Tone2 Firebird

Virtual synthesizer with HCM

User Manual

Version 1.1, 2007

Welcome

Tone2 would like to thank you for your interest in Firebird, a VST-format virtual analog synthesizer. Firebird is a ground breaking product in a VST market often saturated with many similar sounding virtual synthesizers. The architecture of Firebird will allow you to produce many unique and dynamic sounds, so your next production that uses it will stand out from the crowd.

Firebird features a new synthesis method called **Harmonic Content Morphing (HCM)** which gives it a unique sound which is not possible with subtractive, additive or FM synthesis methods alone. Harmonic Content Morphing actually allows you to alter the harmonics of your oscillators over time to produce stunning dynamic sounds. Just as sounds in the real world have changes in harmonics over time, which makes them sound pleasing and interesting, Firebird can mimic this behaviour by changing the harmonic content of its oscillators over a certain time period. Not only will Firebird allow you to produce new and unheard of dynamic sounds, but it can also become your workhorse synthesizer because of the large range of possibilities available from this seemingly straightforward synthesizer.

Icons used in this manual

To help you while your learn how to use Firebird we have included a couple of icons:

The **hint** icon - which gives you hints and tips to remember when using Firebird.

The **warning** icon - which warns you of any important things to be aware of when using Firebird.

With the introductions over, let’s get started!

Installation

To install the Firebird VST instrument, simply run the setup EXE file. You will be prompted to select the install folder – please make sure that you choose the location that your VST host application uses as the default 'VSTPlugins' folder. Additionally, it is strongly advised to create a subfolder within this location for the Firebird.

Firebird is provided as a VST standard DLL file, which can be loaded in hosts that support VST plugins.

Hint

> Refer to your host application's manual to learn how to install the Firebird DLL, though hopefully you would have done this before.

When the installation is completed, Firebird will be available on the instrument plug-in menu of your VST host application. An uninstaller will be created and added to your start menu, which you may use if you would like to remove Firebird from your computer at a later time.

Support

If you have difficulties installing or using Firebird, please contact us by visiting our website and clicking on the Support button:

http://www.tone2.com

We also have a support forum located on the popular KVR website, where you can post feedback, bug reports, and ask questions.

http://www.kvraudio.com/forum/viewforum.php?f=76

Overview

Firebird features

- Harmonic content morphing (HCM)
- 58 OSC types containing 14000 morphable waveforms!
- 20 Filter Types
- True stereo mode, 4x unison mode, and up to 8 OSCs per voice
- Can sound like other synthesis methods- Additive, Subtractive, AM, FM, Phase Distortion, Supersaw, Vocoder - with just a few parameter changes
- Spectral manipulations or “modifiers”

So, I hear you ask… what is Harmonic Content Morphing?

Picture this…

In a studio somewhere, a musician picks up an acoustic guitar and strums a note. As the string vibrates through the air and the sound reverberates through the guitar chamber, this seemingly simple act generates a very complex sequence of harmonic spectra which change over time. In other words, the essence of the guitar sound changes over time, which makes an acoustic guitar sound like an acoustic guitar. It is possible to make a sequence of snapshots of these spectra at given times, in essence to capture that change in basic sound over time. And this is where Firebird comes in…

Tone2 has analysed the spectras of natural instruments and synthesizer sounds, to produce harmonic content snapshots of various sounds which have been included in the synthesizer as **waveform morph-tables**. Each snapshot in a morph-table is equivalent to a traditional single oscillator waveform, and each morph-table has 256 snapshots! In Firebird, these morph-tables can be loaded exactly like traditional oscillators in subtractive synths, but then you can:

Ÿ **Modify** the morph-table spectrally by changing the harmonic structure of the sound - you can make a fat sound become thin for example, a thin sound become fat, or you can multiply the harmonics… and much more!

Ÿ **Control the playback of snapshots** in each morph-table, over a chosen time period. In other words, you can change the sound over time, however you see fit.

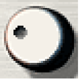
Harmonic Content Morphing gives you the ability to mimic the sound of real life instruments like guitars and pianos, but also gives you the opportunity to create unique sounds by morphing harmonic content in interesting ways. The possibilities are endless…. Unlike traditional synthesis methods like subtractive and additive which for the most part have only static single oscillators, Firebird allows you to alter your basic sound over time because of the inclusion of 256 snapshots per morph-table. Firebird includes 58 morph-tables, so that means a total of 14,000 snapshots are contained in the synthesizer. Welcome to the power of Firebird!

This manual assumes that you have a certain amount of synthesis knowledge before you start trying to program Firebird. Sure, presets can be acceptable to use in certain situations, but more often than not you will want to dive into the world of synthesis to tailor sounds to your needs.

If this world is new to you, you may wish to learn the basics of sound synthesis before you continue to read through this manual. The Sound on Sound website has some great resources about synthesis. Go to http://www.sospubs.co.uk and search for "Synthesis" using the search engine.

Controlling parameters

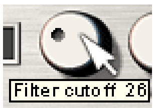
Firebird uses three main controls, which you will alter to program your own sounds. These are:



Knobs
Click on a knob and drag left or right to decrease or increase the parameter.

Note: when adjusting a knob, the parameter name and value are shown over it so you know what parameter you are adjusting and by how much.

In this example, the *Filter cutoff* is being set at a value of *26*.



Drop down selectors
Click on these and a drop down menu will appear with a number of options. Click on an option in a drop down menu to select it.

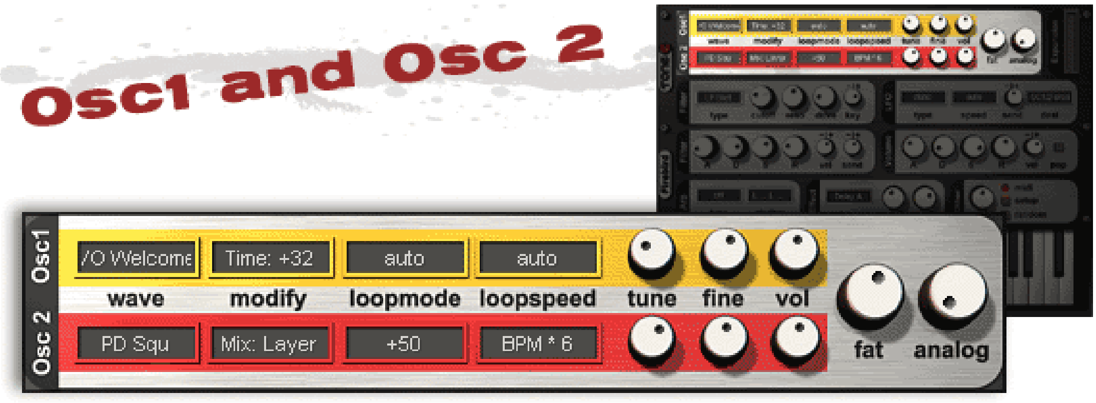
Buttons
There are a number of buttons on the Firebird interface which can be clicked These are described in later sections.

Using Firebird

The following pages contain a detail overview of how to use Firebird. We'll follow Firebird through from signal generation (oscillators) to filtering, modulation, volume, arpeggiator and effects.

First up… the oscillators of Firebird…

Osc1 and Osc 2



	wave	modify	loopmode	loopspeed
Osc1	/O Welcome	Time: +32	auto	auto
Osc 2	PD Squ	Mix: Layer	+50	BPM * 6

The **Osc1** and **Osc2** sections provide the sound generation of Firebird. This is where you can get the basic timbre of the sound which can be spectrally modified, and the playback of the harmonic content can be controlled through Harmonic Content Morphing (HCM). Firebird contains over 15000 spectras in more than 60 morphtables. Each morph-table basically acts as an oscillator than can change harmonics over time.

Let's look at what each part of the Osc1/Osc2 section does:

wave For either Osc1 or Osc2 click on the drop-down selectors to select a morph table. This is the equivalent of choosing a waveform in a traditional subtractive synthesizer, but Firebird stores 256 waveforms (snapshots) for each morph-table which can be morphed using *loopmode* and *loopspeed* (see below)

Choose from the following waveform morph-tables (shown here grouped in categories):

Single Waveforms

Off No waveform is used in the oscillator.
Noise
WV Saw
WV Pulse
WV Sine
WV Peek
WV Comb
WV Platine

Pulses

EL PWM
EL Squ Multi

Saws

- EL Beta 2x
- EL Beta 4x
- EL Saw Multi
- EL Flange 1
- EL Flange 2
- EL Synced

Sine morphed sounds

- PD Peek
- PD Squ
- PD Saw

FX

- SO Sine Rand
- SO Ambie 1
- SO Ambie 2
- SO Digital
- SO Morph
- SO Multi
- SO Platine
- SO Feedsyn
- SO Lava
- SO Siaou

Other

- OT Didge
- OT Flute

Brass

- BR Sax
- BR Trumpets
- BR Trumpet

Organ

- OR Church
- OR Clicks
- OR Hammond
- OR Tremolo
- OR Orgicato

Guitar

- GT Slap 1
- GT Slap 2
- GT Sitar
- GT Saz

Piano

- PI Piano like 1
- PI Piano like 2
- PI Harpsich

Percussion

- PE Bowl 1
- PE Bell
- PE Marimba

Vocoder

- VO Electro
- VO Synth

VO Vocoder
VO Music
VO We are…
VO Let the...
VO I am...
VO Welcome
VO Drumloop 1
VO Drumloop 2

modify Select a modifier to alter the harmonics of the sound.

You can choose from the following modifiers:

Off	No spectral modification occurs
Mix: X2	Mix with one octave up
Mix: X4	Mix with two octave up
Mix: Layer	Mix with a layer of octaves
Thin: Square	Sets all even harmonics to 0, to give a tone like a square waveform
Thin: Bell	Bell sound harmonics, similar to sounds that can be derived from FM synthesis
Thin: Warm	Makes sound warmer and more bassy
Squeeze: shrink	?????
Squeeze: spread	Makes sound sharper with more treble
Squeeze: up	Shift spectrum up
Squeeze: down	Shift spectrum down
Multi: 1	Sounds like several waves are playing at once for a thicker sounds
Multi: 2	Sounds like several waves are playing at once for a thicker sound
Multi: Flange1	Adds a flange effect to the sound
Multi: Flange2	Another flanger-like sound
Multi: Hyper1	Sounds like several noisy waves are playing at once
Multi: Hyper2	Sounds like several noisy waves are playing at once
Filt: LP down	Low pass filter with falling cutoff
Filt: LP up	Low pass filter with raising cutoff
Time: +16	Rotate spectrum in time (+16 snapshots)
Time: +32	Rotate spectrum in time (+32 snapshots)
Time: +37	Rotate spectrum in time (+37 snapshots)
Time: +64	Rotate spectrum in time (+64 snapshots)
Time: +107	Rotate spectrum in time (+107 snapshots)
Sync	Provides a sync-like sound, similar to the oscillator-sync function found in some subtractive synthesizers

loopmode
There are different ways how Harmonic Content Morphing can be done:

forward,
backward,
forward and backward.

Load a piano oscillator (eg **PI Piano like 1**) and play around with it, this helps to understand what happens. Plus is forward, minus is backward, when playing the morph-table.

loopspeed This is how fast the morph is performed - the time it takes to cycle through the harmonic sequence of the morphtable.

The available loop speeds fall into the following categories when you choose

auto: Tries to automatically detect the best loopspeed

Hz: A fixed loopspeed, in hertz.

BPM: Host BPM synced loopspeed.
The frequency sets the time how long it takes to cycle trough on harmonic set

BPM*2 Means the loopspeed will be twice the hosts BPM rate

Key follow: The higher the note, the faster the cycling speed

tune Adjusts the coarse tuning of each oscillator (in octaves).

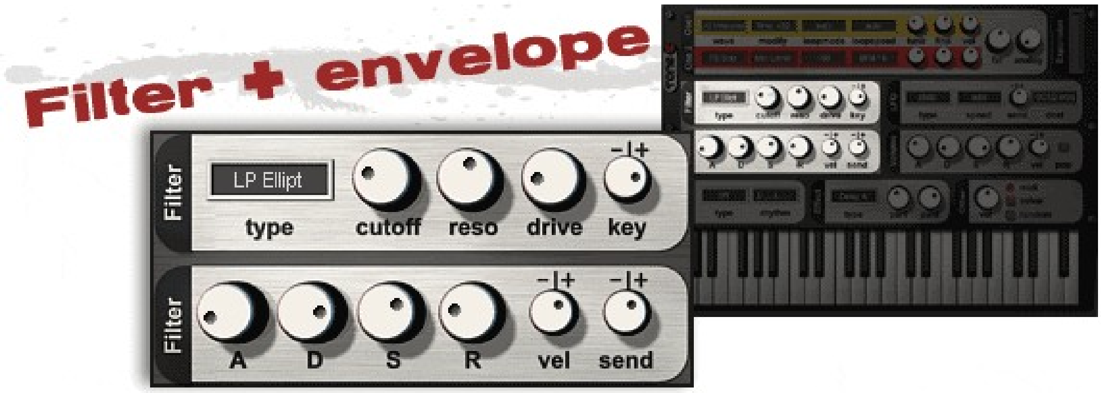
fine Adjusts the fine tuning of each oscillator (in semitones).

vol Adjusts the volume of each oscillator.

fat This is equivalent to a unison effect and will multiply the available oscillators and spread them across the stereo field to provide a huge, wide sound which is often favoured on lead sounds in contemporary dance music.

Available fat settings: mono; 2x stereo unison; 4x stereo unison

analog Adjusting this will increase or decrease the amount of oscillator pitch drift, to simulate the effect of old virtual analog synthesizers going out of tune slightly. This is a subtle effect but can add some realism to a patch.



Filter

type Choose from the extensive range of available filter-types from the drop down selector:

While there are many different filter types most are variations on the four main filter types, **lowpass**, **highpass**, **bandpass** and **notch**.

A **lowpass** filter allows low frequencies to be heard, but blocks the higher frequencies. It is often used for isolating bass sounds.

A **highpass** filter allows high frequencies to be heard, but blocks the lower frequencies. It is frequently used to create hi-pitched whistle sounds, and piercing synthesizer leads.

A **bandpass** filter allows the frequencies within a specific range to be heard, and blocks out all the other frequencies above and below it. It can be used to create a variety of effects, from the subtle to insane!

A **notch** filter is the opposite of a bandpass filter – it will block the frequencies within a set range, and allow all other frequencies above and below it to be heard. Like the bandpass filter, it can be used to achieve a wide variety of effects.

cutoff Adjust the cutoff of the filter.

Cutoff is used to set the frequency at which the filter's behavior changes, relative to the filter type. In a lowpass filter, the cutoff will set the frequency at which the filter begins to 'close' and allow less and less of the higher frequencies through. When the frequencies are high enough past the cutoff point, no more sound will be allowed through the filter.

In a highpass filter, the opposite applies – the cutoff sets the frequency point at which the filter begins to reject sounds that are lower than the cutoff point. Sounds far enough below the cutoff point will not be let through the filter at all.

In a bandpass or notch filter, the cutoff value acts a little but differently – it sets the center point of the 'band' or 'notch', which will taper off as the frequencies move away from the cutoff point, both in higher or lower frequencies.

reso Adjust the resonance.

Understanding how the cutoff function works is essential to understanding resonance. In essence, resonance controls the steepness of the 'slope' around the cutoff point. A very steep slope would filter more frequencies sooner, relative to the sound moving away from the cutoff point. In comparison, a very soft slope would have the filtering applied more subtly, and require a farther frequency from the cutoff point to achieve complete signal attenuation.

Steep filter response slopes are referred to as having a higher resonance value, or sometimes a higher 'Q' (which refers to 'quality' – a steeper curve is a higher quality filter because it is more precise).

The slope of a filter's response curve is often measures in dB/Oct, or 'Decibels per Octave'. Values may look like 18dB/Oct, 30dB/Oct, etc. Using 18dB/Oct as an example, this means that a frequency an octave away from the cutoff point would be attenuated by 18 decibels relative to the full signal. The higher the resonance or 'q' of the filter, the higher the number in the dB/Oct measurement will be.

High resonance values will actually add a boost to the frequencies at the cutoff point, and are useful when you want to really focus on a very precise part of a sound, or generate intense, cutting tones. Low resonance values are better suited to subtle and less precise 'smoothing' and shaping of your sounds.

drive The Drive knob is used to adjust the amount of signal that is being fed into a distortion module in Firebird. The higher the value, the greater the effect of the distortion effect will be, from subtle to very overdriven and extreme sounds.

key Adjusts the effect that notes playing will have on the cutoff of the filter. Positive “key” knob values will cause the cutoff to increase when higher keys are played, while negative knob values will cause the cutoff to decrease.

Filter envelope

The filter envelope controls (ADSR) determine how the filter is affected by the envelope. Adjust these parameters to make the filter’s cutoff change over time.

A (Attack time) Controls the attack time of the filter envelope. If you want the filter cutoff to be immediate use a short filter attack time, or if you want the cutoff to fade in use a longer attack time.

D (Decay time) controls the initial decay filter decay time, ie the time it takes the filter cutoff to return to the set “cutoff” value.

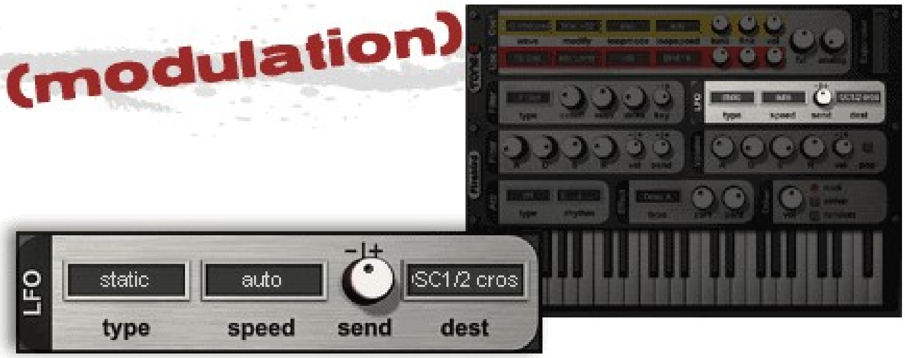
S (Sustain volume) Sets the volume that the sound reaches after the decay phase.

R (Release time) Sets the amount of time the sound takes to go from sustain volume to zero volume, after the decay phase. Increase the release time for long sounds like pads and strings.

vel (Velocity to filter envelope) Positive values (+) will amplify the effect of the filter envelope, while negative values (-) will decrease the effect.

send This will modulate the chosen destination from the LFO section (see next page), by a positive (+) or negative (-) value.

LFO (modulation)



The Low Frequency Oscillator (LFO) allows you to modulate various parameters of Firebird.

LFO works by creating a rising and falling waveform, moving at a sub-audio (less than 20hz, or ‘cycles per second’) rates. This waveform can typically be linked to any of multiple different parameters, giving the effect of having the parameter ‘rise’ and ‘fall’ according to the waveform and rate of the LFO. It’s a simple yet powerful way to automate control over various parameters, and create a more interesting, dynamic sound.

You can adjust the following parameters when programming modulation into a patch:

type Here you can choose the shape of the LFO. A triangle waveform will rise and fall at a constant rate, while a rising saw will fall faster than it rises. This is an area where experimentation will help you find the sound you are after.

speed Controls the speed of the LFO - choose from Hz (frequency) or BPM (tempo-synced to host) settings.

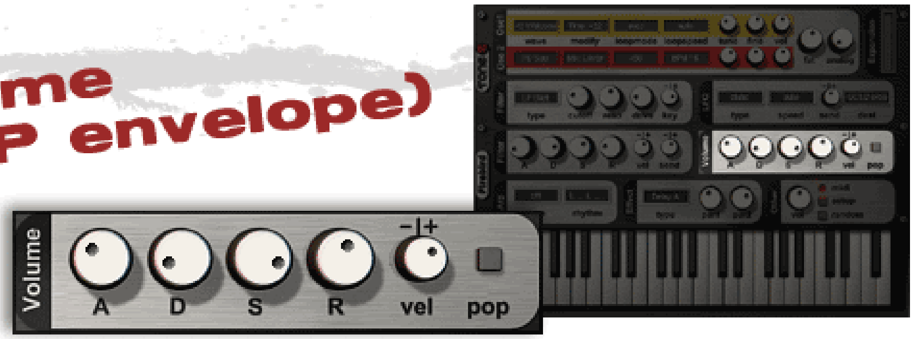
send Controls how much the LFO will affect the destination parameter. Positive values (+) will affect it more, and negative values (-) will affect it less.

dest Here you can choose the modulation destination, in other words you can choose the destination parameter which will be modulated by the LFO.

The possible destinations include:

- Cutoff
- Resonance
- Volume
- OSC octave
- OSC pitch
- OSC detune
- Pan
- OSC 1/2 cross

Volume (AMP envelope)



Like any other synthesiser, the volume/amplitude envelope allows you to shape the volume of your patch over time.

A (Attack time) Controls the attack time of the volume envelope. For punchy sounds use lower attack times, or for sounds that fade in use longer attack times.

D (Decay time) controls the initial decay time of the sound, after the attack phase has finished, before the patch reaches the sustain volume (and then moves into the release phase)

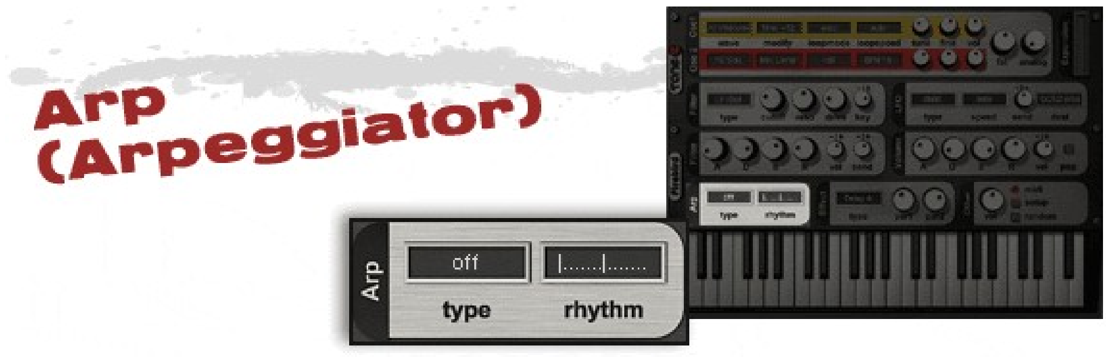
S (Sustain volume) Sets the volume that the sound reaches after the decay phase.

R (Release time) Sets the amount of time the sound takes to go from sustain volume to zero volume, after the decay phase. Increase the release time for long sounds like pads and strings.

vel (Velocity to volume) This effects how much the velocity of incoming notes affects the volume envelope. Greater **vel** values will cause velocity to amplify the volume envelope, while lesser **vel** values will have the opposite affect.

pop If this button is turned on (it goes a darker shade when turned on) then the volume envelope will be retriggered when you release a key on the keyboard. If you are programming long, evolving pads where the volume envelope should be continuous regardless of what key is pressed, then turn **pop** off. In certain situations it can be useful to re-trigger the volume envelope after every key, so in those situations you would turn **pop** on.

Arp (Arpeggiator)



Firebird provides an arpeggiator so you can turn your incoming midi notes into a hi-energy melody for dance music (or anywhere else you would like). The Arp options are:

type Selects the Arp type from the following a selection.

Up / Down / Alt — The arpeggiator plays each of the keys being pressed in order, and with an increasing octave range.
Example: **Up 2oct** plays the currently pressed keys in an upward direction, while systemically increasing the note by 2 octaves from the original key. Larger **oct** values will cause the arpeggiator pattern to cover a larger ranges of notes.

Gate — Rhythmically triggers a complete chord at once.

1 Finger — The 1 finger types automatically play a chord in the key chosen, eg 1 Finger C.

rhythm Controls the rhythm or feel of each 1 bar arpeggio pattern. When selecting rhythm, take note of the following symbols in the patterns:

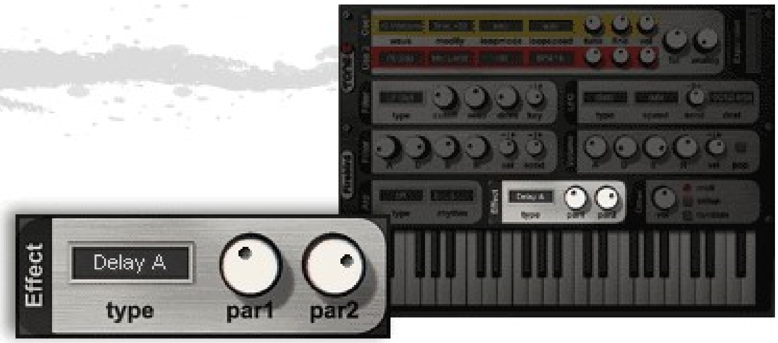
| indicates an **on** note in the pattern
. Indicates an **off** note in the pattern

The | symbols indicate where individual hits sounds in the Arp pattern, so they give you an idea of the groove of the pattern.

Eg.
|…….|…….
Means that the arpeggiator will sound on the 1st and 8th notes of the bar in that pattern.

|…|…|……..
Means the arpeggiator will sound on the 1st, 4th and 8th notes of the bar.

Effect

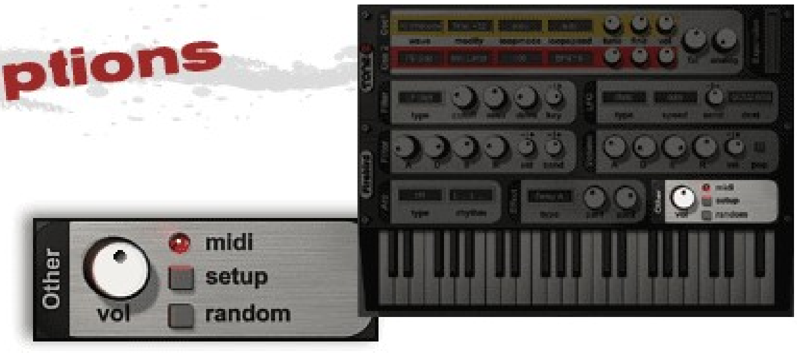


Firebird provides you with a range effect treatments to help you tailor sounds to your needs. You can assign one effect per patch. Move the **par1** and **par2** knobs left and right to decrease and increase amounts. Click the drop down selector above **type** to select the effects.

The effects are:

type	**description**	**par1**	**par2**
Off	Effects are bypassed	-----	-----
Reverb A	A reverb controlled by a time setting	mix	time
Reverb B	A reverb suited to halls and larger rooms	mix	room size
Delay A	An echo-like delay which uses room size	mix	room size
Delay B	A dub style delay using feedback	feedback	time
Delay C	An echo-like delay using time	mix	time
Delay D	A dub style delay using feedback	feedback	time
Chorus	A chorus effect	speed	depth
Ensemble	A thicker chorus-like effect	speed	depth
Flanger	A classic flanger effect	speed	depth
Rotary	A rotary speaker effect	speed	volume mod
Del + Rev A	A mix of delay + Reverb A	mix	room size
Del + Rev B	A mix of delay + Reverb B	mix	room size
Ens + Rev	A mix of the ensemble effect + reverb	mix	room size

Other options



The **Other** section of the Firebird interface provides controls and buttons for various Firebird utilities. These controls are:

vol This knob controls the output gain of Firebird.

midi The red light emitting diode (LED) flashes whenever Firebird receives midi notes.

setup Clicking the setup button opens the setup screen - see “Setup” section below

random Clicking this button will randomize all the parameters of Firebird and may yield interesting and possibly other-wordly results! Click this for instant inspiration, and don’t forget to save random patches if they sound particularly good.

The **random** button could result in unpredictable sounds. Make sure insert a reliable **Brickwall Limiter** after Firebird to ensure that you don’t blow your speakers - or even worse, your eardrums! Always remember to have your speakers, monitors or headphones set at lower levels when you are experimenting with sound to avoid long term damage to your hearing. Once your hearing is gone, it’s very difficult to get it back, it not impossible. So, please take care.

Midi CC assignment:

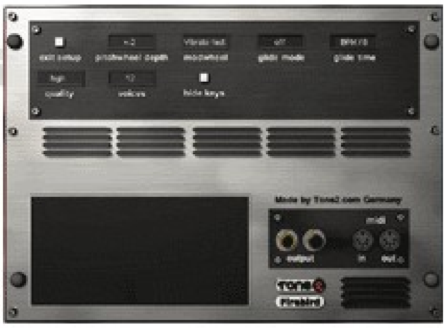
#2: Analog
#7: Main volume
#21: OSC1 tune
#22: OSC2 tune
#23: OSC1 fine
#24: OSC2 fine
#25: OSC1 volume
#26: OSC2 volume
#28: Filter key follow
#71: Reso
#72: Reso
#74: Cutoff
#116: Drive
#91: Effect par1
#92: Effect par2
#102: Filter env attack

#103: Filter env decay
#104: Filter env sustain
#105: Filter env release
#106: Filter env velocity
#107: Filter env send
#108: Volume env attack
#109: Volume env decay
#110: Volume env sustain
#111: Volume env release
#112: Volume env velocity
#113: Volume env pop
#114: LFO send

In **setup** you can route your **modwheel** (CC#1) to these destinations:

- vibrato fast
- vibrato slow
- cutoff +
- cutoff -
- reso +
- reso -
- osc1/2 crossfade

Setup



The **Setup** screen allows you to alter some of Firebird's options:

exit setup
Clicking this button returns you to the main Firebird screen.

pitch wheel depth
Controls how much the pitch wheel of a midi controller will affect the pitch of Firebird, in semitones. A depth of +-2 means that when the pitch wheel is pushed to it's maximum the pitch is altered by 2 semitones.

modwheel
Sets the destination parameter that is affected when you move the modwheel on a midi controller. The possible destinations are:
Ÿ Vibrato fast
Ÿ Vibrato slow
Ÿ Cutoff + (affects the cutoff positively)
Ÿ Cutoff - (affects the cutoff negatively)
Ÿ Resonance + (affects the resonance positively)
Ÿ Resonance - (affects the resonance negatively)
Ÿ OSC ½ crossfade (Crossfades between Osc1 and Osc2)

glide mode
Controls the glide mode (portamento) of Firebird. This allows you to slide between notes to create particular effects, like the TB303 acid sound; or the sound of a finger sliding along a violin string.

glide time
Controls the glide (portamento time) - the time it takes to glide between two particular notes.

quality
Sets the rendering and playback quality. Lower values will decrease CPU use but lower quality. Higher values will increase CPU usage, but also increase quality.

voices
Controls the number of notes that Firebird can play at once. Decrease to lower CPU usage when using complex arrangements or playing chords with many notes.

hide keys
Clicking this button will show or hide the virtual keyboard at the bottom of the Firebird interface. The virtual keyboard shows the keys midi notes that Firebird is receiving by animating a key press, and clicking on the keyboard will force Firebird to play the note you have pressed. If you find these features unnecessary and wish to conserve screen space, then hide the keyboard.

Expansion

Visit the tone2 website http://www.tone2.com in the future, and you will be able to buy a firebird expansion package including more filter-types, more waveforms and additional presets.

Check the website regularly to see when new expansion packages are released!

Acknowledgements

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We would like to thank the following contributors:

The beta testing team

Manual

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