

If you are 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.



**Product:** Mu Voice

**Key Features:**

- Intelligent 4 track harmonizer that takes into account the musical context of a piece like chord and scale information.
- Chord selector with scale, chord and modifier options.
- Preset manager that allows applying, saving and naming presets.
- Chord scheme editor allowing to define chord and preset sequences.
- Automated sequencing.
- Tuner with parametric impact, operating in chromatic and scale mode.
- XML based file format for storing parameters, presets, plug-in state and chord scheme.

**Version:** 1.1.1.

**Mu Technologies** continuously updates **Mu Voice** with new innovations. Many updates are **free**. Get the latest version at [www.mu-technologies.com](http://www.mu-technologies.com).



RTAS



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# Mu Technologies

p r e s e n t s

## Mu Voice

— user manual —

Taking you to the edge of vocal processing ...



# Mu Voice

- user manual -

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# 1. About Mu Voice

## 1.1 Introduction

Thank you for choosing **Mu Voice**, one of the most powerful real-time vocal processors on the market. **Mu Voice** combines different tasks like harmonizing, tuning and effects into a single plug-in making it a must-have product for your recording studio. In addition, its internal latency of 5.8 ms makes it an ideal vocal processor to perform live.

Feature list:

- Intelligent 4 track harmonizer that takes into account the musical context of a piece like chord and scale information.
- Chord selector with scale, chord and modifier options.
- Preset manager that allows applying, saving and naming presets.
- Chord scheme editor allowing to define chord and preset sequences.
- Full automation by recording the timing in write mode and automated synchronization in read mode.
- Tuner with a parametric impact and two modes; chromatic and scale.
- XML based format for parameters, presets, plug-in state and chord scheme.
- SIMD optimizations for optimal performance.

Each harmony channel has a large number of controls:

- Configure your harmonies by selecting the voicing and octave.
- Bypass button on first track.
- Mute button.
- Gain slider.
- Pitch shift slider, with configurable and editable range.
- Pan Slider.
- Humanize Slider.
- Formants Slider.
- Filter Selection.
- Harmonic EQ Selection.

## 1.2 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

## 1.3 Installing Mu Voice

### Versions

The current version of Mu Voice is 1.1.1 and is available on

Windows:	VST / RTAS
Mac (Universal Binary):	VST / AU (RTAS coming soon)

### Manual Install on Windows

A plug-in in Windows is a dynamically linked library with the extension '.dll'. For RTAS, a dpm and a dpm.rsr file are required. These files must be copied to the plug-in directory which is different for every host. For the most common hosts these directories are

Pro Tools:	C:\Program Files\Common Files\Digidesign\DAE\Plug-Ins\
Cubase:	C:\Program Files\Steinberg\Cubase\VstPlugins\
etc.	

### Manual Install on Mac

A plug-in on Mac is a bundle, which must be copied to predefined locations. The VST, AU and RTAS versions of Mu Voice have the extensions .vst, .component and .dpm. They are placed respectively in the directories

/Library/Audio/Plug-ins/VST/  
/Library/Audio/Plug-ins/AU/  
/Application Support/Digidesign/Plug-Ins/

### Note!

Mu Voice creates two data files called W.dat and Y.dat. These data files are generated automatically by the plug-in when it is launched for the first time or when the files are missing.

Computing these data files takes quite some time!

## 1.4 Authorizing Mu Voice

Mu Voice is authorized exclusively by the iLok USB dongle. Therefore you need to have an iLok and create an account at iLok.com. After purchase, a license will be deposited on the account by Mu Technologies or an authorized reseller. By synchronizing the iLok with the account, licenses are transferred to the USB dongle. After the trial period Mu Voice will stop working if your iLok does not contain a license.





## 2. The Mu Voice Concept

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

### 2.1 Standard Plug-in Controls

When one attempts to control the 70 parameters of Mu Voice simply by using sliders and knobs, one would quickly find that this is practically impossible with just one mouse pointer. This mouse pointer would have to change the scale and chord over time, and control the parameters of four harmony channels at once.

One might think this could be solved by using parameter automation as is available in many hosts. However, it would take many runs to set all parameters

### 2.2 Presets

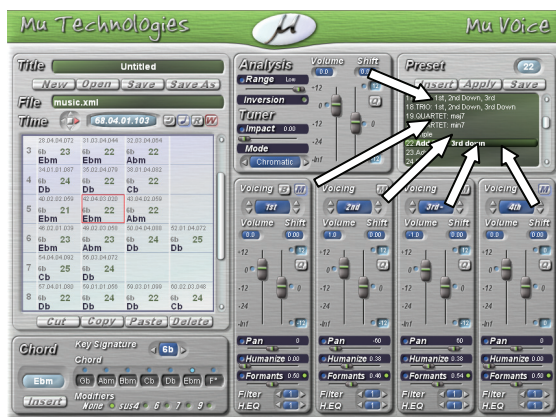
Presets or Programs are a first option to control many parameters simultaneously. However, for Mu Voice this seems not to solve the problem entirely. Imagine that you would have to use presets that contain both voicing and chord information. This would require that for each combination of voicing and chord a separate preset needs to be created which would yield a large number of presets even for a simple song.

### 2.3 Chord / Preset Scheme

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

#### 1. Preset Creation

All the voicing parameters are stored in presets or programs. By defining a preset name, and pressing the Save button on the Preset Panel a preset is saved. The creation of presets is the first step when using Mu Voice. Section 6 (p. 13) 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 to cut, copy, paste and delete selections.

#### 3. Go Live!

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 keyboard events can be used when the scheme has the focus (only for hosts that support key events).

This is typically how Mu Voice could be used in a live setting. In a studio setting, full automation is the way to go (see 2.4).



### 2.4 Full Automation

#### 4. No hands!

Mu Voice allows to automatically synchronize itself to the host time.

Edit Mode

Write Mode

Read Mode

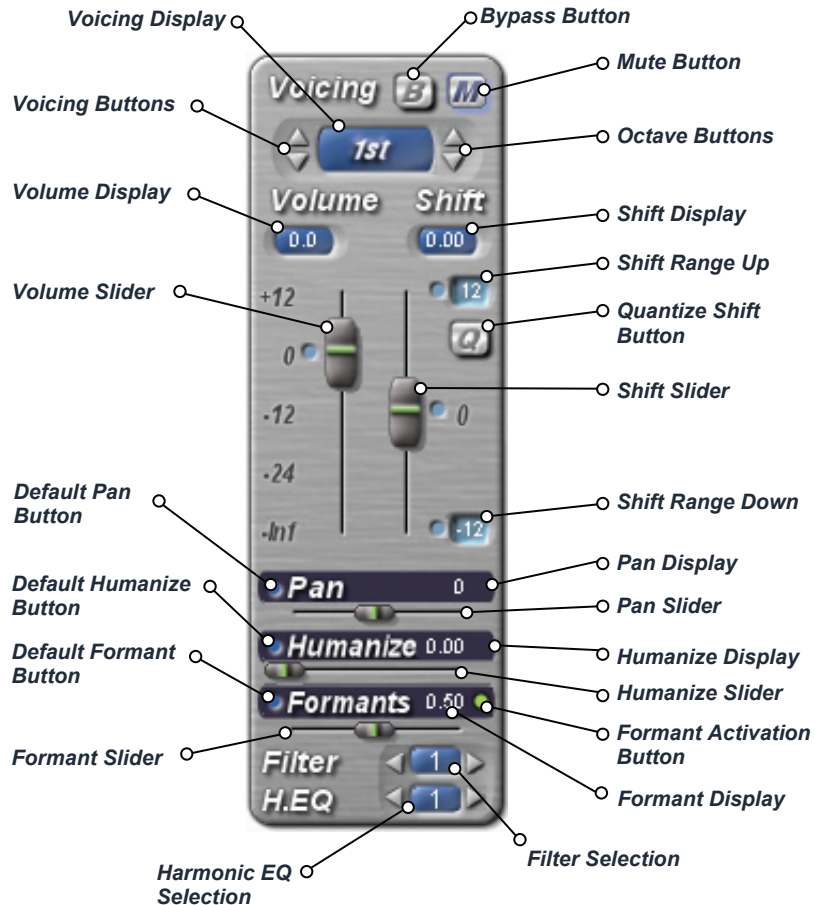


After editing the scheme, the timing of the progression can be recorded by putting the plug-in in write mode. One can use the right arrow button on the keyboard or on the left hand side of the time display. After that, the plug-in can be put in read mode and will synchronize itself automatically to the host time



## 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 since 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. Let us take 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 in case there are no modifiers. When the modifier 6, 7 or 9 are selected, they will be applied to the fourth voice

Internally, Mu Voice uses tables that define which note should be used for second, third and fourth voice, based on the scale, chord and leading note.

One can change the voicing by 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 on the right hand side. 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 one has selected the second voice and an octave down, this would be depicted as



Also the number of harmonies that one desires can change over time. Therefore the **Mute Button** allows switching channels on and off.

The **Bypass Button** on the first channel allows passing the incoming voice unprocessed. Evidently, the effects and shift will not work when the bypass is switched on. Only volume control and pan will work in bypass.

### 4.3 Mixing

The **Volume Slider** allows you to mix the different channels. Its value is displayed in dB on the **Volume Display**. This display can be edited by clicking on it with the mouse and typing the desired value. When the blue button on the left hand side of the slider is pressed, the volume is set its default value (0.0 dB).



## 4.4 Pitch Shifting

Although the voicing configuration provides a convenient way to harmonize your vocals, some users may still want to apply a manual pitch shift or do glissandos. For those users, 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. By clicking them with the mouse, the values can be set from the keyboard. The range values are expressed in half tones. For example when one wishes that the upper range is a minor third, one should use the value 3. Note that the range up parameter should always be positive while the range down is always negative.

When the range of the pitch shift is set to the values one desires, one 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. When one wishes that the shift interval is always an integer value, the **Quantize Shift Button** can be used, rounding the shift to the nearest half tone.

### Note!

The shift is added to the pitch of the harmonies. 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 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. The **Default Pan Button** on the left hand side of the slider puts this control on its default value being zero.

## 4.6 Humanizing

When a harmony is added to the leading voice interference might occur when since the pitches are coupled too tightly. To make sure that both are perceived as independent voices a slight pitch randomization is added to the harmonies. The **Humanize Slider** internally controls two parameters at the same time being the pitch variance and an additional delay. The pitch variance range 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. The interface also contains an editable **Humanize Display** and a **Default Humanize Button** which sets the value to zero.

## 4.7 Formant Control (Gender)

In order to understand the **Formant Slider**, it is important 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 frequency. For a periodic sound source it consists of a series of peaks that are positioned at multiples of the fundamental frequency. Mu Voice uses its proprietary state-of-the-art spectral analyzer that determines the amplitude of each component. The curve that connects all these peaks is called the spectral envelope or the formant curve. This curve determines the timbre of the sound, and is different for all each vowel.

Figure 2.A shows the spectral envelope and fundamental frequency of a spectrum. When a pitch shifted up without correcting the spectral envelope (Fig. 2.B) or formant curve, the timbre is changed. When one wishes to carry out a pitch shift without timbre change, the spectral envelope needs to be preserved (Fig. 2.C).

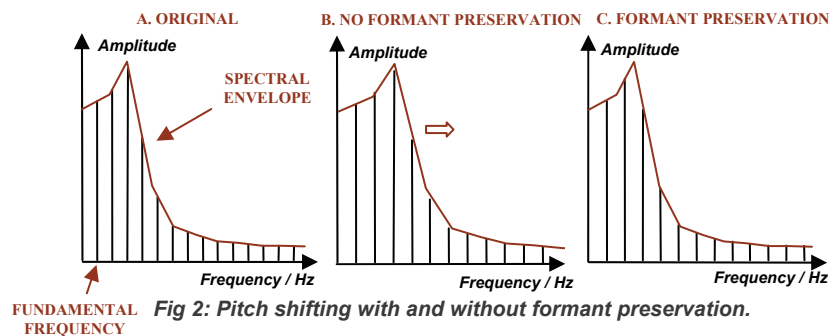


Fig 2: Pitch shifting with and without formant preservation.

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.

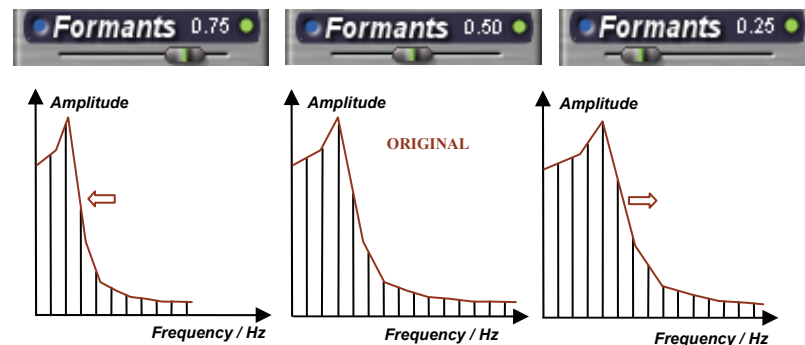


Fig 3: Formant Scaling.

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

The **Formant Display** shows the value of the formant slider which can be put in neutral by pressing 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 **Filter Selector** displays a value ranging from 1 to 10. By pressing the button on its right-hand side the index is increased. The other button decreases the index.

Index 1 does not apply any filtering and is the default value. Index 2 and 3 decrease the range respectively above and below 4000 Hz by 6 dB resulting in an high- and low-pass filter. Index 4 filters the range between 400 and 4000Hz making it sound like a telephone line. The other filters are comb and inverse comb filters. Comb filters have resonances at multiples of a given frequencies as shown in Fig. 4. Comb and inverse comb filters are provided with resonances at multiples of 300, 600 and 1200 Hz respectively.

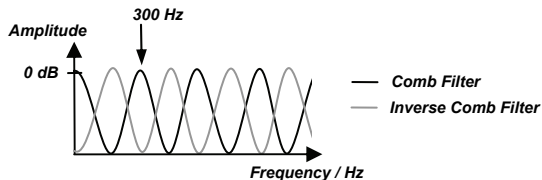


Fig 4: Comb and Inverse Comb Filters

## 4.9 Harmonic EQ

Mu Voice can control each harmonic individually. This yields a truly unique effect which was named *harmonic equalizing* (denoted H. EQ). To illustrate what it works a H.EQ preset was made for each filter, by evaluating the filters for all multiples of 150Hz. For the comb filter at 600 Hz, this results in the following harmonic EQ coefficients.

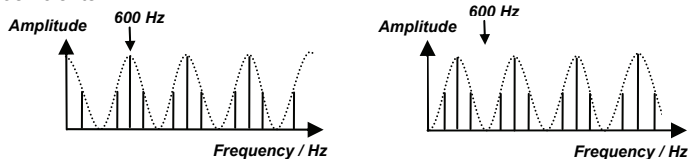
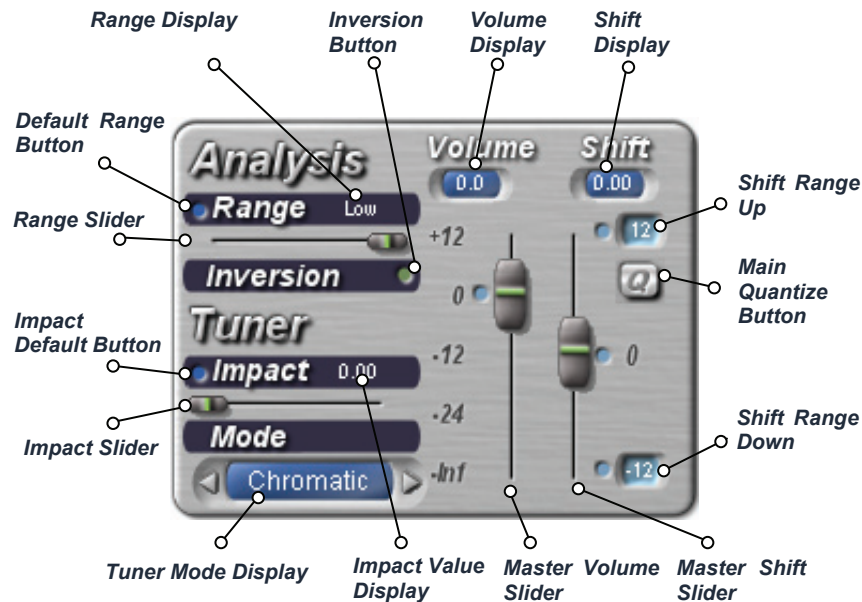


Fig 5: Comb and Inverse Comb Harmonic EQ

These coefficients are multiplied with the harmonics of the sound. When the sound is pitched at 150Hz it has the same effect as the filter. The harmonic EQ effect can be seen as a filter that scales with the pitch of the sound.

## 5. Analysis and Tuner Panel



### 5.1 Analysis

The **Range Control** allows setting the range of analyzer. For low pitched voices and instruments a low frequency range is used for the analysis. This setting is the default value and should remain unchanged for most vocal performances. However, for high pitched notes a range adjustment might be needed to avoid artifacts. The **Default Range Button** puts the range in its default state.

The pitch estimator detects the beginning of each period and might get confused when the signal is inverted. In that case, the **Inversion Button** allows to solve this.

### 5.2 Tuner

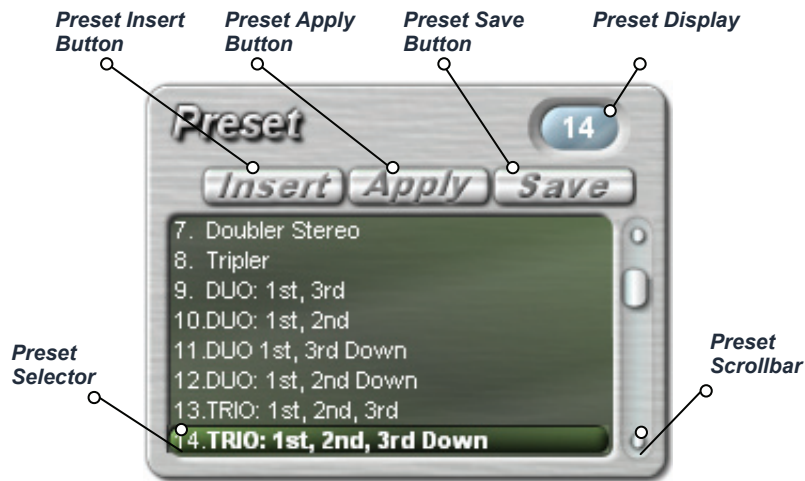
The **Tuner Mode** can be set to “Chromatic”; tuning to the nearest half tone or “Scale”; tuning to the nearest note on the scale. The impact of the tuner can be adjusted by the **Impact Slider**. When the impact is one, the pitch is rounded to the exact value, but this might result in the loss of expression in the sound or discontinuous jumps between notes. Therefore, a trade-off between accuracy and expression is the best option.



### 5.3 Volume and Shift, part 2

The analysis panel contains an additional pitch and volume slider that are applied on all four channels at once. The way they work is identical as in the harmony channels.

## 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 that was last selected is displayed in the **Preset Display**.

### 6.2 Changing a Preset Name

Click on a preset in the **Preset Selector** of which you want to change the name. Click a second time to make the preset name editable and then click once more to set the cursor. After changing the name press enter.

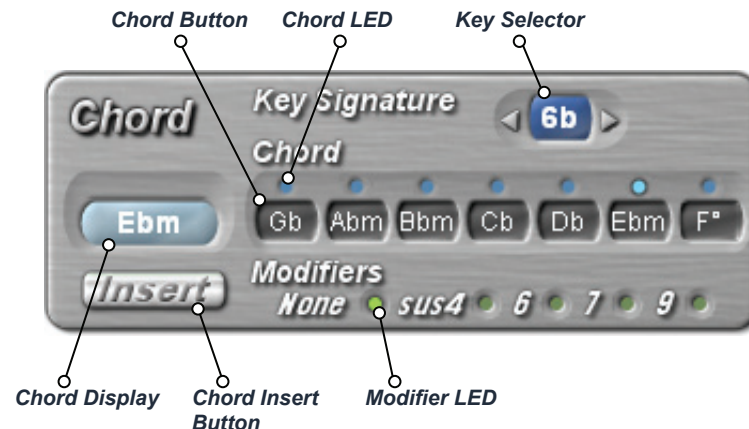
### 6.3 Saving a Preset

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

The **Key Selector** allows you to select a 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. By pressing the button on the right hand side, a sharp is added or a flat is subtracted. When the button on the left hand side is pressed a flat is added or a sharp is subtracted.

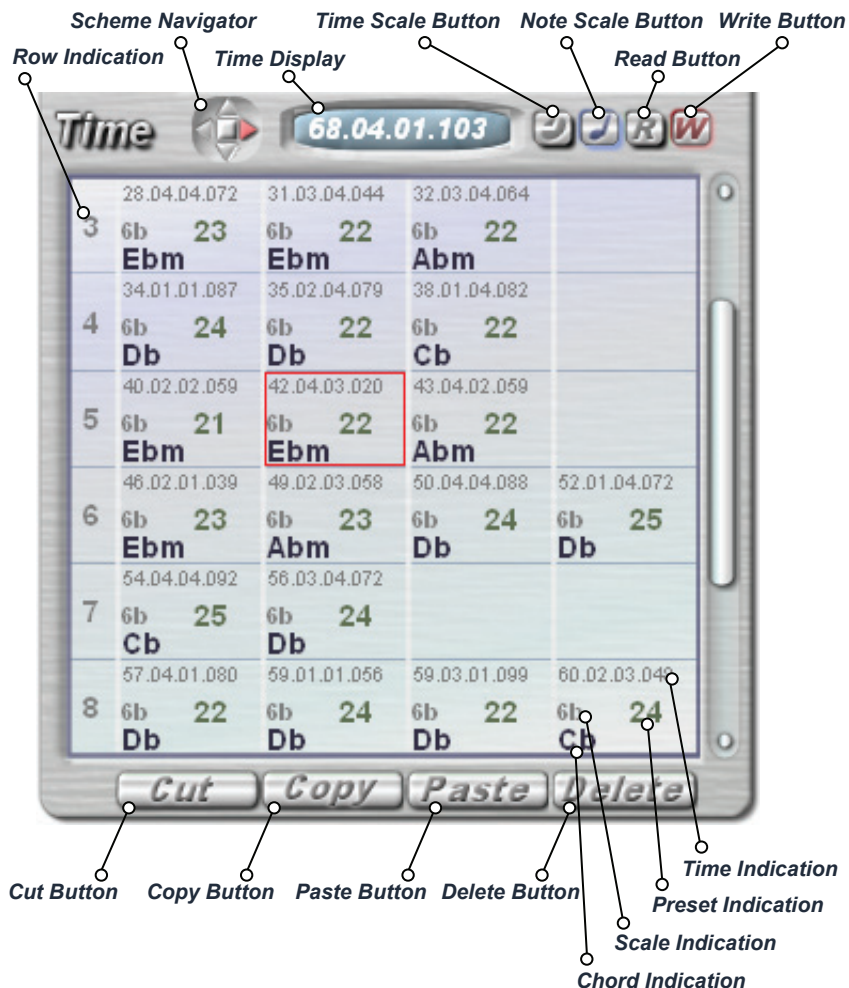
When a key is selected, the diatonic series of chords appears on the **Chords Buttons**. When a chord is selected, its **Chord LED** switches on and it is used for the harmonization of the vocals. In addition to the series of chords one can use modifiers by pressing the **Modifier LEDs**. The result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

### 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

The chord scheme should be considered to be the central command center of Mu Voice. The scheme contains both chord and preset information. When the cursor is placed on a given position, the corresponding preset and/or chord are applied (see section 2.3).



### 8.1 Chord Scheme Data

Each element in the chord scheme editor contains four data elements. On the bottom we find the **Chord Indication**. In the middle, the **Scale Indication** on the left hand side and the **Preset Indication** on the right hand side. The top displays the **Time Indication** which displays the time used to automatically switch from one state to the other (when being in read mode).

### 8.2 Setting the Mode

Centrally above the chord scheme editor is the **Time Display** that shows the time of the host. One can choose between two time representations by pressing the **Time Scale Button** or the **Note Scale Button**. The time representation will also be used within the chord scheme.

The plug-in can be put into the states Edit, Read and Write, by pressing the **Read and Write Buttons** (see section 2.4). When put in read mode, the cursor of the chord scheme editor is synchronized automatically with the host time. This timing information is obtained in Write mode. When the cursor is moved to the right, the timing of the sequencing is recorded in the scheme.

### 8.3 Navigating the Chord Scheme

The position of the cursor can be changed by normal arrow keys on your keyboard. However, since some hosts do not send key events to the plug-ins, a **Scheme Navigator** control is provided. Pressing the up, down left and right arrow changes the position of the cursor. The square button in the center enables to make selections of multiple elements. The state of the navigator depends on the mode in which the plug-in is used. All buttons are disabled in read mode since the position of the cursor is set automatically.

### 8.4 Editing the Chord Scheme

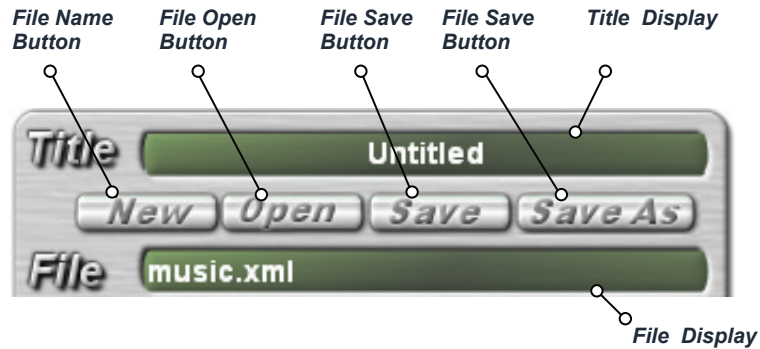
Sections 6.4 and 7.2 explain how a preset and chord can be added to the chord scheme respectively. In addition, a number of editing controls are provided as there are the **Cut Button**, **Copy Button**, **Paste Button** and **Delete Button**.

For hosts that support keyboard events, these operations can also be carried out using standard key combinations like <Ctrl><C>, <Ctrl><X>, <Ctrl><V> and <Delete>.

#### Note!

Empty positions in the chord scheme are ignored. This means that in write and read mode, they will be skipped automatically.

## 9. File Panel



### 9.1 XML

Mu Technologies has chosen 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 portable over different platforms and hosts.

### 9.2 File Management

The **File Panel** offers the basic functionality to open and store your data files. A suitable description of your track can be chosen by editing the **Title Display**. By pressing **File Open Button** an XML file is selected to be loaded. The **Save and Save As Buttons** store the data to the current file and a new file respectively. When one wishes to erase all data and go back to the default settings of Mu Voice, one presses the **New Button**.

#### Note!

When pressing "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 it will be lost!