



# CronoX

SAMPLE SYNTHESIZER

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Thanks to Alex, Chris, David, Fabio, Jacky, PA, Pat, Scot and all the others that helped me with ideas and during the development!

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# Welcome

Thank you for buying the "CronoX" sample synthesizer.

The CronoX is a fully professional, highly-flexible, easy-to-use, VST (Virtual Studio Technology) software sample-synthesizer designed for creating music on your personal computer.

The CronoX's key features include an easy-to-use interface, highly flexible generators which include time sampling and loop sampling options, a user-programmable filter, an enormous range of processing and modulation options, as well as a sophisticated effects section.

This manual describes all aspects of the CronoX sample synthesizer and is designed so that your use of this software is as efficient and as painless as possible.

We feel that the CronoX is exceptional because of its unique audio processing capabilities. We hope you get a lot of pleasure using the CronoX sample synthesizer and that it becomes an integral part of your music-making.

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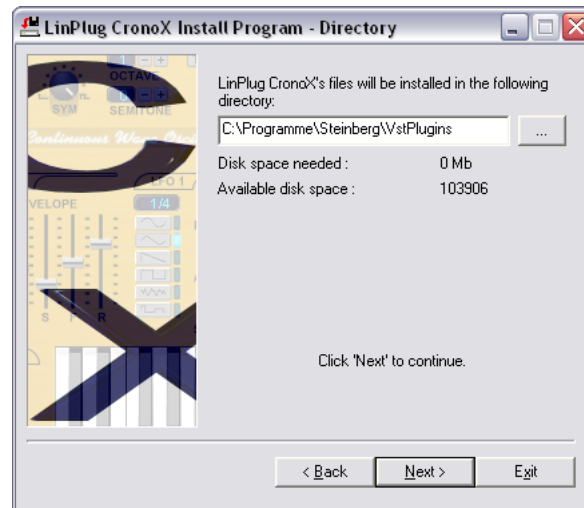
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## PC Installation

The CronoX comes with its own Installer. After downloading the CronoX you will find a file named "CronoX.exe" located in your download folder. Double-click on this program to begin the installation process.

Once installation commences you will see the window shown below:



By clicking the three dots on the right of the "Extract to" textbox you can choose the plug-in directory to which all files will be copied. Refer to your host software's manual if you are unsure about where the host software plug-in directory is located.

The following is a list of plug-in directories that are present in commonly used sequencing programs:

- C:/Programs/Steinberg/Cubase/VstPlugIns
- C:/Programs/Emagic/Logic.../VstPlugIns
- C:/Programs/FruityLoops3/PlugIns/VST
- C:/Programs/OrionPro/VstInstruments
- C:/Programs/MtStudio/Vstplugins

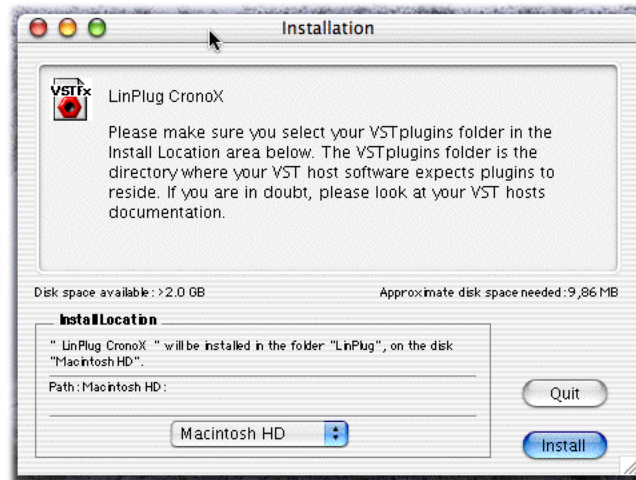
After selecting the desired directory click the "Start" button. The instrument file "CronoX.DLL" and the CronoX manual and presets will now be placed in the chosen directory. The next time you start your host software the CronoX will be listed in the VST Instrument list.

If you have any questions regarding the installation of the CronoX please contact [support@linplug.com](mailto:support@linplug.com)

# Mac Installation

The CronoX comes with its own Installer. After downloading the CronoX you will find a file named "CronoX.sit" located in your download folder. Double-click this file to decompress it, then double-click the installer program to begin the installation process.

Once installation commences you will see the window shown below:



You can choose the plug-in directory to which all files will be copied by clicking the "Macintosh HD" button on the lower part of the installer's window. This opens a popup menu from which you can use the "Select Folder" option to set the folder to which all files will be copied.

If you are using e.g. Cubase under Mac OS-9 the plugin directory is normally found in the following location:

MacintoshHD:Programs:Cubase:VstPlugIns

Refer to your host software's manual if you use a host other than Cubase or if you are unsure about where the host software plug-in directory is located.

If you are using Mac OS-X you should install the plug-in into the following location:

MacintoshHD:Library:Audio:Plug-Ins:VST

After selecting the desired directory click the "Install" button. The instrument file "CronoX" and the CronoX presets will now be placed in the chosen directory. The next time you start your host software the CronoX will be listed in the VST Instrument list. If you have any questions regarding the installation of the CronoX please contact [support@linplug.com](mailto:support@linplug.com)

# Features

The CronoX contains a range of features designed to make your music-making more efficient and enjoyable. These features include:

- 2 Generator modules, 4 types of Generator. Generator modules include Analogue, TimeSamp, Schrader and LoopSamp. FM modulation and AM modulation options.
- Analogue modeled Generator for analog-style synthesis.
- TimeSamp Generator with realtime control, separate time-stretching and pitch-shifting.
- LoopSamp Generator with individually modulatable loop points and start point.
- Schrader Generator, a unique Generator that offers wavetable-like operation using any sample.
- Analog-style multimode Stereo Filter with modulatable cutoff frequency and resonance.
- ADSFR type envelope for controlling Amplitude and Filter Cutoff as well as a freely assignable Modulation Envelope.
- 2 independent LFOs with various waveforms and midi-sync capabilities. LFO Waves have adjustable attack time and waveform-symmetry.
- Modulation Matrix which includes 8 routings with 18 sources and 23 destinations.
- Fully recognizes Velocity, Aftertouch, Pitch bend , Modwheel and various other controllers
- A sophisticated effects section containing 7 effects including Drive, Chorus, Delay, Filter, Phaser, Reverb and Stereo Delay.
- Mono/Polyphonic Portamento/Glide featuring Fingered mode, switchable constant Time/constant Rate and Auto-Bend Modes.
- 24-voice polyphony (CPU dependent).
- Adjustable voice limit (1...8, all).
- Onscreen keyboard incorporating control of MIDI velocity.
- Dial operation is switchable between circular and linear modes.
- Operates under all VST 2.0 hosts on PC and Mac OS 9 and OS X.
- Supported audio formats include WAV and AIFF up to 24bit/96kHz.
- Sample accurate timing, full automation and settings are saved with your song.
- Modular design for both Generator and Effects sections.



# Overview

The CronoX is a 24 note-polyphonic VST sampler with some extraordinary features. The sampler has a modular design that includes various Generator modules, modulation modules and effects modules.

The design of the CronoX can be divided into 6 sections: Generator, Source, Filter, Amplifier, Effects and Modulation (Envelope, LFO 1/LFO 2 and Matrix).

Audio signals are created by a Generator that gets pitch information from the synthesizer's MIDI input (either externally or from the onscreen keyboard). The MIDI input is automatically connected to MIDI output of the host software.

The CronoX has 2 independent Generators offering a choice of 4 types of Generator module.

The output of both Generators is sent to the CronoX's Source section. Here the output signals are combined in one of several ways. The signals can be mixed together proportionately or the output of Generator 1 can be used to modulate the frequency and amplitude of Generator 2. This latter option increases the harmonic spectrum of the modulated Generator producing very interesting, harmonically-rich results. At this point the signals can also be detuned and thickened using the Spread control.

The output of the Source section is then routed through the Filter section. The filter modifies the harmonic spectrum of the output signal. The Filter has an ADSFR envelope for controlling its cutoff parameter.

The Amplifier section enables you to control the CronoX's volume using a master volume control and an ADSFR envelope.

Following the Amplifier section is the CronoX's Effects section which contains a distortion effect, as well as a Mono Delay, a Chorus, a Phaser, a Filter, a Reverb and a Stereo Delay. Each effects processor is described in detail later in this manual.

The audio outputs of the CronoX are automatically connected to the input of your host software's mixer. Here you can set the pan position of the CronoX's output.

At various points throughout the signal path you can modulate the signal using either the Modulation Envelope, the 2 LFOs or MIDI Controllers. The CronoX contains a dedicated modulation envelope which can be routed to numerous destinations using the Modulation Matrix. The CronoX also contains 2 independent LFOs that can be routed to any available modulation destination.

Hopefully, this chapter has given you a brief overview of how the CronoX works. More detailed information can be found in the following chapters.

## Controls

Users have the option of controlling all CronoX dials in either a circular or a linear manner depending on the Dial Mode setting on the CronoX's rear panel (see the "Main" section of this manual for more information about the CronoX's rear panel).

Holding down the ALT key while clicking on a control changes the selected control's value a minimum step upwards (when clicking in the upper half of the control) or a minimum step downwards (when clicking in the lower half of the control).

Holding down the CTRL key while clicking on a control sets the control to its default value (e.g. for Volume controls it sets the control's value to -6 dB).

All Controls can be controlled from an external hardware controller provided that it transmits MIDI Control Change messages. To do this you need to use the CronoX's ECS which is described in detail later in this manual.

When a control is adjusted its value is displayed in the Preset section's display.

# Generators

The CronoX's Generator section is located on the upper left of the front panel. It contains two independent audio generators which can be used to produce a wide variety of sounds.



The CronoX contains four types of Generator module: "Analogue", "TimeSamp", "Schrader" and "LoopSamp". Don't be confused by the use of the term "Analogue" here; all four of the CronoX's generators are digital (obviously!). In the case of the first Generator, we've used the term "Analogue" to describe waveforms that are created in real-time much as in true analog synthesizers. To change Generators click on the menu to the right of the Generator section's label. Each Generator also has its own On/Off switch located to the right of the module's menu. If you don't want to use one of the Generators it's best to switch it off as this conserves CPU resources. However, make sure that at least one Generator is switched on, otherwise the synthesizer will not produce any output.

Each Generator operates in a different way and has a different set of controls. These are described in detail below.

## Analogue Generator

The CronoX's Analogue Generator module creates its waveforms in real-time. The Generator uses 64-bit internal resolution and allows full control over all waveform parameters including pulse width. You can morph between waveforms and use the continuous Pulse Width for all available waveforms. This gives a wide range of classic analogue sounds.



The Waveform dial sets the Generator's waveform shape. When turned all the way to the right it outputs a pulse wave. When turned all the way to the left it outputs a sawtooth wave. In intermediate positions it outputs a waveform that is a combination of the two. Range: Sawtooth...Pulse.

The Symmetry dial effects the waveform's shape, expanding and contracting it, as in the case of pulse width modulation. In this case however, the waveform reshaping can be applied to any available waveform. Range: 0%...100%

The "Analogue" Generator module contains several controls for generator tuning and tracking. These include: Octave, Semitone and TRK.

The Octave and Semitone controls are used to set the Generator's pitch. Octave sets the Generator pitch in octaves. A range of -2 to +7 octaves is available. Semitone sets the Generator pitch in semitones. A range of -11 to +11 semitones is available. The TRK (Track) button determines whether the Generator tracks the pitch of incoming MIDI messages. If TRK is switched off the frequency of the Generator depends on the Octave and Semitone settings.

## TimeSamp Generator

The TimeSamp Generator is one of the key features of the CronoX. In some ways, the TimeSamp Generator is like a conventional sampler: you load a WAV or AIFF file into the Generator and then trigger it. However, the TimeSamp Generator is no ordinary sampler. It holds just one sample and there are no velocity splits or key regions. Although only one sample is used as basic waveform for the TimeSamp Generator, what you can do with this one sample is unique. You can time stretch it in realtime (time is available as modulation destination!). You can pitch-shift it without affecting the duration. And you can use key tracking to control the Time parameter, allowing you to create really weird sample-based sounds! Of course you can also reverse the sample, as well as use it for amplitude and frequency modulation.



The Sample control is used for loading and unloading samples. The Load button (folder symbol) opens a dialog that lets you select a file for loading. The Previous and Next buttons allow you to traverse a list of samples. The Clear button (X symbol) is used to remove a sample from the Generator.

The Root control enables you to set the unity note of the loaded sample. If, for example, you set Center to "C1" and play a C2 the sample will be played one octave above its original frequency. In the case of the TimeSamp Generator, it's essential that the sample's root note is set to the same note as the one at which the sample was initially recorded. Otherwise the Generator will not function correctly. Range: CO...C6.

The Time control enables you to continuously time-stretch the loaded sample in realtime. As a result, you can shorten or lengthen the sample independently of its pitch. For example, a value of 133 means that the sample is 133% of its original length. If it was originally 3 seconds in duration it becomes four seconds in duration. Range: 25...3200.

The Reverse button enables you to play the sample in reverse so that it plays from the end to the beginning. Range: On/Off.

The Time Tracking control enables you to set the duration of the sample independently of its pitch. Lets say for example, your sample's root note is C3

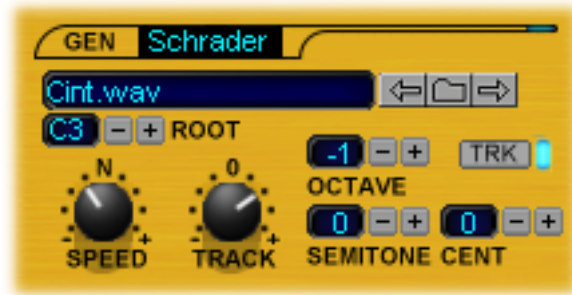
and that it is 4 seconds in duration. What happens to the duration of the sample when you play a C4? This is where Time Tracking comes into play. If you set the Time Tracking control to 0, the sample duration remains at 4 seconds. If you set the Time Tracking control to 100%, the sample duration will be reduced to 2 seconds (a doubling of the frequency results in a halving of the duration). If you set the control to 50%, the duration will be about 3 seconds, while with a setting of -100% the sample is reversed and has a duration of 8 seconds. Range: -100%...100%

The Octave, Semitone and Cent controls are used to set the Generator's pitch. Octave sets the Generator pitch in octaves. A range of -3 to +3 octaves is available. Semitone sets the Generator pitch in semitones. A range of -11 to +11 semitones is available. Cent sets the oscillator pitch in cents (a cent is equal to 100 semitones). A range of -100 to +100 cents is available.

The TRK (Track) button determines whether the Generator tracks the pitch of incoming MIDI. If TRK is switched off the frequency of the Generator depends on the Octave, Semitone and Cent settings. Range: On/Off.

## Schrader Generator

The CronoX's "Schrader" Generator module uses a sample to generate a wavetable. This Generator works best with samples that are both exactly in tune and without regions of silence.



The Sample control is used for loading and unloading samples. The Load button (folder symbol) opens a dialog that lets you select a file for loading. The Previous and Next buttons allow you to traverse a list of samples.

The Root control enables you to set the unity note of the loaded sample. If, for example, you set Center to "C1" and play a C2 the sample will be played one octave above its original frequency. In the case of the Schrader Generator, it's essential that the sample's root note is set to the same note as the one at which the sample was initially recorded. Otherwise the Generator will not function correctly. Range: C-2...G8.

The Speed dial determines the playback speed of the wavetable where 1.0 is the approximate speed of the original sample. Range: 0.01...32.

The Track dial determines whether the playback speed gets faster with higher notes (positive tracking) or slower (negative tracking). This can be used for achieving an effect similar to that found on conventional samplers where playback gets faster as pitch increases. Range: -1...+1.

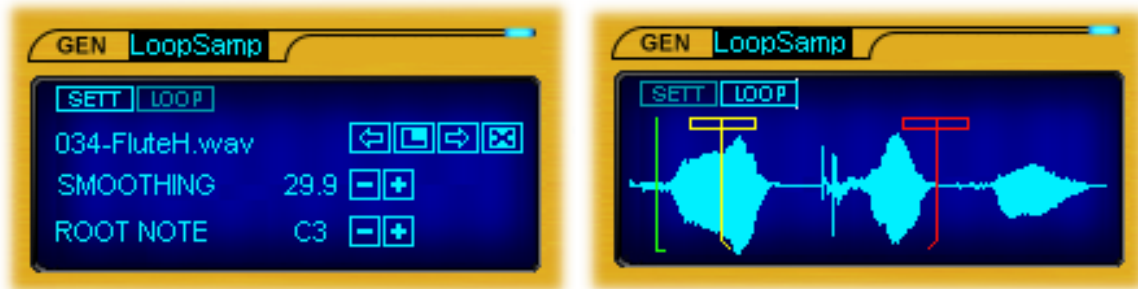
The Octave, Semitone and Cent controls are used to set the Generator's pitch. Octave sets the Generator pitch in octaves. A range of -3 to +3 octaves is available. Semitone sets the Generator pitch in semitones. A range of -11 to +11 semitones is available. Cent sets the oscillator pitch in cents (a cent is equal to 100 semitones). A range of -100 to +100 cents is available.

The TRK (Track) button determines whether the Generator tracks the pitch of incoming MIDI. If TRK is switched off the frequency of the Generator depends on the Octave, Semitone and Cent settings. Range: On/Off.

Interesting results are usually achieved with slower playback, rather than with faster playback.

## LoopSamp Generator

The CronoX's "LoopSamp" Generator is ideally suited to looping samples. This Generator consists of two windows: the Sett (Settings) window and the Loop window



The Sett (Settings) window is used to load the sample as well as to set the Loop Smoothing and the sample's root note. The Sample control is used for loading and unloading samples. The Load button (folder symbol) opens a dialog that lets you select a file for loading. The Previous and Next buttons allow you to traverse a list of samples. The Clear button (X symbol) is used to remove a sample from the Generator.

The Smoothing setting determines the degree of loop-smoothing when loop points are used. The maximum setting is 50.0%. This means that half of the loop's length is used for smoothing. Depending on the loop length, a typical setting is between 5 and 20%. It's best to use higher smoothing settings for shorter loops. Smoothing cannot be applied when the loop start point is the same as the sample start point. Range: 0.1...50.

The Root control enables you to set the unity note of the loaded sample. If, for example, you set Center to "C1" and play a C2 the sample will be played one octave above its original frequency. Range: C-2...G8.

The Loop window displays the currently loaded sample as well as the loop's startpoint marker (the yellow vertical line), endpoint marker (the red vertical line), and the sample's startpoint marker (the green vertical line). To adjust these markers click on or near the vertical line. The degree to which the Loop Startpoint and Loop Endpoint can be modulated is adjusted by clicking near the top of the loop's startpoint marker (the yellow vertical line). The width of the small horizontal rectangle indicates the maximum modulation range.



## Source

The Source section of the CronoX is where the mixing and output destination of the synth's two Generators is controlled. This section is located to the left of the Generator section and contains six controls: Mix, AM and FM buttons as well as Mix, Detune and Spread dials.



The Mix, AM and FM buttons determine the Generators output destinations. When the Mix button is selected the output of both Generators is combined. In this case you can use the Mix dial (see below for more information) to control the relative proportion of each Generator's output in the combined signal. The AM (Amplitude Modulation) button enables you to modulate the amplitude of Generator 1 using Generator 2. This type of modulation can be used to produce rich and complex waveforms. The FM (Frequency Modulation) button allows you to modulate the frequency of Generator 1 using Generator 2. This type of modulation is great for producing metallic, bell-like tones.

The Detune dial detunes the CronoX's two Generators against one another. This can be used to create fat synth sounds. This parameter has no effect if only one generator is used. Range: 0.0...50 cents.

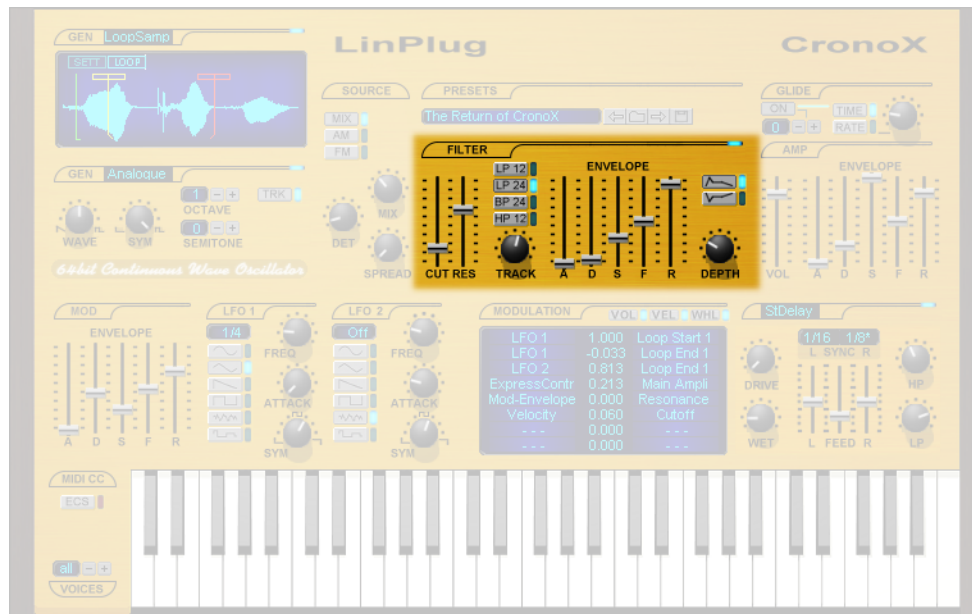
The Mix dial is used to set the relative output levels of Generator 1 and Generator 2. When set all the way to the right Generator 2 outputs with maximum volume while Generator 1 is muted. When set all the way to the left Generator 1 outputs with maximum volume while Generator 2 is muted. When set to an intermediate position both Generators' output is in proportion to the dial's position.

When generator 1 is used as a modulation source (AM or FM switch on) the Mix dial only effects the output of Generator 1. The modulation destination (Generator 2) is always output at full volume. Range: Generator 1...Generator 2.

It's quite common for synths to offer a Unison mode in which several or all of the oscillators are simultaneously detuned to create extremely fat, rich sounds. However, on most synths this mode has a major drawback: the synth becomes monophonic. A special feature of the CronoX is that it allows polyphonic unison. That is, the detuning of Generators without the loss of polyphony. The Spread dial is used to set the CronoX's level of polyphonic unison. When moved from the leftmost position the dial gradually detunes five of the currently selected Generators to produce a thick and fat sound. This does not affect polyphony (however it does use more CPU resources). Range: Off, 0...20 cent.

## Filter

The CronoX's filter has been carefully designed in order to make it especially "musical" and to ensure that it uses very little CPU resources. The filter is located to the right of the Source section and contains a wide range of sound-shaping controls.



The filter has its own On/Off switch located to the right of the module's label. If you don't want to use the filter it's best to switch it off as this conserves CPU resources. To turn the filter on or off, click either on or to the right of the filter's label.

The CronoX's filter section contains 4 filter types: LP 12 dB (Low Pass 12 dB/Oct), LP 24 dB (Low Pass 24 dB/Oct), HP (High Pass 12 dB/Oct) and BP (Band Pass 24 dB/Oct).

The CronoX's filter contains several parameter controls. These are: Cut (Cutoff), Res (Resonance), Track (Envelope Tracking), Envelope (an ADSFR envelope), Envelope Direction and (Envelope) Depth.

Cut (Cutoff) is used to set the frequency (in Hz) above which frequencies are filtered out of the signal. Higher settings produce brighter sounds while lower settings result in darker sounds. Range: 40 Hz...20 kHz.

Res (Resonance) is used to set the amount of emphasis around the cutoff frequency. Higher settings create a more pronounced peak in the signal while lower settings produce a flatter response. Range: 0%...100%.

Track (Envelope Tracking) is used to control the degree to which the filter tracks the signal's frequency. Range: 0%...100%.

The CronoX's filter cutoff frequency is controlled via an ADSFR envelope which consists of controls for Attack, Decay, Sustain, Fade and Release.

The Attack slider setting determines the length of time (in seconds) it takes for the filter cutoff frequency to reach the full envelope depth. For example, if the Attack slider is set to 0.100 seconds, the filter cutoff frequency will move from zero to full volume within 100 milliseconds. Range: 0.001 seconds...10 seconds.

The Decay slider setting determines the length of time (in seconds) that the filter cutoff frequency takes to move from the Attack peak frequency to the Sustain frequency. Range: 0.001 seconds...10 seconds.

The Sustain slider setting determines the filter cutoff frequency after the initial Attack/Decay phase has been completed. Range: 0.000...1.000.

The Fade slider is used to set the rate at which the filter cutoff frequency moves from the Sustain frequency to either 0 (for negative Fade values) or full range (for positive Fade values). A Fade setting of 0 means that the filter cutoff frequency remains at the Sustain level until the key is released. Range: -10...10.

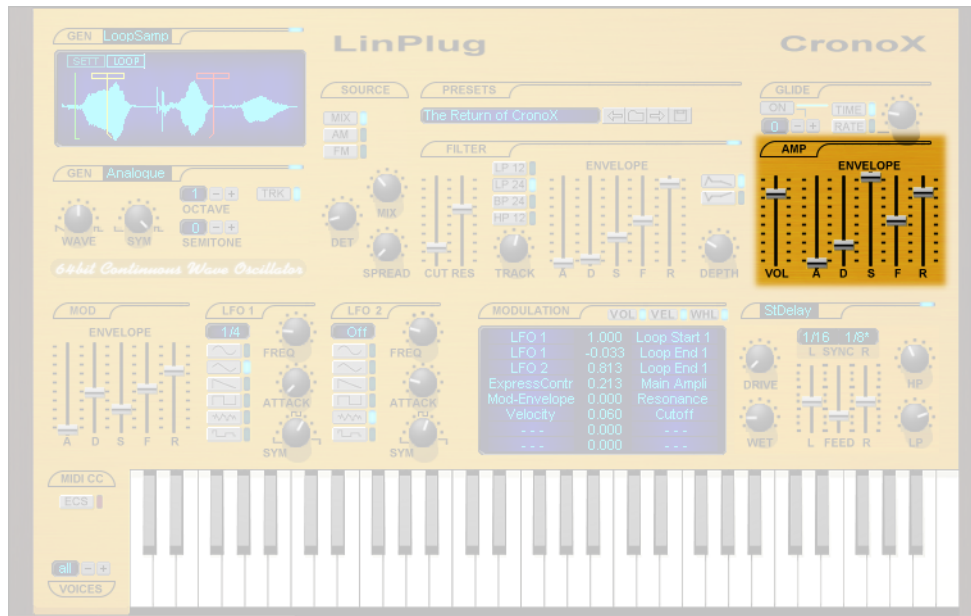
The Release slider is used to set the length of time (in seconds) that the filter cutoff frequency takes to move from the current level to 0 after the key is released. Range: 0.004 seconds...10 seconds.

The Envelope Direction button is used to set either a positive or negative envelope shape. This can be used for a range of effects including opening the filter when a note is released (this is impossible with a non-inverted envelope).

The Depth control is used to set the degree to which the filter's envelope effects the signal. Setting Env to 0.00 means that the envelope has no effect on the filter. Setting Env to 1.00 means that the filter is modulated by the envelope's full range. Range: 0.00...1.00.

# Amplifier

The CronoX's Amplifier section... The Amplifier section is located on the right of the front panel beneath the Glide section.



The synthesizer's main volume level is set using the Vol slider. It has a range of -∞ to 0 dB.

The CronoX's amplifier is also controlled via an ADSFR envelope which consists of controls for Attack, Decay, Sustain, Fade and Release.

The Attack slider setting determines the length of time (in seconds) it takes for the amplifier to reach the full envelope depth. For example, if the Attack slider is set to 0.100 seconds, the amplifier will move from zero to full volume within 100 milliseconds. Range: 0.001 seconds...10 seconds.

The Decay slider setting determines the length of time (in seconds) that the amplifier takes to move from the Attack peak frequency to the Sustain frequency. Range: 0.001 seconds...10 seconds.

The Sustain slider setting determines the amplifier after the initial Attack/Decay phase has been completed. Range: 0.000...1.000.

The Fade slider is used to set the rate at which the amplifier moves from the Sustain frequency to either 0 (for negative Fade values) or full range (for positive Fade values). A Fade setting of 0 means that the amplifier remains at the Sustain level until the key is released. Range: -10...10.

The Release slider is used to set the length of time (in seconds) that the amplifier takes to move from the current level to 0 after the key is released. Range: 0.004 seconds...10 seconds.

# Modulation

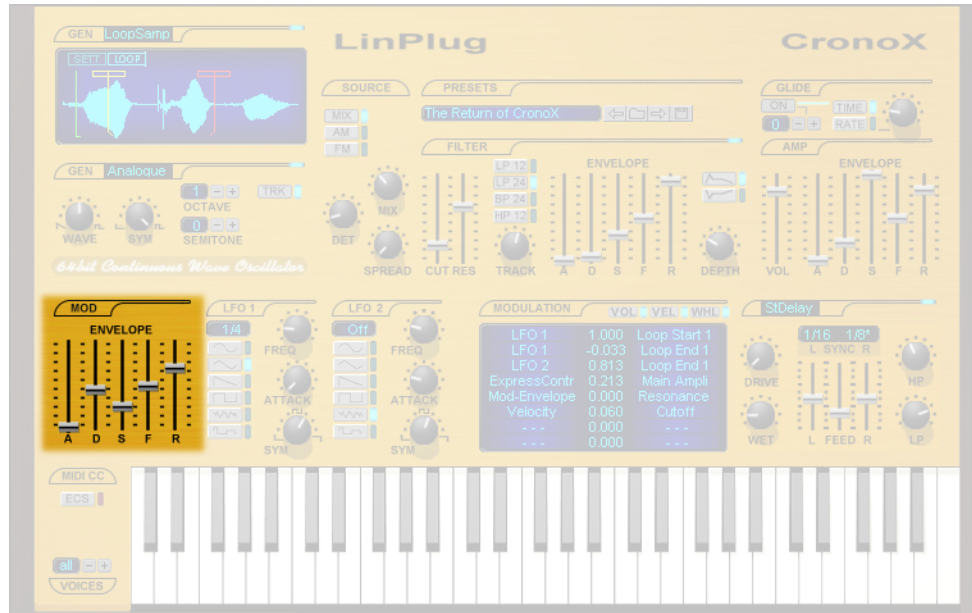
One of the key features of the CronoX is its sophisticated modulation capabilities. The instrument contains a Modulation Envelope, two independent LFOs (low frequency oscillators) as well as an 8x8 Modulation Matrix that is used to control modulation routing.



The Modulation Envelope, LFOs and Modulation Matrix are described in more detail below.

## Mod Envelope

The CronoX has an independent modulation envelope which can be used as a general purpose envelope to control any Modulation Matrix (see below for more information about the CronoX's Modulation Matrix) destination. The Mod Envelope is located on the lower left of the instrument's front panel above the ECS button.



The CronoX's modulation envelope is controlled via an ADSFR envelope which consists of controls for Attack, Decay, Sustain, Fade and Release.

The Attack slider setting determines the length of time (in seconds) it takes for the modulation envelope to reach the full envelope depth. For example, if the Attack slider is set to 0.100 seconds, the modulation envelope will move from zero to full volume within 100 milliseconds. Range: 0.001 seconds...10 seconds.

The Decay slider setting determines the length of time (in seconds) that the modulation envelope takes to move from the Attack peak frequency to the Sustain frequency. Range: 0.001 seconds...10 seconds.

The Sustain slider setting determines the modulation envelope after the initial Attack/Decay phase has been completed. Range: 0.000...1.000.



The Fade slider is used to set the rate at which the modulation envelope moves from the Sustain frequency to either 0 (for negative Fade values) or full range (for positive Fade values). A Fade setting of 0 means that the modulation envelope remains at the Sustain level until the key is released. Range: -10.00...10.00.

The Release slider is used to set the length of time (in seconds) that the modulation envelope takes to move from the current level to 0 after the key is released. Range: 0.004 seconds...10.000 seconds.

The destination of the Modulation Envelope is set using the Modulation Matrix which is described below.

## Dual LFO

An LFO is an oscillator that generates low frequency control signals that can be used to modulate other aspects of the audio signal. The CronoX contains 2 separate LFOs each offering 5 user parameters. These are: Wave, Sync, Freq (Frequency), Attack and Sym (Symmetry). Both LFOs are identical.



To select one of the LFOs waveforms click on one of the waveform buttons at the bottom left of the LFO section. Six LFO waveforms are available: Sine, Triangle, Ramp, Square, Noise and Sample and Hold.

The Sync menu enables you to sync LFO triggering with the current tempo (see Appendix D for the range of possible sync settings). It should be noted that when the Noise and Sample and Hold waveforms are synced to tempo, they run at a faster tempo than the other LFO waveforms. For example, if you set sync to 1/1, use a tempo of 120 bpm and play a whole note (4 beats), the duration of one cycle of the regular waveforms (Sine, Triangle, Ramp, Square) will be 2 seconds. However, the Sample and Hold and Noise waveforms will change their state within 1/8 of 2 seconds or 0.25 seconds. Also, don't forget that when the LFO is synced to tempo, the Freq (Frequency) control no longer operates.

The "Freq" (Frequency) parameter determines the LFO's frequency (in Hz). Range: 0.04 Hz...32 Hz.

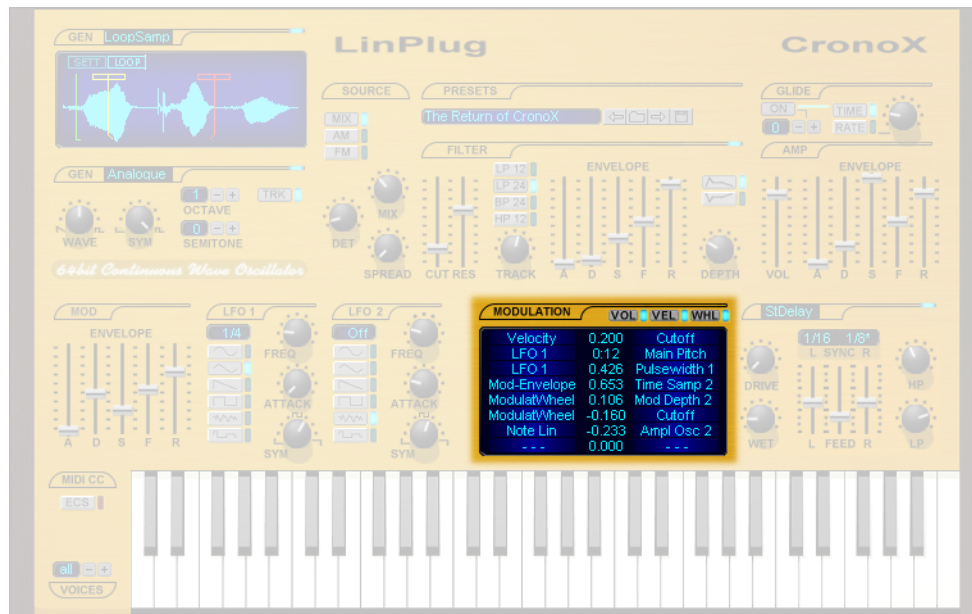
The Attack dial setting determines the length of time (in seconds) it takes for the LFO to reach the full modulation depth. This can be used to slowly increase the amount of modulation applied to the signal. A setting of 0 means that modulation commences immediately. Range: 0 seconds...10 seconds.

The "Sym" (Symmetry) parameter can be used to distort the waveform's shape, stretching it or compressing it as required. Range: 4%...96%.

The destination of each LFO is set using the Modulation Matrix which is described below.

## Modulation Matrix

The CronoX's Modulation Matrix allows you to create 8 user-defined modulation routings. 23 modulation destinations are available for modulation by 18 modulation sources (see Appendix B for a listing and description of all modulation sources and destinations).



Modulation sources are shown in a column on the left of the display, while the destinations are shown on the right. The modulation amount is displayed in the middle. To change a routing click on the source or destination that you want to change. A menu will appear which lets you select the new source or destination. To remove a modulation source or destination select the "- - -" entry in the menu.

To change the modulation depth click on the amount display and move the mouse (while keeping the mouse button pressed) upwards or downwards (increasing or decreasing the value) until the desired amount has been reached. A negative modulation depth inverts the waveform of the modulation source. Range: -1.00...1.000.

The modulation of Main Pitch has a special display for modulation depth. The example above shows a modulation depth of "0:12" (see second row of the Modulation Matrix). This means master pitch is modulated to a depth of 0 semitones and 12 cents (or 0.12 semitones). Range: -48.00 semitones...48 semitones.

The three buttons at the top of the Modulation Matrix are used to determine 3 default modulation settings. When the Vol button is turned on, the MIDI channel volume (which is sent by most keyboards Volume control) is routed to the Amplifier Level. When the Vel button is turned on MIDI velocity (as sent by most keyboards keys) is routed to the Amplifier Level. When the Whl button is turned on the MIDI pitch wheel (as sent by the pitch wheel of your keyboard) is routed to the master pitch (with a modulation depth adjustable on the rear panel of CronoX).

# Effects

The CronoX has a stereo effects unit located on the bottom right of the front panel.



The effects unit contains seven modules: Drive, Delay, Chorus, Phaser, Filter, Reverb and StDelay ("Stereo Delay"). To change the effect type click on the menu to the left of the Effect label. The Drive effect is always present and precedes the other six effects.

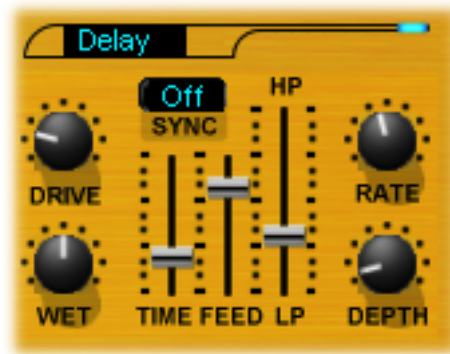
Each effect's controls differ slightly. Each effect is described in detail below.

## Drive

The Drive dial sets the amount of distortion that is applied to the signal before it is fed into the following section of the effects unit. The further the dial is turned clockwise, the more the signal is distorted. Distortion sounds best if applied to complex signals. Note that the drive effect can be applied independently of the other section of the effects unit. Range: 0%...100%.

## Delay

The Delay effect can be used to create "echoes" and other related effects. It features controls for "Wet", "Time", "Feedback", "Filter", "Rate", "Depth" and "Sync".



The Wet dial allows you to set the balance between the processed "wet" signal and the original unprocessed "dry" signal. Range: 0%...100%.

The Time slider is used for setting the delay time (in milliseconds). Range: 1 ms...680 ms.

The Feed (Feedback) slider allows you to set the number of times the signal repeats or "echoes". Range: 0%...99%.

Also included in the Delay section is a variable low pass/high pass 6dB/Oct filter. Range: -1.00...1.00.

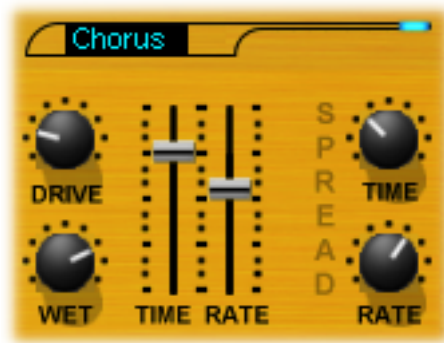
The Rate dial sets the rate (in Hz) at which the modulation takes place. As an example, when you set the Delay Rate to 0.5Hz you get a complete sweep from 50ms (using the above example) to 150ms and back to 50ms in 2 seconds. Range: 0.01 Hz...2.00 Hz.

The Depth dial is used to set the depth to which the delayed signal is modulated. For example, if you set a delay time of 100ms and a depth of 50%, the amount of modulation is 50% of 100ms (50 ms). In this case you'll get a delay time that varies from 100 - 50ms (50ms) up to 100 + 50ms (150ms). Range: 0.00...0.99.

Finally, you can use the Sync menu to sync the delay time with the song's current tempo (see Appendix C for the range of possible sync settings). Normally it doesn't make much sense to combine a synced delay time with delay time modulation.

## Chorus

The Chorus effect can be used to "thicken" a single sound creating the impression that it contains multiple voices. The Chorus works by mixing delayed signals with the original signal. The CronoX's Chorus features controls for "Wet", "Time", "Rate", "Spread Time" and "Spread Rate".



The Wet dial allows you to set the balance between the processed "wet" signal and the original unprocessed "dry" signal. Range: 0%...100%.

The Time slider is used for setting the delay time (in milliseconds). Longer times produce a "chorusing" effect while shorter times create a "flanging" effect. Range: 0.01 ms...5.00 ms.

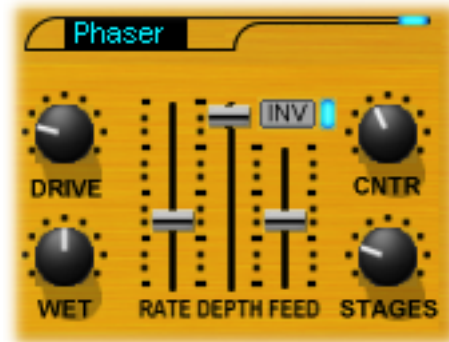
The Rate slider is used to set the rate at which the signal is modulated. Range: 0.02 Hz...4.00 Hz.

A unique feature of the CronoX Chorus are its Spread controls. Basically, "Spread" makes the chorus sound fatter by adding random deviations to the Time and Rate parameters. The degree of "randomness" depends on the spread Time and Rate parameters; setting the Spread Time and Rate to 0 cancels the effect; increasing the value of the Spread Time and Rate parameters adds additional richness and fullness to the sound. It can also make the effect sound more natural. Range: Spread Time: 0%...90%, Spread Rate: 0%...90%.



## Phaser

The CronoX Phaser can be used to create "swirling" dynamic movement in sounds. The Phaser effect is created by automatically sweeping a series of equally spaced frequency notches up and down the audio spectrum. The CronoX's Phaser features controls for "Wet", "Rate", "Depth", "Feed", "Center", "Stages" and "Inv" (Invert).



The Wet dial allows you to set the balance between the processed "wet" signal and the original unprocessed "dry" signal. Range: 0%...100%.

The Rate slider is used to set the rate at which the signal is modulated. Range: 0.04 Hz...1.00 Hz.

The Depth dial is used to set the depth to which the signal is modulated. Range: 1%...99%.

The "Feed" (Feedback) control is used to set the amount of internal feedback employed within the phaser. More internal feedback produces increasingly pronounced resonant peaks. Range: 0%...99%.

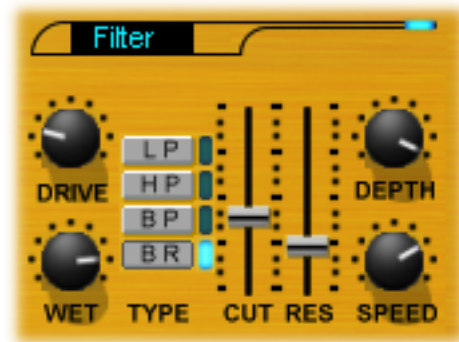
The Center dial is used to set the frequency around which modulation occurs. Range: 100 Hz...10 kHz.

The Stages dial is used to set the number of stages that the phaser contains. Each phaser stage shifts the signal's phase by 180 degrees. The higher the CronoX's Stages setting, the more frequency notches there are in the signal and so the more pronounced is the phasing effect. Range: 1...9.

The Inv (Invert) button allows you to invert the signal that is used to create the phasing effect.

## Filter

The Filter features controls for: Filter Type, Cut (Cutoff), Res (Resonance), Depth (Cutoff-Mod Depth) and Speed (Cutoff-Mod Speed).



The Wet dial allows you to set the balance between the processed "wet" signal and the original unprocessed "dry" signal. Range: 0%...100%.

The Filter Type buttons allow you to select one of four filter types: LP (Low Pass), HP (High Pass), BP (Band Pass) and N (Notch).

The Cut (cutoff) slider is used to set the frequency (in Hz) above which frequencies are filtered out of the signal. Higher settings produce brighter sounds while lower settings result in darker sounds. Range: 40 Hz...20 kHz.

The Res (Resonance) slider is used to set the amount of emphasis around the cutoff frequency. Higher settings create a more pronounced peak in the signal while lower settings produce a flatter response. Range: 0%...100%.

The filter's cutoff frequency can be controlled using the Depth (Cutoff-Mod Depth) and Speed (Cutoff-Mod Speed) controls. The Depth (Cutoff-Mod Depth) control is used to set the depth to which the filter's cutoff frequency is modulated. A setting of 0% means no modulation occurs. The Speed (Cutoff-Mod Speed) dial allows you to set the rate (in Hz) at which the filter's cutoff frequency is modulated. Range: Depth (Cutoff-Mod Depth) 0%...100%, Speed (Cutoff-Mod Speed) 0.04 Hz...4.00 Hz.

## Reverb

The Reverb effect is used to add ambiance to sounds. It features controls for: Wet, Delay, Size and Damp (Damping).



The Wet dial allows you to set the balance between the processed "wet" signal and the original unprocessed "dry" signal. Range: 0%...100%.

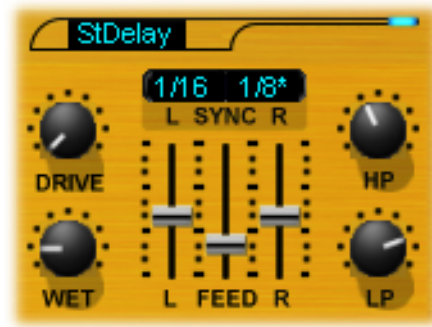
The Delay slider enables you to delay the processed signal by a given amount (in milliseconds) so as to achieve a more natural reverberation. Normally, shorter predelay times are applied in the case of smaller room sizes while longer predelay times are applied in the case of larger room sizes. Range: 0 ms...125 ms.

The Size slider is used to set the size of the simulated room. The Roomsize varies from a small chamber up to a huge hall. Range: 0.1 seconds...10 seconds.

The simulated room's wall materials can be adjusted with the Damp (Damping) slider. This parameter ranges from practically loss-free reflecting walls (0% damping) up to very absorbent walls (90% damping). In practical terms, the amount of damping determines the amount of higher frequencies that are contained in the processed signal: The higher the Damp (Damping) setting, the less higher frequencies are contained in the processed signal. Range: 0%...90%.

## Stereo Delay

The Stereo Delay features controls for: Wet, L Time, R Time, Feed (Feedback), LP Filter (Cutoff), HP Filter (Cutoff), Left Channel Sync and Right Channel Sync.



The Wet dial allows you to set the balance between the processed "wet" signal and the original unprocessed "dry" signal. Range: 0%...100%.

The L Time and R Time sliders are used for setting the left and right channel delay times (in milliseconds). Range: 1 ms...1300 ms.

The "Feed" (Feedback) slider allows you to set the number of times the signal repeats or "echoes". Range: 0%...99%.

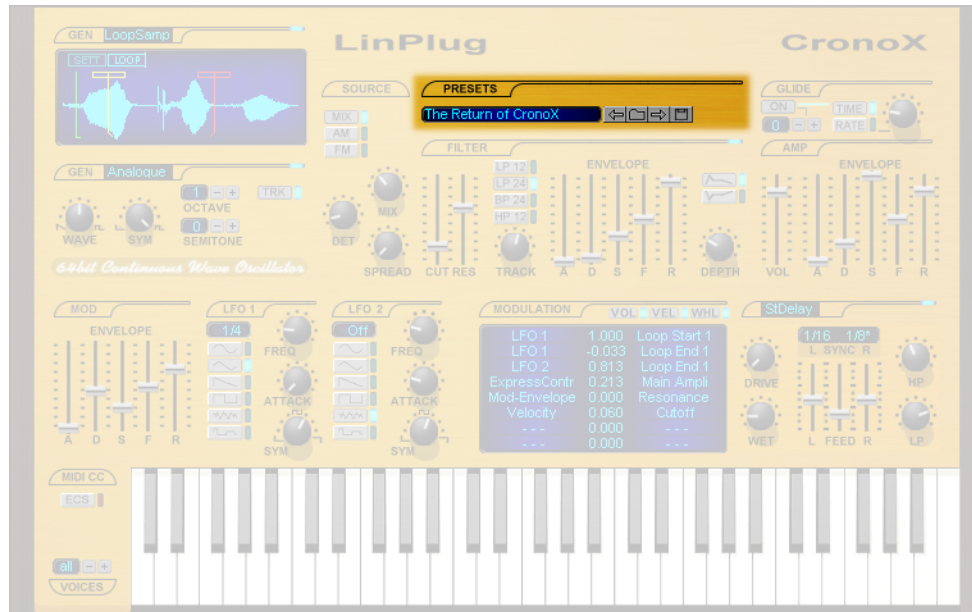
The "LP Filter" (Low Pass Filter Cutoff Frequency) dial is used to set the frequency (in Hz) above which frequencies are filtered out of the signal. Higher settings produce brighter sounds while lower settings result in darker sounds. Range: 40 Hz...22 kHz.

The "HP Filter" (High Pass Filter Cutoff Frequency) dial is used to set the frequency (in Hz) below which frequencies are filtered out of the signal. Higher settings produce thinner, brighter sounds, while lower settings produce fatter, darker sounds. Range: 8 Hz...22 kHz.

The left and right channels of the delay's output can be independently synced to the song's current tempo using the Sync menus located beneath the L Time and R Time dials (see Appendix C for the range of possible sync settings).

# Preset

The CronoX's Preset section contains various controls for loading and saving presets. The Preset section is located in the upper middle area of the front panel.

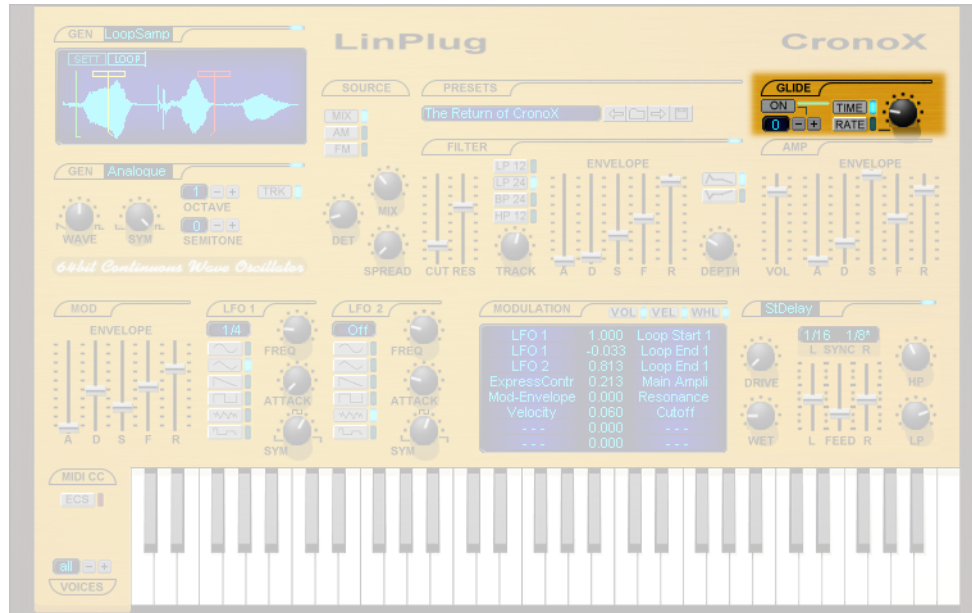


The Preset control is used for all File-related operations. The Load button (folder icon) opens a dialog that lets you select a file for loading. The Previous and Next buttons allow you to traverse a list of CronoX presets. The Save button allows you to save the current preset settings. The settings of all sections, including the Volume setting, are saved with the preset. The CronoX loads and saves all of its presets directly to hard disk so your computer's RAM does not limit the number of available presets.

# Glide

The Glide or "portamento" section allows you to set the CronoX's portamento parameters. "Glide" continuously changes the pitch from one note to the next, connecting the notes and letting you smoothly "glide" from one to the other.

The Glide section has four controls: the Glide button, the Bend display, the Time/Rate buttons and the Range control.



The Glide button has 4 values: On, Off, Held and Bend. The On and Off functions turn "Glide" on and off. When "Glide" is on, the Range dial is used to set the length of time it takes for the first note to reach that of the second note. Range: 0.001 seconds...1.200 seconds.

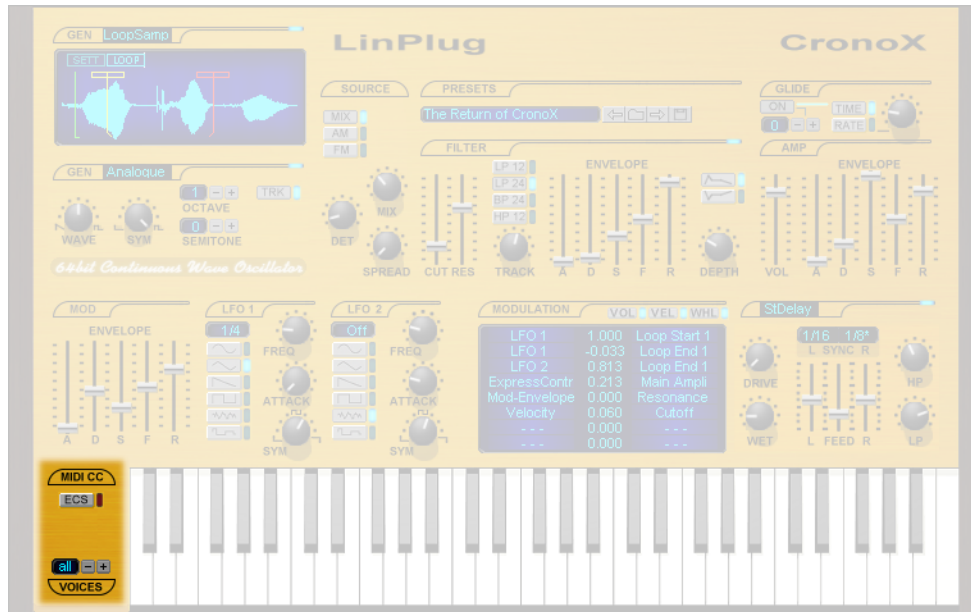
The "Held" setting works as follows. If notes overlap then Glide is applied, however if they don't then the notes are played without Glide. This makes it possible to apply Glide only to selected notes. "Bend" allows you to apply a predetermined pitch bend to each note. The bend range is set using the Range control. A bend range of -48 to +48 semitones is available.

The Time/Rate buttons enable you to choose between two settings: Time and Rate. These settings determine the manner in which the pitch of one note moves to that of the next note. When set to "Time", it takes a constant amount of time to move from one note to the next.

In this case it will take the same amount of time to reach the destination pitch regardless of whether the preceding notes are a semitone apart or an octave apart. When set to "Rate", the amount of time it takes to move from one note to the next depends upon how far apart the two notes are. The further apart the notes, the longer it will take for the pitch of the first note to reach that of the following note.

## Voices

The Voices control is used to set the number of voices ("polyphony") available. The maximum polyphony is 24. A variety of settings are available for polyphony. Range: 1...all.



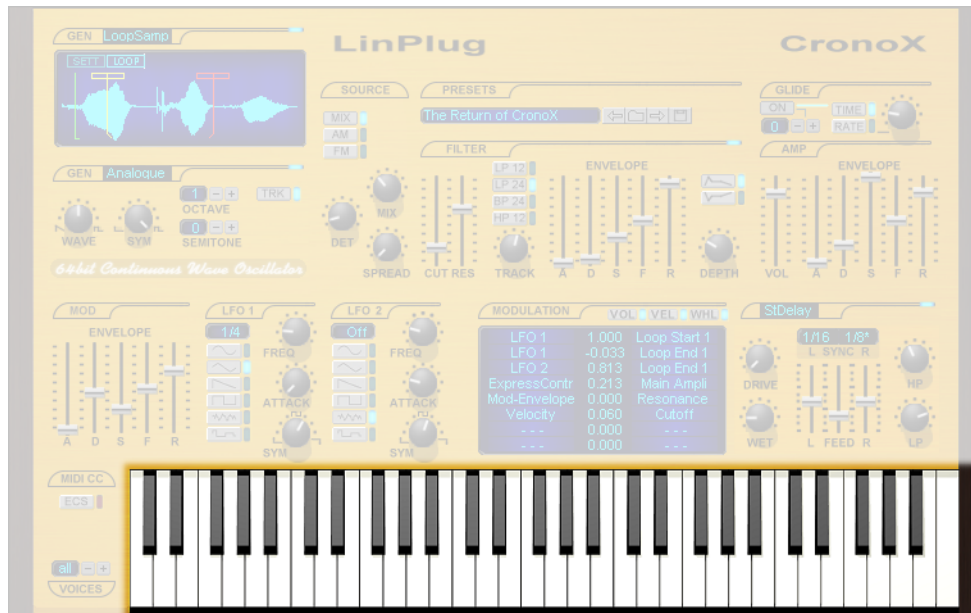
## ECS

The ECS (Easy Controller Setup) section makes it simple to control the CronoX from an external MIDI controller (either hardware or software). All you have to do is click on the ECS button, select a CronoX parameter with the mouse and then send some MIDI messages to the CronoX from your MIDI source. That's all there is to it! From now on you can change the parameter with that controller. In addition to this, more than one controller can be defined to change a particular parameter. In fact, you can define up to 128 parameter-controller-combinations. This does not depend on the type of controller you have nor the particular MIDI Control Change messages it sends. Don't forget to switch off the ECS button after you have finished using it!



# Keyboard

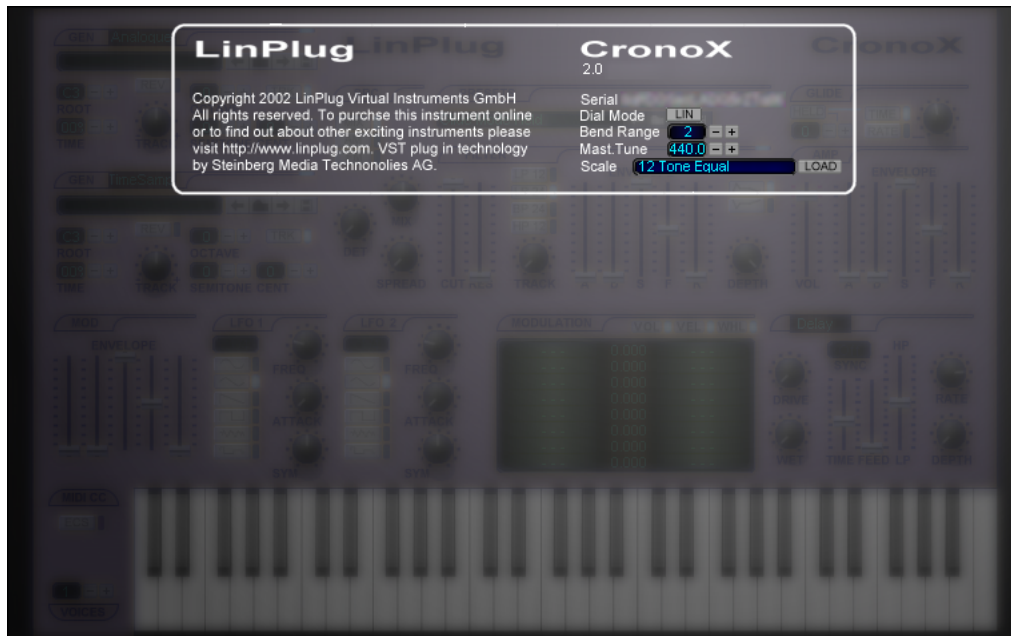
The CronoX's Keyboard enables you to use the instrument even when there is no external keyboard connected to your computer.



The keyboard "velocity sensitive", the more you click in the lower regions, the higher the velocity is.

## Rear Panel

The "Rear Panel" of the CronoX is accessed by clicking on the LinPlug or CronoX logos at the top of the CronoX front panel. Several master controls have been located here to make the front panel less crowded, and also so that they are not changed accidentally while the CronoX is in use. The controls located here are Dial Mode, Bend Range, MasterTune, and Scale.



Dial Mode is used to select the CronoX's dial operation mode. Two modes are available: "Cir" (Circular) and "Lin" (Linear). In "Cir" mode the CronoX's dials track cursor movement in a circular fashion around the dial. In "Lin" mode the CronoX's dials track vertical cursor movement. It's important to note that some sequencers can override the instrument's dial mode settings so if the CronoX's dials are not operating in the correct manner, check the host program's settings. Range: Cir...Lin.

Bend Range is used to set the CronoX's response to pitch bend messages. Range: 1...24 semitones.

In order to make the Bend Range settings from the CronoX's rear panel work correctly in FruityLoops, FruityLoops' pitch bend range setting for the CronoX must be set to 12. Otherwise, FruityLoops changes the PitchWheel MIDI messages.



Master Tune is used to set the overall tuning for the Key A of the CronoX if no microtuning file is loaded.

Scale: See Appendix A for a complete description of how to use TUN files in the CronoX.

Finally, the rear panel also contains your CronoX's serial number and version number.

To switch back to the main edit screen click the Linplug CronoX logo at the top of the CronoX's rear panel.

## Get The Full Version

You can use the demo version of the CronoX for evaluation purposes for a period of up to 30 days. If you then decide that you would like to keep using the CronoX you must register your demo version.

Registering the CronoX is very easy. All you have to do is visit our online shop at [www.linplug.com](http://www.linplug.com) and purchase a license. As soon as your credit card transaction has been authorized you will be sent a personal serial number. In most cases this will only take a few minutes.

After you've installed and opened the full version of the CronoX, go to the instrument's rear panel. The S/N edit box should read "Please enter serial number here". Enter the serial number you have received into the S/N edit box.

After entering the serial number return to the CronoX's front panel. Now send the CronoX a few note-on messages. After the CronoX receives the first few note-on messages it automatically becomes registered. After registration, the S/N field is no longer editable. You can confirm this by looking at the S/N field on the instrument's rear panel. If the serial number has not been entered or it has been entered incorrectly, the full version of the CronoX will not play any notes.

If you have any questions regarding the CronoX's registration process, please write to [support@linplug.com](mailto:support@linplug.com).

## Optimizing CPU Usage

Software synthesizers are highly CPU-intensive. The real-time calculation of audio waveforms, filters, effects and modulators places a significant load on the host computer's CPU.

As such, the main limiting factor in software synthesizer performance is CPU processing power. Each additional generator, filter, effect and modulator that is included in an instrument adds to the CPU load. As a result, it's best to switch off any unused sections of the CronoX to conserve CPU resources.

# Glossary

AM:	AM or "Amplitude Modulation" is a process where the amplitude of one generator (the carrier) is controlled by another (the modulator). When the frequency of the modulator is periodic and below the audio range (less than 20 Hz) tremolo is produced. When the modulation frequency is within the audio range, Ring Modulation is produced.
Amplifier:	A signal processing device that changes the amplitude, and hence the volume, of a signal.
Effect:	A signal processing device that changes some aspect of the input signal. An enormous number of different effect types are available. These include Chorus (which produces a thickening of the signal), Delay (adding echoes to the signal) and Distortion (which changes the shape of the waveform usually adding overtones).
Envelope:	A time-varying signal used to control the development of another signal after it has been triggered. Envelopes are most often used for controlling a signal's amplitude. The shape of the envelope is determined by the number of control parameters. Usually four parameters are available: Attack Time, Decay Time, Sustain Level and Release Time.
Filter:	A signal processing device that suppresses or "filters" out specific parts of a signal's frequency spectrum. Numerous types of filter are used in audio synthesis. These include Low Pass, High Pass, Band Pass and Notch. The tone controls on a stereo amplifier are one example of an audio filter.
FM:	FM or "Frequency Modulation" is a process where the frequency of one oscillator (the carrier) is controlled by another (the modulator). When the frequency of the modulator is periodic and below the audio range (less than 20 Hz) vibrato is produced. When the modulation frequency is within the audio range, Frequency Modulation is produced.

LFO:	An LFO or "Low Frequency oscillator" is a periodic signal source (usually below audio frequency range) used to modulate another signal parameter. An LFO can be used for a variety of effects including vibrato (by modulating the volume) and tremolo (by modulating the pitch).
Microtuning:	See Appendix A for a detailed description.
Modulation Matrix:	A signal "junction" where a source signal can be patched so that it controls a destination signal. The CronoX's Modulation Matrix is used for tasks such as modulating a generator's amplitude by an LFO.
Generator:	A signal source that generates a waveform at a given frequency.
Ring Modulation:	The process of combining two audio signals by multiplication. Ring Modulation produces sidebands but suppresses both the carrier and modulating frequencies.

# MIDI Implementation Chart

Product: LinPlug CronoX Version 2.x Date: 20.Dec 2002  
 Manufacturer: LinPlug Virtual Instruments GmbH

Function	Transmitted	Recognized	Remarks
Basic Channel			
Default	no	no	
Changed	no	no	
Mode			
Default	no	Omni	
Changed	no	no	
Note Number			
True Voice	no	<b>yes</b>	
	no	no	
Velocity			
Note On	no	<b>yes</b>	
Note Off	no	no	
Aftertouch			
Poly (Key)	no	<b>yes</b>	
Mono (Channel)	no	<b>yes</b>	
Pitch Bend	no	<b>yes</b>	
Control Change	no	<b>yes</b>	
Program Change	no	no	
System Exclusive	no	no	
System Common			
Song Position	no	no	
Song Select	no	no	
Tune Request	no	no	
System Realtime			
Clock	no	no	
Commands	no	no	
Aux Messages			
Local On/Off	no	no	
All Notes Off	no	<b>yes</b>	
Active Sensing	no	no	
System Reset	no	<b>yes</b>	



# Appendix A: Using TUN Files

By Jacky Ligon

## About Microtuning

Microtuning, or "microtonality" are methods for tuning musical instruments whereby musicians may explore and compose with ethnic, historical and contemporary tuning-systems. Microtuning musical instruments allows one to use scales which may have pitches lying between the notes of our familiar Western 12 tone scale. These pitches which are found in the 'cracks' of 12 Tone Equal Temperament are one of the things that give musics of Bali, India, Africa, Thailand, Turkey and the Middle East (to name but a few) a special intonational flavor, but is something that is of immeasurable value to the contemporary acoustic and electronic composer, who may require a more broad palette of musical pitches for their music.

The quest for creating beautiful and musically useful tuning-systems has been an unending process of discovery and debate amongst musical theorists, mathematicians, physicists and musicians going back to early history. Quite often the reasons for microtuning instruments may involve improving the consonant intervals of a tuning-system for sweeter sounding harmonies, as well as offering wider variety of choices for melody. "Microtuning" an instrument can sometimes mean there may be less or more than 12 tones in an octave, or even that the octave itself may be stretched or compressed. Microtuning is a vast topic, rich with lore, music and an infinity of musical possibilities for the sonic explorer.

## Creating TUN microtuning files with SCALA

Scala is a freeware utility developed by Manuel Op de Coul in the Netherlands, which can be used for the creation and analysis of historical, ethnic and contemporary microtunings. A powerful capability of Scala is that it enables the user to create the proprietary tuning data required for microtuning a wide range of hardware and software synthesizers and samplers.

Scala may be used to create the TUN format microtuning-files needed to explore microtunings with this VSTi. What follows is a brief instruction guide on how to use the Scala application to create these files.

The Scala home page is

<http://www.xs4all.nl/~huygensf/scala/>

## Installing SCALA

1. Firstly, go to the below Scala download page, and download the version of the Scala application for your computer platform, as well as the Scale Archive:

<http://www.xs4all.nl/~huygensf/scala/downloads.html>

Note: The Scala Scale Archive is a vast collection of over 2,900 historical, ethnic and contemporary microtunings in the Scala SCL format. Here is a page which shows brief descriptions of these microtunings:

<http://www.xs4all.nl/~huygensf/doc/scalesdir.txt>

2. Install Scala.
3. Create a new-folder inside the Scala program folder, labeling it "SCL".
4. Extract the contents of the Scala Scale Archive to the "SCL" folder.
5. Create an additional folder and label it as "TUN". This will be used as the location for saving the TUN files as they are created.

## How to create a TUN microtuning file from the SCALA archive

The microtuning files in the Scala Scale Archive are saved in the Scala SCL format. The below procedure will enable the user to convert the SCL format into the TUN format, using the command-line and menus in Scala.

1. Run the Scala program from either the desktop icon or by double-clicking its EXE file.
2. Type into the command-line "cd tun", then hit the Enter key on the keyboard. Scala is now focused inside this folder and will save files to this location.
3. Click the File Menu (located at the top left of the Scala application window), and chose Open Scale. Navigate to the SCL folder and find the file labeled "indian\_12.scl". Double-click this file, which will load the microtuning into Scala.
4. Type "show" in the command-line, then Enter. Now one will see information and values for this microtuning in the field above the command-line.

5. Type "set synth" in the command-line, then Enter. Next, one is prompted to specify the synth for which the proprietary microtuning data is to be created. Type "112" in the command-line, then Enter. One will now see that the TUN format has been selected.

6. Type "send/file", then Enter. Type the file name "indian\_12.tun", then Enter.

7. The TUN file has now been created and saved in the TUN folder, and is ready to be used with the soft-synth! Load the TUN file just created into the soft-synth plug-in from its UI.

## Specifying the Reference Frequency of a Microtuning

One of the powerful capabilities of the TUN file format and Scala, is the ability to specify the pitch and midi note which will be the reference pitch for the microtuning in use. This becomes a very important consideration when one is using a number of different synthesizers and wishes to keep them in tune with a given base frequency. It is very common for one to specify a chosen concert pitch such as A440 Hz or C261.6256 Hz as a reference for a microtuning, however, the flexibility of the TUN format and Scala enables one to specify this frequency arbitrarily. In Scala this reference is called Map Frequency.

As well as being able to specify the Map Frequency, one can also specify a central midi-note, which will become the starting point for the microtuning in use. Being able to specify a particular midi-note on the controller, provides a way to map a microtuning beginning on any desired midi key, making it easier to navigate the keyboard when there may be more or less than 12 tones per octave, or where one may desire to have the notes of a tuning fall on certain physical keys.

## How to specify the Map Frequency

1. Firstly, to see what the default settings are, type "show map", then Enter. One can see that the default pitch "Reference" is set to "261.6256 Hertz at note 60.C". Let's change this to A440, midi-note 69.

2. Type "SET MAP\_FREQ 440.0 69", then Enter.

3. Type "show map", then Enter. One can see that now the Reference is 440.0000 Hertz at note 69.A.

## How to specify the Middle Key for degree 0 of the microtuning

1. Type "set middle 69" to specify midi-note A69 as degree 0 of the microtuning, then Enter.
2. Type "show map" to see the results of the change. One can now see that the beginning note for degree 0 is 69.A.
3. Follow steps 5-6 above to save a TUN file with these new mapping properties.

## Important Note

When one uses a TUN microtuning-file in the CronoX VSTi, the above specified mapping properties will override the Master Tuning reference. Normally when one is using the default 12 Tone Equal Tempered Scale, the Master Tuning will be used to make fine pitch adjustments around the standard concert pitch of A440 Hz, but when one has specified another pitch base for a microtuning when the TUN file is created in Scala, such as C261.6256 Hz, the data in the TUN microtuning-file will provide a new pitch reference.

## Appendix B: Modulation Sources and Destinations

### Modulation Sources:

--- (Off), Note Log, Note Lin, Velocity, AfterT(poly), AfterT(mono), Pitch Wheel, ModulatWheel, BreathContr, FootContr, ExpressContr, CC16 Contr, CC17 Contr, CC18 Contr, CC19 Contr, Mod-Envelope, LFO 1, LFO 2.

### Modulation Destinations:

---(Off), Ampl Osc 1, Ampl Osc 2, Pitch Osc 1, Pitch Osc 2, Time Samp 2, Cutoff, Resonance, Pulsewidth 1, Pulsewidth 2, Main Ampli, Main Pitch, Mod Depth 1, Mod Depth 2, Mod Depth 3, Mod Depth 4, Distortion, LFO 1 Speed, LFO 2 Speed, Loop Start 1, Loop Start 2, Loop End 1, Loop End 2.

Two types of modulation source are available: unipolar and bipolar. Unipolar modulation sources increase the modulation destination's value in a single direction (e.g. the ModWheel), while bipolar modulation sources both increment and decrement the modulations destination value (e.g. an LFO).

### Modulation Sources

Note Log	The note being played with exponential response. The modulation value follows the frequency of the played note (bipolar).
Note Lin	The note being played with a linear response. The modulation value follows the note number (e.g. C3 = 60) (bipolar).
Velocity	The MIDI note-on velocity information. The harder the key is hit, the higher the modulation value (unipolar).
AfterT(poly)	The Aftertouch value of each separate note is used as modulation source. Your MIDI keyboard must support this. If this doesn't work it is likely that your keyboard has no polyphonic aftertouch (unipolar).
AfterT(mono)	As above, however only one aftertouch value is used for the whole keyboard. All notes being played on a specific channel share the same monophonic aftertouch value. This is how most keyboards work (unipolar).

Pitch Wheel	The value of the pitch-wheel (bipolar).
Modulat Wheel	The MIDI modulation wheel (MIDI CC 1) (unipolar ).
Breath Contr	MIDI CC 2 (unipolar).
Foot Contr	MIDI CC 4 (unipolar).
ExpressContr	MIDI CC 11 (unipolar).
CC16 Contr	MIDI CC 16 (bipolar).
CC17 Contr	MIDI CC 17 (bipolar).
CC18 Contr	MIDI CC 18 (bipolar).
CC19 Contr	MIDI CC 19 (bipolar).
Mod-Envelope	The Mod-Envelope is user-definable and can be routed to any available modulation destination (unipolar).
LFO 1	LFO 1 (bipolar).
LFO 2	LFO 2 (bipolar).

## Modulation Destinations

Ampl Osc 1                      The amplitude of generator 1, used for tremolo.

Ampl Osc 2                      The amplitude of generator 2, used for tremolo.

N.B. In order to create the classic tremolo effect it is better to use Main Ampli as the modulation destination as this is applied to the whole voice.

Pitch Osc 1                      The pitch of generator 1, used for vibrato.

Pitch Osc 2                      The pitch of generator 2, used for vibrato.

N.B. In order to create the classic vibrato effect it is better to use Main Pitch as the modulation destination as this is applied to the whole voice.

Time Samp 2	The Time parameter of second TimeSamp Generator. This is only available when the TimeSamp Generator is loaded into Generator 2.
Cutoff	Cutoff frequency of Filter 1, often used with an LFO to create filter sweeps or with Velocity to simulate an acoustic instrument's response to note attack.
Resonance	Resonance of Filter 1, a rather subtle effect, typically used with an LFO or for Keyscaling (Note Lin or Note Exp source) to adjust Resonance over the key range.
Pulsewidth 1	Pulsewidth or Symmetry of generator 1's waveform, used to thicken a sound or make it swirl, effect depends on intensity and modulation speed, typically used with LFO. Only available for Analogue type generator.
Pulsewidth 2	Pulsewidth or Symmetry of generator 2's waveform, used to thicken a sound or make it swirl, effect depends on intensity and modulation speed, typically with used LFO. Only available for Analogue type generator.
Main Ampli	Overall amplitude of all generators. Often used for tremolo.
Main Pitch	Overall pitch of all generators. Often used for vibrato.
Mod Depth 1	Intensity of the first entry (line 1) in the Modulation Matrix, often used with the ModWheel as source to control a specific modulation parameter (e.g. vibrato).
Mod Depth 2	Intensity of the second entry (line 2) in the Modulation Matrix, often used with the ModWheel as source to control a specific modulation parameter (e.g. vibrato).
Mod Depth 3	Intensity of the third entry (line 3) in the Modulation Matrix, often used with the ModWheel as source to control a specific modulation parameter (e.g. vibrato).
Mod Depth 4	Intensity of the fourth entry (line 4) in the Modulation Matrix, often used with the ModWheel as source to control a specific modulation parameter (e.g. vibrato).
Distortion	The amount of drive or distortion present in the signal.

LFO 1 Speed	Speed of LFO 1, this allows tempo changes of the LFO to be programmed. Typically this is used with Mod-Env as the source. Another example is Key Lin which can be used to make the LFO run faster with higher notes.
LFO 2 Speed	Speed of LFO 2, this allows tempo changes of the LFO to be programmed. Typically this is used with Mod-Env as the source. Another example is Key Lin which can be used to make the LFO run faster with higher notes.
Loop Start 1	The startpoint of the sample currently loaded into Generator 1. This is only available when LoopSampler is selected.
Loop Start 2	The startpoint of the sample currently loaded into Generator 2. This is only available when LoopSampler is selected.
Loop End 1	The endpoint of the sample currently loaded into Generator 1. This is only available when LoopSampler is selected.
Loop End 2	The endpoint of the sample currently loaded into Generator 2. This is only available when LoopSampler is selected.



## Appendix C: Delay Sync Settings

Off, 1/2, 1/2T, 1/4\*, 1/4, 1/4T, 1/8\*, 1/8, 1/8T, 1/16\*, 1/16, 1/16T, 1/32\*, 1/32, 1/32T.

Note: "T" stands for Triplet and "\*" stands for a dotted note. In the case of a dotted note, the note duration is equal to 1.5 times its original undotted value.

## Appendix D: LFO Sync Settings

Off, 16/\*1, 16/1, 16/1T, 8/\*1, 8/1, 8/1T, 4/\*1, 4/1, 4/1T, 2/\*1, 2/1, 2/1T, 1/\*1, 1/1, 1/1T, 1/2\*, 1/2, 1/2T, 1/4\*, 1/4, 1/4T, 1/8\*, 1/8, 1/8T, 1/16\*, 1/16, 1/16T, 1/32\*, 1/32, 1/32T.

Note: "T" stands for Triplet and "\*" stands for a dotted note. In the case of a dotted note, the note duration is equal to 1.5 times its original undotted value.