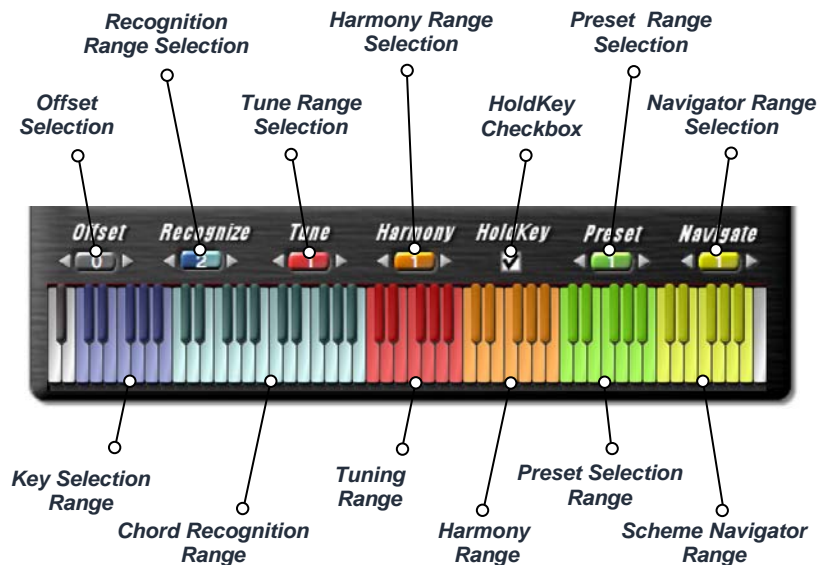
## 10.2 MIDI Event Types

MIDI (Music Instrument Digital Interface) is an event based protocol for communication between musical devices. Mu Voice allows you to use a wide range of MIDI devices like keyboards and foot controllers and has powerful ways to configure parameter behavior.

A basic knowledge of the different event types will help you to configure Mu Voice for different MIDI controllers.

1. **Note Events:** Note events are sent by a keyboard when a key is pressed or released. The event contains information about which key was pressed and with which velocity.
2. **Program Change Events:** This event only contains an index of a selected program. This event is sent when pressing a button on a foot controller or selecting a sound bank for a synthesizer.
3. **Control Change Events:** This event occurs when moving a MIDI slider or knob and contains information about which controller was used and what its actual value is. The “Main Volume” expression pedal has the number 8 as a unique identifier. The value ranges from 0 to 127, 127 means that the pedal is pressed all the way.

## 10.3 MIDI Note Events



Use the **Offset Selection** to shift the key functionality up or down a number of octaves. This is particularly handy if your keyboard has less than 88 keys, since you can choose which functionality falls into your keyboard range. The keyboard has the following controls:

- **Key Selection Range (dark blue):** The first octave is colored dark blue. Use this range to select a key signature. The note you play corresponds with the tonic of the key, yielding: C → nothing, F → 1 flat, G → 1 sharp, Bb → 2 flats, D → 2 sharps, and so on.
- **Chord Recognition Range (light blue):** This key range recognizes pressed notes as chords, including sus4, 6, 7 and 9 modifiers. If a key selection is pressed, the choice of chords is limited to that key.
- **Tuning Range (red):** When a note is played in this range, the pitch of the incoming voice is tuned to this note. When several notes are played the plug-in tunes the closest note automatically. The tuner will correct the pitches of harmonies indirectly.
- **Harmony Range (orange):** Notes that are pressed in this range are sent to a channel for which the voicing is configured as “MIDI”. Notes are assigned first to available MIDI channels. If all MIDI channels are taken, the channel with the closest note is chosen and its note is adjusted. Mu Voice also allows adjusting channel parameters automatically in function of the pitch of the harmony or the pitch difference between the harmony and the lead (See section 10.6).
- **HoldKey Checkbox:** When the “HoldKey” checkbox is checked, the keys in the harmony range will remain pressed. Since these notes are sent to channels that are set to MIDI mode, one can only have as much keys pressed as there are MIDI channels. For instance, when there are two MIDI channels and a third note is played, the nearest note will be released. One can also release notes by pressing them again.
- **Preset Selection Range (green):** Notes that are pressed in this range select presets. The first note selects preset one, the second one preset two, and so on.
- **Scheme Navigation Range (yellow):** Simultaneously selecting a key, chord and preset might be somewhat daunting during live performance. Therefore you can assign all this information to a given cell in the chord scheme and jump to different cells using the yellow keys. The first yellow key will put the cursor at the first cell, the second key to the second, and so on.

## 10.4 Program Change Events

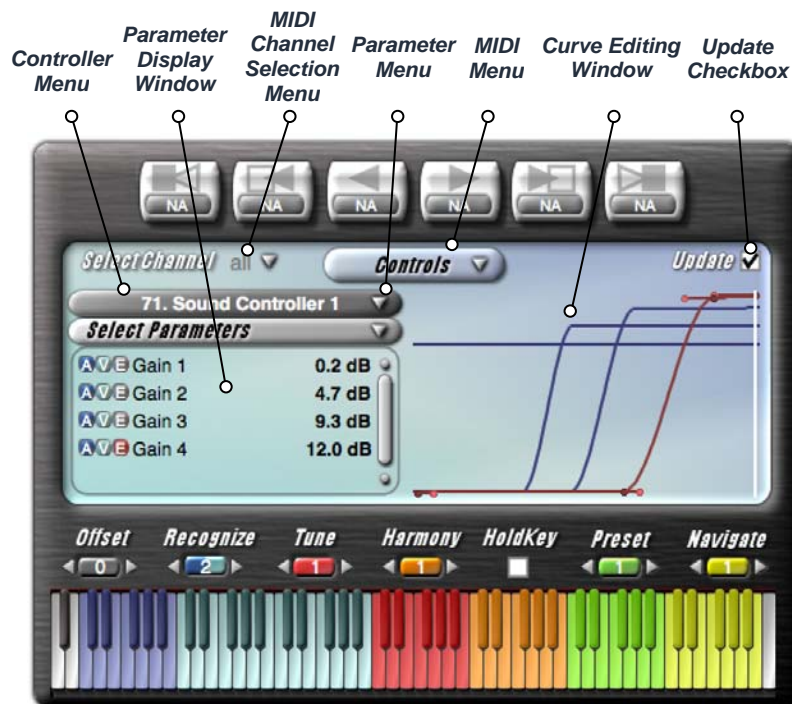
Program Change Events are sent to a musical instrument like a synthesizer to change sound banks. A MIDI foot controller sends this type of event when a button is pressed. When this type of event is sent to Mu Voice, the plug-in will take the program number and put the cursor of the chord scheme in that position. When pressing button 6 on the foot controller, Mu Voice will switch to the sixth position in the chord scheme.

## 10.5 Controls Display

Control Change Events allow continuous control of a parameter. Several hosts offer MIDI assignment by mapping a single controller to a single parameter. For a plug-in with over 70 parameters like Mu Voice you need something that is more powerful. Mu Voice allows you to map a single controller to any number of parameters and define a mapping curve for each individual parameter.

Select “Controls” from the **MIDI Menu** to get the display show below. Then you can configure the controls in three steps:

1. Select the controller from the **Controller Menu** that you want to configure. If you do not know the number of the controller, you just can check the **Update Checkbox**, move the controller and Mu Voice will select it for you.
2. You can select multiple parameters from the **Parameter Menu** which are then displayed in the **Parameter Display Window**. A mapping curve is added to the **Curve Editing Window**. A parameter is removed by removing it from the **Parameter Menu**.
3. Edit the parameter curve (see section 10.6, p. 24).



The **MIDI Channel Selection Menu** allows you to select a given MIDI channel. The default value is “all”, accepting all channels.

## 10.6 Parameter Curve Editing

Parameter curves are used to configure MIDI controls and the MIDI2Pitch parameter mapping. Each parameter is displayed in a **Parameter Display Window**. Each row represents a parameter and has three status buttons on the left hand side.

- **Active (A)**: The Active Button enables or disables a parameter curve. When a curve is disabled, it is preserved and remains visible but when the controller is used the parameter value is not affected.
- **Visible (V)**: The Visible Button makes curves (in)visible. Especially when there are many parameter curves it is convenient to make some curves disappear while editing the others.
- **Editable (E)**: When the Editable Button is pressed, the curve handles are displayed. The handles allow setting the curve values and their derivatives.

When a curve is editable following actions can be performed:

- **Change a curve value**: Select a dark red handle and drag it to the position you need.
- **Change a curve derivative value**: Select a light red handle and drag it to the position you need.
- **Add a handle**: Double click on the position where you want to add a new handle. The handle is added to the editable curve. The default derivative for the new handle is zero.
- **Remove a handle**: Double click on a handle to remove it.

In the picture on the left hand side a setup is shown for a MIDI controller named “Sound Controller 1”. The idea behind the setup is that when the controller is put in its minimal position, only the lead voice remains. When turning the knob, the second, third and fourth voices are added progressively.

Following steps are taken to configure the controller.

1. Click the **Update Checkbox**.
2. Touch the controller that you want to configure and it will be selected in the **Controller Menu** automatically.
3. Select Gain 1 to Gain 4 from the **Parameter Menu** and the values are shown in the **Parameter Display Window**. All curves are active (A), and visible (V), and the first curve is made editable (E).
4. Put each parameter curve in editable mode to alter it. The vertical white line on the **Curve Editing Window** shows the current value of the controller.



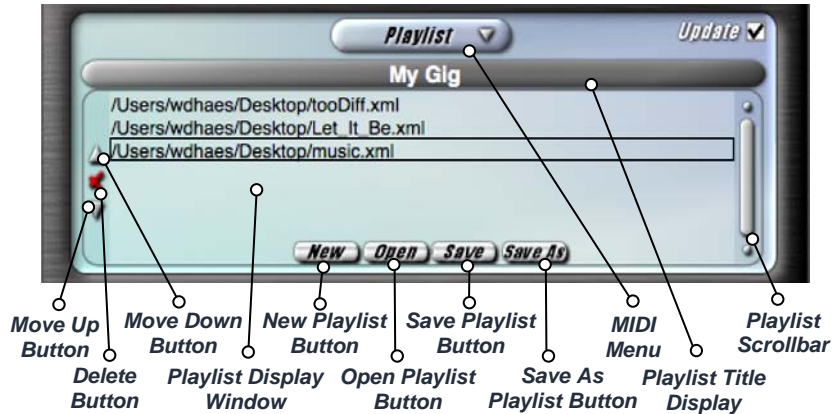
## 10.7 Playlist Display

Create a track list with the “Playlist” display. Another goal of Mu Voice is that a user can put together an entire gig in a playlist. In combination with the MIDI Navigation Controls (see 10.9, p. 27) an entire performance can be carried out controlling Mu Voice exclusively from MIDI controllers.

Songs are displayed in the **Playlist Display Window** and are added by dragging (multiple) files and dropping them on the playlist. The order of the songs is managed by the **Move Up** and **Move Down Buttons**. The currently selected song is deleted by pressing the **Delete Button**.

The playlist is saved to file by pressing the **Save Playlist Button** or to a different file by pressing the **Save As Playlist Button**. Opening and clearing the playlist is done by pressing the **Open Playlist Button** and **New Playlist Button** respectively.

Finally, the title of the playlist is set by editing the **Playlist Title Display**.

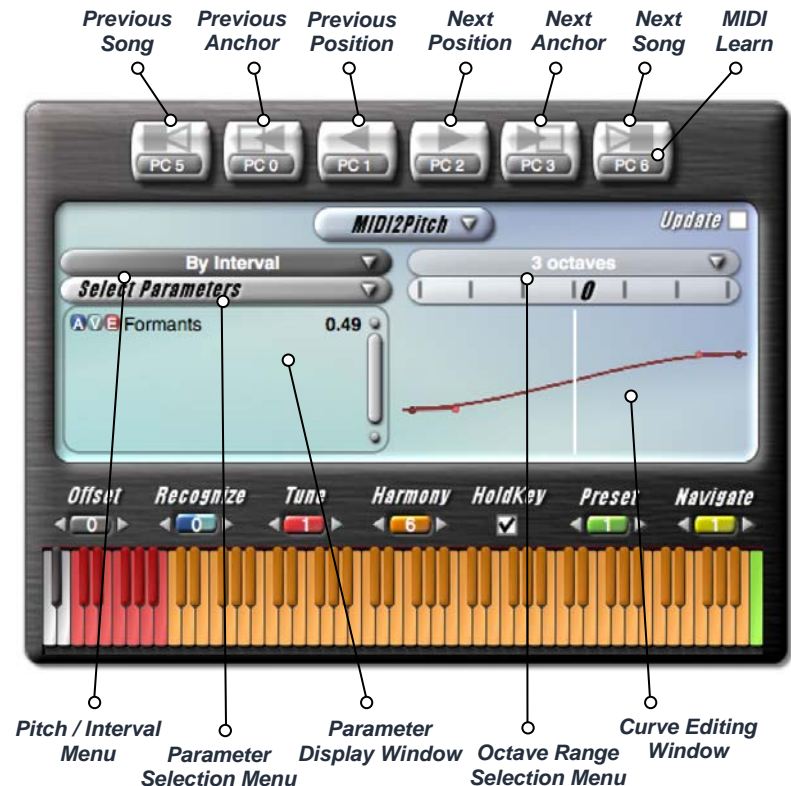


### Note!

Both songs and playlists have the extension “.xml” which can be confusing. To keep track of which file is what, we advise to create a folder */songs* for the songs and */gigs* for the playlists.

## 10.8 MIDI2Pitch Display

As explained in section 10.3 the keyboard events from the Harmony range are sent to channels that are in MIDI mode (MIDI-to-pitch). Problems can occur when a channel is configured to make a low note sound great while it actually receives a high note.



As a solution, Mu Voice allows to change parameters automatically in function of the pitch or the interval between the lead and harmony. Parameters that can be automated that way are: Gain, Shift, Pan, Humanize and Formants.

The image above shows an example of how this can be used.

1. First one needs to choose whether the parameters should depend on the pitch or the interval. This is done by making a selection in the **Pitch / Interval Menu**.
2. Then, the parameters are selected from the **Parameter Selection Menu**.
3. The parameters are displayed in the **Parameter Display Window**. By making the curve editable it can be altered in the **Curve Editing Window**.

In the example shown above the formant parameter will increase with the interval between the harmony and the lead which will result in a more natural sound. Finally the x-axis of the window can be changed by selecting a range from the **Octave Range Selection Menu**.

## 10.9 MIDI Navigation Controls

The chord scheme can be navigated by Program Change Events as described in section 10.4, p. 22. However when one has to proceed through the chord scheme by tapping one foot switch after the other this is very awkward. A much more convenient way would be to have one foot switch that allows you to increment the chord scheme position by one.

Mu Voice has a set of MIDI assignable buttons that are located at the top of the MIDI Panel (see the picture on the previous page). The buttons can be used to navigate by chord scheme position, anchor point and song. The ***MIDI Learn*** area on each button allows assigning a note or program change event to that button. For instance, when you want to use the third foot switch on a foot controller to go to the next position, you just click the ***MIDI Learn*** area (that turns blue), press the controller and the event is assigned to the button. This is denoted as “PC 2”.

## 10.10 Getting Minimal Latency

The total latency of Mu Voice is the sum of the audio interface latency, the host latency, and the plug-in's own internal latency. If the block size of each processing unit in this chain is different, then this introduces additional latency because the buffer of one unit has to be filled completely before it can proceed. **The block size of Mu Voice is 128 samples at both 44.1 kHz and 48 kHz.** When the sample rate is twice or four times as high, the buffer size scales accordingly. To ensure that you have the absolute lowest possible latency, configure your audio interface and host to use a block size or buffer size of 128 samples.

### Note!

Not all audio interfaces can handle low latency real-time processing. If you get glitches in your sound, try to increase the latency (I/O buffer size) and check if this solves the problem.

Thanks for choosing Mu!