User's Manual - Rack Extension

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1. Introduction

Thank you for choosing The Legend HZ by Synapse Audio!

Developed in collaboration with iconic and multiple-award-winning film composer Hans Zimmer, The Legend HZ builds on the legacy of its predecessor, The Legend.

The Legend HZ has been designed with great care and attention to detail, so that no opportunities were missed to create a software synth which is both highly usable and insanely versatile. It is at heart the product of the combined knowledge of a genre-defining composer and Synapse Audio's experience emulating an industry-defining synthesizer.

Building on the success of The Legend, we've teamed up with Hans Zimmer to mark new ground in analog modeling synthesis. Multiple features have been added to The Legend HZ that were previously unavailable with The Legend. These include an additional three oscillators (and with them an added polyphony setting), a modulation matrix, a 32-step sequencer, an MSEG for added modulation controls, and an expanded effects section.

The Legend HZ even contains a fixed filter bank that was modeled after Hans Zimmer's personal Vintage 914 Fixed Filter Bank, an exceptional and rare piece of hardware.

The result of this collaborative effort is an analog modeled software synth which is uniquely positioned for use in modern film scoring and music production applications. Most importantly, it retains this position while faithfully recreating the sonic characteristics of the original hardware.

The Legend HZ ultimately exists at the meeting point of two cultural icons. The first, a world-renowned film composer who has left a lasting mark on multiple generations of musicians, composers, and the film industry at large. The second, a vintage synthesizer that has left a lasting mark on synthesis and sound design.

With The Legend HZ, Synapse Audio makes this meeting point accessible for industry professionals and bedroom music producers alike.

2. Basic Operation

The user interface of The Legend HZ is divided in two panels: the front panel and the back panel.

The front panel contains the main sound parameters of The Legend HZ.

These include the OSCILLATORS section, the MIXER section, the FILTER/AMPLIFIER, the filter and amp envelope, the pitch bend (PB) and Mod Wheel (MW) knobs, the CONTROLS section, the OUTPUT section, the MODULATION MATRIX (MM) section and Arpeggiator/Sequencer (SEQ) section.

In addition to the above controls is a centrally located graphical envelope that contains four separate MSEGs (Multiple Segment Envelope Generators) which can be used as modulation sources. The MSEG section will be covered in Chapter 3. Front Panel.

The back panel hosts additional settings that are crucial in shaping a sound.

It includes the GLOBAL, MODULATION, OSCILLATORS, FILTER, AMP, and FIXED FILTER BANK sections. It also contains The Legend HZ's individual effects units. These include the PHASER, CHORUS, REVERB, DELAY, and the COMPRESSOR. The back panel hosts also a bunch of CV connections.

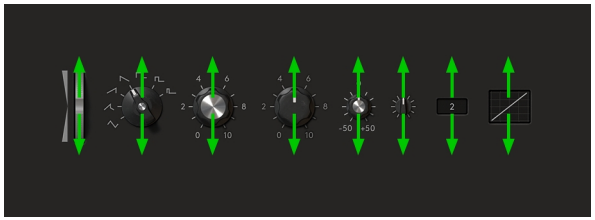
2.1. Patch selection

The patch operation in The Legend HZ RE is the same as in any other Reason device.

To select a patch, either click on the patch name, the folder icon or the arrow buttons.

To save a patch, click on the disk icon.

2.2. Controlling parameters



Knobs, faders, and numerical displays are all controlled by left-clicking on them, then dragging the mouse up or down in a vertical direction. To set precise values, hold down Shift while turning knobs. To set knobs to their default position, use Command/Ctrl+Click. Toggle switches by simply left-clicking on them.

2.3. Controlling by MIDI

Most controls of The Legend HZ can be remote controlled via MIDI. The default controller assignments follow common conventions and the MIDI standard as much as possible. To browse the complete MIDI assignments please see Appendix A. MIDI Implementation Chart.

2.4. Customizing the Interface

You may do brightness and hue adjustments by clicking on the brightness icon. This will cause an additional section to appear with two sliders.

The first slider changes the hue of all LEDs and the MSEG, while the second slider changes the background brightness and texture from flat to a more grainy look.

3. Front Panel

3.1. Overview

This chapter covers the individual sections of The Legend HZ's front panel, from the top left to the bottom righthand corner. These are the Pitch Bend (PB) and Mod Wheel (MW), controls, the modulation sources, output and voice controls, sound sources, and filter and amplifier controls.

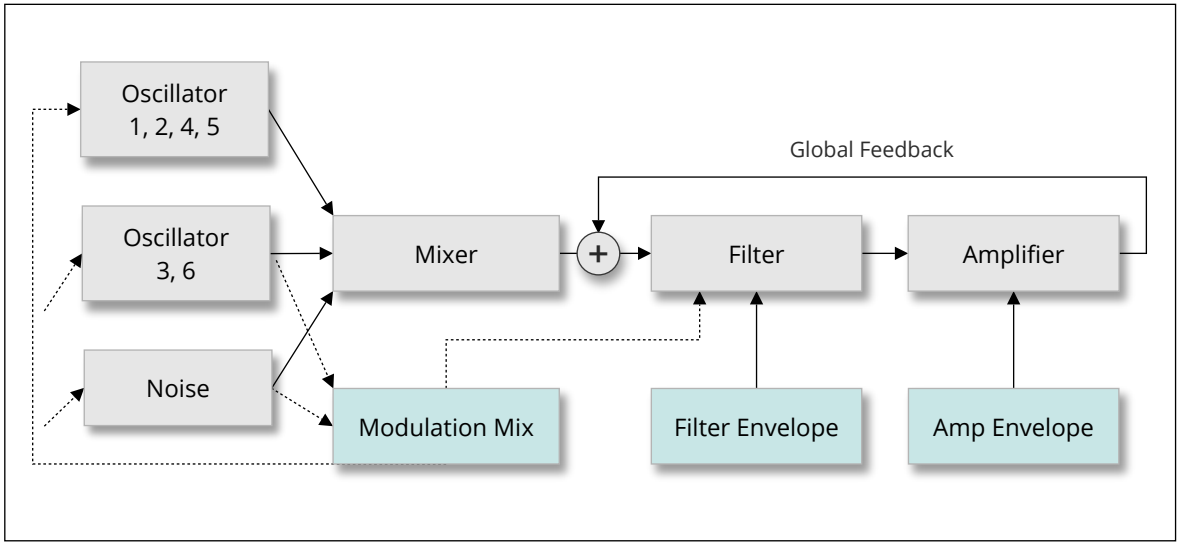


Fig. 3.1. Signal Flow of The Legend HZ

For its sound generation, The Legend HZ uses six oscillators and a noise generator. These seven sources are mixed and then processed by either a wide range lowpass (LP) filter, or by a bandpass (BP) filter. The output of the filter then passes through an amplifier and is finally scaled in volume by the Master Volume control.

The filter and amplifier are controlled by their designated envelopes: the FILTER ENVELOPE, and the AMPLIFIER ENVELOPE, respectively.

The Legend HZ has three modulation sources in particular that can be used as Low Frequency Oscillators (LFOs).

The first is a blend of Oscillator 3 (OSC 3) and NOISE, which is controlled via the MOD MIX knob in the CONTROLS section on the front panel. By default, OSC 3 is assigned to modulate the filter cutoff frequency and the pitch of all oscillators. These assignments can however be toggled on or off in the CONTROLS section. Additionally, OSC 3 can be used as a source in the Mod Matrix to modulate the behavior of one or more destinations.

The second LFO is Oscillator 6, which can also be assigned as a source in the Mod Matrix. Finally, though not listed as an LFO in the Mod Matrix, the MSEG can also be used as a modulation source to mimic the behavior of an LFO. The MSEG is in fact more versatile than a standard LFO, since exact shapes can be drawn to specify the destination's behavior.

For more information on the Mod Matrix, including its sources and destinations, see Chapter 6. Modulation Matrix.

3.2. Pitch Bend (PB) and Modulation Wheel (MW)

The Pitch Bend and Modulation Wheel (mod wheel) are typically controlled via a MIDI controller. They can also be adjusted directly on the user interface by left-clicking and dragging up or down on the respective wheel. The maximum pitch bend range and modulation amount applied can be fine-tuned on the back panel.

PB

Bends the pitch of the note played either up or down, relative to the PB RANGE settings on the back panel.

MW

Controls the amount of modulation applied to the sound. The default assignment for the mod wheel is to modulate the pitch of each oscillator or the filter cutoff frequency via oscillator 3.

The mod wheel can also be linked to oscillator 6 as a source in the Mod Matrix. Since the mod wheel can be chosen as a modulation source in the Mod Matrix, it can also be used independently of oscillator 3 or oscillator 6.

3.3. Controls

GLIDE

Controls the rate of portamento (glide) from one note's pitch to another.

At low settings, the transition from one note to another is nearly instantaneous.

At higher settings, the time it takes for one note pitch to transition to another is lengthened. This effect is more obvious with wider intervals. Though GLIDE is commonly used in MONO and UNISON modes, it can also be used in any of the polyphonic modes.

MOD MIX

A blend of oscillator 3 and the noise generator is used as the default modulation source for the mod wheel. The MOD MIX adjusts the mix of these two sources. Turned all the way to the left, only oscillator 3 will be used as a modulation source. Turning the knob to the middle "MIX" position establishes a 50/50 blend of oscillator 3 and the noise generator as one modulation source. Set all the way to the right, the noise generator alone will be used as a modulation source. Since MOD MIX values are not locked to the positions mentioned above, in-between values are also possible (60/40, 75/25, 80/20, etc.).

Note that the modulation wheel must be set to a value above 0 for modulation to be audible. Additionally, either the OSC or FILTER toggle switch next to the MOD MIX knob need to be toggled in the "ON" position for any modulation to take place.

OSC

Enables pitch modulation for all active oscillators.

FILTER

Enables modulation of the filter cutoff frequency.

3.4. Tuning

COARSE

Adjusts the coarse tuning of the synthesizer in octaves, ranging from -2 to +2 octaves.

FINE

Adjusts the fine tuning of the synthesizer in cents. This parameter is useful to adjust the tuning to a particular range of the keyboard. Analog synthesizers based on voltage-controlled oscillators (VCOs) are usually out of tune, and this can be emulated in The Legend HZ via the back panel.

3.5. Output

EFFECTS

Toggles all effects on the back panel on or off. When toggled in the "ON" position, the effects activated on the back panel are audible. When toggled in the "OFF" position, the effects section is bypassed. This renders effects inaudible, even if they are individually toggled in the "ON" position on the back panel.

Note: when toggling the effects on or off globally, make sure to monitor your levels, as this can cause significant jumps in volume.

ARP

Toggles the Arpeggiator in the on or off position.

DETUNE

Sets the amount of pitch offset for the number of voices used. Higher settings generate more substantial differences in pitch between voices, whereas lower settings generate slight inconsistencies in pitch between voices.

SPREAD (UNISON and POLY modes)

In UNISON mode and all POLY modes, SPREAD controls the stereo panorama for the number of voices used. In any of the POLY modes, SPREAD is integrated by panning the first and third voices to the right, the second and fourth voices to the left, and so on. This pattern will continue until the maximum number of voices has been reached (4, 8, and 12, respectively).

UNISON I and II

There is two unison modes I and II, they differ by how the four voices are detuned and spread in the stereo panorama.

POLYHPONY

Sets the number of voices used by The Legend HZ.

The Legend HZ's two monophonic modes are MONO and UNISON.

In MONO mode, the patch strictly uses one voice (monophonic). UNISON mode employs a different method for creating monophonic patches, whereby four voices are stacked simultaneously each time a note is played. The result can be described as a chorusing effect.

VOLUME

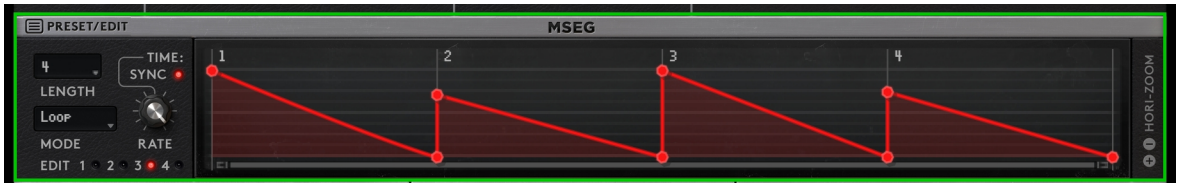
Adjusts the Master Volume (all sound sources and effects).

3.6. MSEG

3.6.1. Overview

The Legend HZ contains four designated graphical envelopes.

These are referred to individually as an MSEG (Multiple Segment Envelope Generator).



MSEGs are highly versatile modulation sources that make precise control over sound parameters possible. All four MSEGs can be drawn and modified in the designated MSEG section. MSEGs (like LFOs) need to be assigned to a modulation destination for them to have an audible effect on the sound. For this reason, they are provided as modulation sources in the Mod Matrix.

PRESET/EDIT

Clicking on the button text will prompt a dropdown menu from which factory MSEG presets can be chosen. An additional five buttons are contained in the dropdown menu.

These are covered below:

- **Copy** - copies the MSEG onto the clipboard.
- **Paste** - replaces the existing envelope with one stored in the clipboard.
- **Invert** - mirrors all points vertically (y-axis).
- **Reverse** - mirrors all points horizontally (x-axis).
- **Clear** - deletes all points written in the envelope. If you accidentally press clear, don't worry! A popup menu will appear that asks if you are sure that you do in fact want to clear the envelope.

LENGTH

Specifies the maximum duration of the envelope. Note that this setting is relative to the RATE knob and SYNC switch.

MODE

Five separate modes can be used for the MSEGs, all off which have unique functions.

These are covered below.

- **Note On** - triggers the MSEG immediately when a note is pressed. All points in the envelope are traversed until the last point has been reached, after which the MSEG will no longer have any effect on the note held. The MSEG is retriggered only after a new note has been pressed. MSEGs are polyphonic in this mode when modulating voice parameters such as pitch. This means that individual voices will maintain their envelope positions.
- **Note Off** - triggers the MSEG when a key is released. The RELEASE knob of the AMPLIFIER ENVELOPE should therefore be at higher settings for this mode to have a significant effect. Note Off is also polyphonic.
- **Loop** - loops the envelope periodically. When synced to the host tempo, this mode is highly effective for creating trance gates or other rhythmic effects. MSEGs are monophonic in this mode. This means that all destinations modulated by the MSEG receive the same signal.
- **Key On** - intended primarily for modulating arpeggiated sequences. Whereas Note On retriggers the MSEG each time a new note occurs in an arpeggiated sequence, Key On retriggers the MSEG only when a new MIDI key is pressed. This can be used to fade in an arpeggiated sequence or to modulate a parameter over time with the arpeggiator.
- **Trigger** - usable only as a destination in the Mod Matrix. This function allows the envelope of the MSEG to be triggered only when one of the modulation sources commands it to do so. As an example, with Aftertouch as a modulation source, the MSEG will be triggered only when receiving pressure data from a MIDI controller.

SYNC

When SYNC is switched on via the bulb next to it, the MSEG is synced to the tempo of the host hardware or software.

The graphical display will show a musical notation format correlating to "bars.quarters". The designation 4.1. corresponds to the first quarter note of the fourth bar; 4.2. to the second quarter note of the fourth bar, and so on.

RATE

Adjusts the speed at which the envelope is traversed.
With SYNC switched off, the RATE knob will scale the envelope from 1/10th to 10 times its duration. At the central position (1x), the RATE knob will have no effect on the envelope. With SYNC switched on, the envelope duration is given in exact rhythmic values, as determined by the host tempo. As an example, setting the RATE knob to half a bar (1/2) will force the envelope to traverse twice as fast as the default setting of one bar (1/1). The values provided can be set as slowly as once every 16 bars (16/1) and as quickly as once every 16th note (1/16). Triplet (T) and dotted (*) values are also provided.

EDIT

Each of the 4 MSEGs can be edited independently of each other by left-clicking on the bulb next to the number. When the bulb is lit red, this shows which MSEG is currently being edited.

3.6.2. Editing points

To add and remove the MSEG point, please hold ALT key and click on the MSEG area (empty space or any current MSEG line). To move the point, simply click on it and move it up/down or left/right. To change the point curve, simply click on the line and move it up/down.

3.7. Oscillators

The Legend HZ has six oscillators. These make up the core of its sound design. Each oscillator can be toggled in the "OFF" or "ON" position via a designated toggle switch in the upper righthand corner.

Oscillators 3 and 6 have one extra toggle switch labelled KTRK (Keytrack). Otherwise, all the available oscillators share the same parameters, which will be covered below.

The Oscillators section is divided into two pages: OSC 1-3 and OSC 4-6.

WAVEFORM

Selects the waveform shape. From bottom left to top right the available waveform shapes are:

- Triangle
- Sharktooth
- Saw (Ramp UP)
- Saw (Ramp Down)
- Square
- Wide Pulse
- Narrow Pulse

RANGE

Sets the pitch register (octave range) of the oscillator.

LO is employed primarily for using oscillators 3 or 6 as an LFO, but it can also be used for creating special effects. The numerical values 32', 16', 8', 4', and 2' relate to octave registers. The lower the number, the higher the pitch will be, and vice versa (2' produces a higher pitch than 4', etc).

Each numerical setting corresponds to one octave above or below the previous one. As an example, if oscillator 1 is set to 16' and oscillator 2 to 8', they would produce the same note one octave apart, with oscillator 1 producing the lower octave and oscillator 2 producing the higher octave.

SEMI

Adjusts the coarse pitch of the oscillator in semitones. The range given is -/+ 7 semitones, which corresponds to a perfect fifth in musical terms.

FINE

Adjusts the fine pitch of the oscillator in cents. The range given is -/+ 50 cents, which is the equivalent to one semitone (one half note).

OFF/ON

Toggles the specific oscillator in the "OFF" or "ON" position. When the bulb is lit red, this signals that the oscillator is in use. Even if an oscillator is in the "ON" position, it will not be heard unless its designated VOLUME knob is turned up in the MIXER section.

KTRK

Oscillators 3 and 6 contain a toggle switch for enabling keytracking.

When toggled in the "ON" position, the rate of modulation applied to the sound by oscillator 3 or 6 is determined by the MIDI note pressed. This results in progressively faster modulation rates for higher pitches, and progressively slower modulation rates for lower pitches.

When toggled in the "OFF" position, the rate of modulation applied to the sound by oscillator 3 or 6 is independent of the MIDI note pressed. This means that the rate of modulation will remain steady throughout a keyboard or MIDI controller's range.

3.8. Mixer

The MIXER section contains the necessary controls for ensuring the sound sources in The Legend HZ sit well together. It includes controls for the synth's six oscillators and its noise generator.

VOLUME

Adjusts the levels of oscillators 1-6.

PINK/WHITE

Toggles between The Legend HZ's two available noise sources: pink noise and white noise.

White noise has a generally flat frequency spectrum, meaning all frequencies have equal magnitude. Pink noise is like white noise, but with greater attenuation of higher frequencies.

NOISE

Adjusts the level of the noise generator.

DRIVE

Adjusts the strength of the signal going into the filter after all sound sources have been mixed. At higher DRIVE settings, the filter will be saturated, or will even distort.

If multiple oscillators are active, even low DRIVE settings can produce audible saturation. If this effect is not desired, simply lower the volume of the oscillators.

FEEDBACK

Adjusts the strength of the output signal which is reintroduced into the input. This emulates the feedback loop that occurs on some vintage synthesizers, whereby the master output was routed back into the filter input.

3.9. Filter/Amplifier

The composite signal of the mixed sound sources is sent to the FILTER section.

The filter is used to shape the raw signal coming out of the MIXER to achieve a desired timbre.

CUTOFF

The CUTOFF knob controls the brilliance, or brightness, of a sound.

How it does so depends on the filter type chosen (LP or BP). The numbers surrounding the CUTOFF knob correspond to specific cutoff frequencies of the filter (with no filter envelope amount or keytracking applied). These range from 25Hz on the low end (left), to 28kHz on the high end (right).

When sweeping the CUTOFF knob from bottom right to bottom left, you'll notice that the sound becomes progressively darker. Turned all the way to the right, the filter maintains the full brightness of the sound coming out of the mixer.

RESONANCE

Controls the filter resonance. RESONANCE emphasizes the cutoff frequency by creating a sharp peak around it. At values higher than 7.5, the filter will self-oscillate, creating a sine wave. During self-oscillation the filter can be played like an oscillator, independent of other sound sources.

ENV AMT

Controls the extent of the filter envelope's effect on the sound.

12/24 dB

Toggles between a two-pole filter with 12dB per-octave attenuation, and a four-pole filter with 24dB per-octave attenuation. Put simply, fewer poles=a brighter sound, while more poles=a warmer sound. The 12dB setting can therefore be useful for creating bright lead sounds, and the 24dB setting for warm pads and bass sounds.

LP/BP

Toggles between The Legend HZ's two filter modes: LowPass (LP) and BandPass (BP). The lowpass filter attenuates frequencies above the frequency set by the CUTOFF knob while allowing frequencies below it to pass. The bandpass filter attenuates frequencies both above and below the frequency set by the CUTOFF knob, essentially isolating the select range of frequencies.

KEYTRACK

When toggled in the "ON" position, keytracking will make the cutoff frequency relative to the key pressed, with higher keys corresponding to higher cutoff frequencies.

Switch 1 enables 1/3rd keytracking and switch 2 enables 2/3rd keytracking. Toggling both switches on thus enables full keytracking. With full keytracking, the cutoff frequency approximately doubles each octave going upward.

3.9.1. Filter Envelope

The FILTER ENVELOPE determines the behavior of the filter cutoff frequency and resonance over time.

It's a necessary part in mimicking the natural behavior of sound, which is to start out bright and darken (or dampen) over time.

The values given around the ATTACK, DECAY, and RELEASE stages range from 2 milliseconds on the bottom left to 35 seconds on the bottom right. The SUSTAIN stage is specified in values of 0-10, since it affects level, and not time.

The four stages (ADSR) of the envelope generator and their uses are covered below.

ATTACK

Sets the duration of time it takes for the envelope to reach its maximum volume. Low/minimal attack times can be used to simulate plucking or the transient noise of something beating a drum.

DECAY

The decay stage commences once the envelope has reached its peak. This stage specifies the duration of time it takes for the envelope to fall to the level set at the sustain stage.

SUSTAIN

The sustain stage commences after the decay stage ends. This stage sets the level that is reached after the decay stage ends and lasts for as long as a key is held.

RELEASE

The release stage commences once a key is released. This stage sets the duration of time it takes until the envelope reaches zero (no more sound is produced).

Note that RELEASE will have no effect if the envelope has already reached zero. This means that either the DECAY stage or the SUSTAIN stage need to be set to prevent the envelope from falling to zero before the note has been released.

3.9.2. Amplifier Envelope

The AMPLIFIER ENVELOPE works identically to the FILTER ENVELOPE. Like the FILTER ENVELOPE, the AMPLIFIER ENVELOPE is also a four-stage envelope generator.

The primary difference between the two is that the AMPLIFIER ENVELOPE determines the amplitude of a sound, whereas the FILTER ENVELOPE determines its timbre.

ATTACK

Sets the duration of time it takes for the envelope to reach its maximum volume. Low/minimal attack times can be used to simulate plucking or the transient noise of something beating a drum.

DECAY

The decay stage commences once the envelope has reached its peak. This stage specifies the duration of time it takes for the envelope to fall to the level set at the sustain stage.

SUSTAIN

The sustain stage commences after the decay stage ends.

This stage sets the level that is reached after the decay stage ends and lasts for as long as a key is held.

RELEASE

The release stage commences once a key is released. This stage sets the duration of time it takes until the envelope reaches zero (no more sound is produced).

Note that RELEASE will have no effect if the envelope has already reached zero. This means that either the DECAY stage or the SUSTAIN need to be set to prevent the envelope from falling to zero before the note has been released.

3.10. Remarks

Envelopes always continue from their current state whenever new notes are triggered. In MONO mode (with LEGATO toggled on the back panel), the resulting sound is heard as a smooth glide from one note to the next. In POLY-4, POLY-8, and POLY-12 mode, successive chords can be played without clicks or artifacts.

With long DECAY and RELEASE times, The Legend HZ's envelope amount starts to build up when keys are pressed in quick succession. This will yield a sound that becomes progressively brighter in timbre, making the synth sound both dynamic and responsive.

4. Back Panel

The Legend HZ's back panel contains settings for fine-tuning the synth's analog emulation and the CV connections. These include its global settings, modulation behavior, oscillator, filter, and amp settings.

The back panel also hosts The Legend HZ's effects section, which includes the FIXED FILTER BANK, PHASER, CHORUS, REVERB, DELAY, and COMPRESSOR.

4.1. Global and Analog Emulation Settings

The Legend HZ's global and analog emulation settings are covered below. These are especially important for controlling the synth's modulation behavior, and for emulating the behavior of vintage hardware.

4.1.1. Global

SYNC MODE

Toggles between HOST and INTERNAL. This determines the triggering of the MSEGs and Arpeggiator/Sequencer. SYNC MODE has two settings:

- **HOST** - the positions of the MSEGs and/or Arpeggiator/Sequencer will be synced to the host sequencer when playing back a song.

- **INTERNAL** - the MSEGs and/or Arpeggiator/Sequencer will be triggered by a keyboard or MIDI controller.

POLY MODE

Toggles between CYCLE and LAST. This specifies how voices are prioritized in any of the POLY modes.

- **CYCLE** - proceeds through voices one by one in a round robin fashion (1, 2, 3, 4, 1, 2, 3, 4...etc.). CYCLE is a standard approach to handling voice prioritization in polyphonic synthesizers and is suited to most applications.
- **LAST** - voices are reused, rather than moved through rigidly as in CYCLE MODE. LAST is more effective than CYCLE in cases where it's desirable to play the same voices repeatedly in succession.

As an example of how this works, initialize patch, set the POLYPHONY to POLY-12, set a RELEASE time of around 3 seconds, DECAY time of around 1 second, and no SUSTAIN. Set the CUTOFF frequency around 400 and an ENV AMT around 4.

With the above settings, set POLY MODE to LAST and play a three-note chord (C E G) in rapid succession (so that each new chord occurs before the RELEASE time has reached 0). The sound produced, including harmonics, will be consistent, since all three notes are given equal weight each time a new chord is produced. Now set POLY MODE to CYCLE and play the same three-note chord in the same way as above. The sound produced is noticeably muddier, with inconsistent harmonics and a type of beating noise. This is because CYCLE mode's blind following of voices in this case leads to an imbalance in note priority, whereby certain notes of the chord will be incidentally prioritized over others.

MONO MODE

Toggles between LEGATO and RETRIGGER. This determines the behavior of overlapping notes in MONO and UNISON modes.

- **LEGATO** - envelopes recommence from the attack stage only when no note is currently being held. This creates an elongated, smooth glide between notes. The rate of the glide between notes is determined by the GLIDE knob.
- **RETRIGGER** - envelopes recommence from the attack stage every time a new note is played. The resulting sound is a short, staccato effect between notes.

MODEL REVISION

The Legend HZ has two model revisions to choose from. These deal primarily with how the oscillator board and part tolerances of the filter and amplifier are modeled.

The differences in revisions are more pronounced when using patches with Square, Wide, or Narrow Pulse wave forms.

PB RANGE

Specifies the range of the pitch bend wheel. By default, this is set to 7 semitones (a perfect fifth) up and 7 semitones down.

4.1.2. Modulation

The MODULATION section is used to fine-tune modulation amounts and the behavior of the mod wheel.

PITCH RANGE

Increases or decreases the mod wheel's effect on pitch. Turning the PITCH RANGE knob to the left will reduce the amount of modulation applied by the mod wheel to pitch information. Turning it to the right will increase the amount of modulation applied by the mod wheel to pitch information.

This will have no effect if the OSC toggle switch in the CONTROLS section on the front Panel is in the "OFF" position.

CUTOFF RANGE

Increases or decreases the effect of the mod wheel on the filter cutoff frequency. Turning the CUTOFF RANGE knob to the left will reduce the mod wheel's effect on the filter cutoff frequency. Turning it to the right will heighten the mod wheel's effect on the filter cutoff frequency.

SHAPE

Blends between a linear and/or an exponential response for the mod wheel. The effect this has on the sound can be heard by slowly moving the mod wheel up (with modulation applied) in each setting.

4.1.3. Oscillators

The OSCILLATORS section on the back panel has controls for fine-tuning the oscillator circuity and keyboard models employed in The Legend HZ.

The Legend HZ is capable of emulating inconsistencies in pitch behavior, a common trend among vintage synthesizers. But since this behavior isn't always desirable, The Legend HZ also employs fixed tuning.

The two primary parameters used for controlling tuning imperfections are keytracking and drift. These will be covered below.

PHASE 1

Sets the initial phase point of oscillator 1.

Oscillator phase determines the starting point of an oscillator. By default, Phases 1, 2, and 3 are set to FREE (free run). In this case, the oscillator will start with a random phase point each time a note is played, yielding a dynamic effect.

Sometimes it's desirable to have a fixed oscillator phase, which can yield a more static effect. For example, having a fixed phase point can be helpful when creating bass or percussive sounds, as it may be desirable for each note to have the same transient attack. In these cases, having the ability to change the starting phase of an oscillator is crucial.

PHASE 2

Specifies the initial phase point of oscillator 2.

PHASE 3

Specifies the initial phase point of oscillator 3.

KEY TRACK

Determines the extent of detune between notes over the range of the keyboard.

At the default middle position (0), all oscillators will remain perfectly in tune across the keyboard range. Changing this setting to positive or negative values will cause notes to be detuned relative to one another.

The wider the distance between the notes, the more noticeable this effect will be.

Note that using extreme values like -5 and +5 will cause significant detuning across the entire keyboard range. As a result, it may be necessary to use the FINE knob in the GLOBAL section for the synth to be in tune with other instruments.

DRIFT

Controls random pitch changes (pitch drift) over time. This is employed separately with each oscillator. Set to the default position (0), no oscillator pitch drift will occur, whereas higher values will magnify the pitch drift effect. To find a suitable drift value, enable two oscillators, set them to the same level, sustain a note, and listen to how they react over time.

O3 L-SYNC

When oscillator 3 is in LO mode, toggling O3 LO-SYNC in the "ON" position will synchronize oscillator 3's rate of modulation to the host tempo of your DAW or hardware.

With O3 LO-SYNC toggled in the "ON" position and oscillator 3 set to LO mode, the values of oscillator 3's SEMI knob are given in exact musical units, including triplet (T) and dotted (*) notes. From the bottom left (slowest rate of modulation) to the bottom right (fastest rate of modulation) these range from *8/1 (once every dotted 8 bars) to 1/32T (once every thirty-second-note triplet).

With O3 LO-SYNC toggled in the "OFF" position, oscillator 3's rate of modulation is based on values determined by the original hardware.

4.1.4. Filter

The FILTER section provides additional parameters for determining the behavior of the filter.

CUTOFF RANGE

Adjusts the range of the filter cutoff frequency.

Positive values (above 0) will progressively increase the maximum possible cutoff frequency achieved by the filter. Negative values (below 0) will decrease its maximum possible cutoff frequency.

RESONANCE RANGE

Adjusts the range of the filter's resonance.

Positive values (above 0) will progressively increase the maximum possible resonance range achieved by the filter. Negative values (below 0) will decrease its maximum possible resonance range.

Note that increasing the RESONANCE RANGE will cause the filter to self-oscillate at lower RESONANCE settings on the front panel.

SYMMETRY

Adjusts the symmetry of the filter. This is provided to emulate the asymmetrical behavior of analog filter circuits being driven into saturation, which causes the generation of even-order harmonics. Set to 0, the filter will only generate odd-order harmonics. For authentic analog-style sounds, non-zero values are recommended.

4.1.5. AMP

SATURATION

Adjusts the amount of saturation present in the signal.

This emulates the standard behavior of voltage-controlled amplifiers (VCAs) in analog synths. The effect of the SATURATION knob on a sound depends on the levels previously set in the mixer section and the filter DRIVE knob.

MAINS FREQUENCY

Models the effects of the power supply on the sound. MAINS FREQUENCY can be toggled between 60Hz and 50Hz.

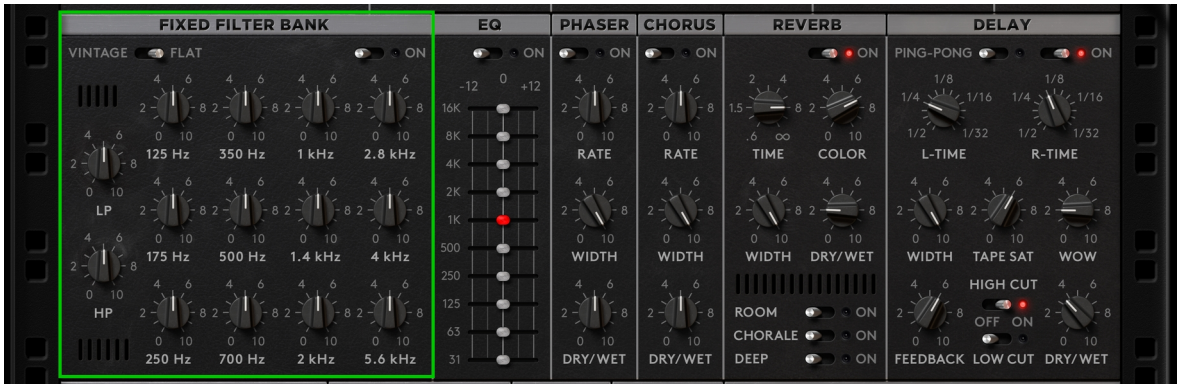
4.2. Effects

The Legend HZ's individual effects units, uses, and parameters are covered below.

4.2.1. Fixed Filter Bank

As mentioned in Chapter 1. Introduction, The Legend HZ includes a FIXED FILTER BANK that emulates an exceptionally rare piece of vintage-analog hardware, the 914 filter bank.

The specific unit used in The Legend HZ is in fact part of Hans Zimmer's personal modular system, making for a truly unique playing experience!



The FIXED FILTER BANK has 14 parallel filters: twelve bandpass filters with fixed middle frequencies, and two shelf filters: LOW PASS and HIGH PASS. Moving from the top left to the bottom right corner, the 12 bandpass filters range from 125 Hz at the FIXED FILTER BANK's lowest frequency to 5.6 kHz at its highest. Each filter has its own designated attenuator control knob, allowing for each filter to be boosted or attenuated. Since this works the same for each of the FIXED FILTER BANK's frequencies, they will be covered together below.

Note that the FIXED FILTER BANK is part of The Legend HZ's effects section. The EFFECTS toggle switch on the front panel will therefore need to be toggled in the "ON" position for it to have any effect. This is the case with all The Legend HZ's effects units.

VINTAGE/FLAT

Toggles between the FIXED FILTER BANK's two available modeling types: VINTAGE, or FLAT.

- **VINTAGE** - modeled strictly after Hans Zimmer's Moog 914. The VINTAGE setting is noticeably warmer than the FLAT setting and is more suited to making changes to the character of the tone received by the FIXED FILTER BANK.

- **FLAT** - a derivative of the above, which has less wiggles in frequency response. This setting produces a nearly flat frequency response if all the FIXED FILTER BANK's knobs are in their default positions. The FLAT setting is more suited to applications in which changes to the tone and character of a sound are intentionally limited.

OFF/ON

Toggles the FIXED FILTER BANK OFF or ON. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

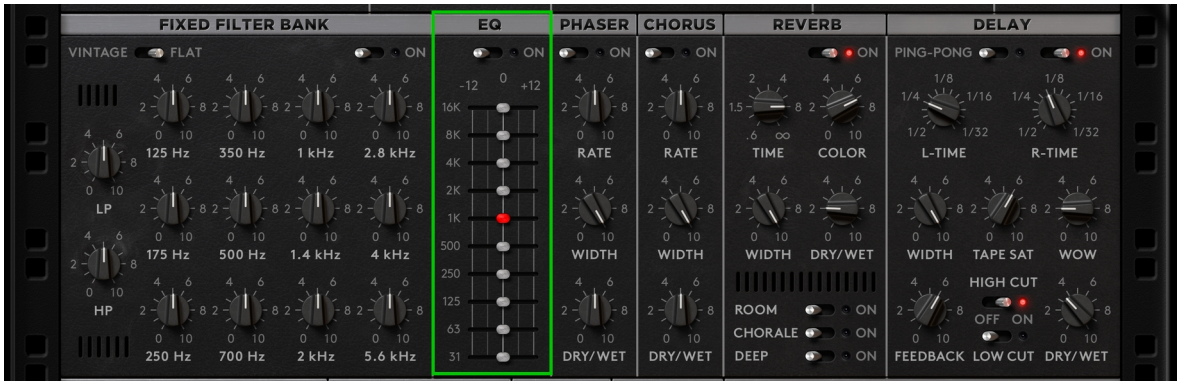
LOW PASS

Boosts or attenuates frequencies below the frequency set by the CUTOFF knob.

HIGH PASS

Boosts or attenuates frequencies above the frequency set by the CUTOFF knob.

4.2.2. EQ



The Legend HZ features a 10-band graphic equalizer, inspired by vintage 560-style hardware units.

Located between the FIXED FILTER BANK and the PHASER in the effects chain, this EQ allows for precise, musical frequency shaping across the entire audio spectrum.

OFF/ON

Toggles the EQ unit in the "ON" or "OFF" position. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

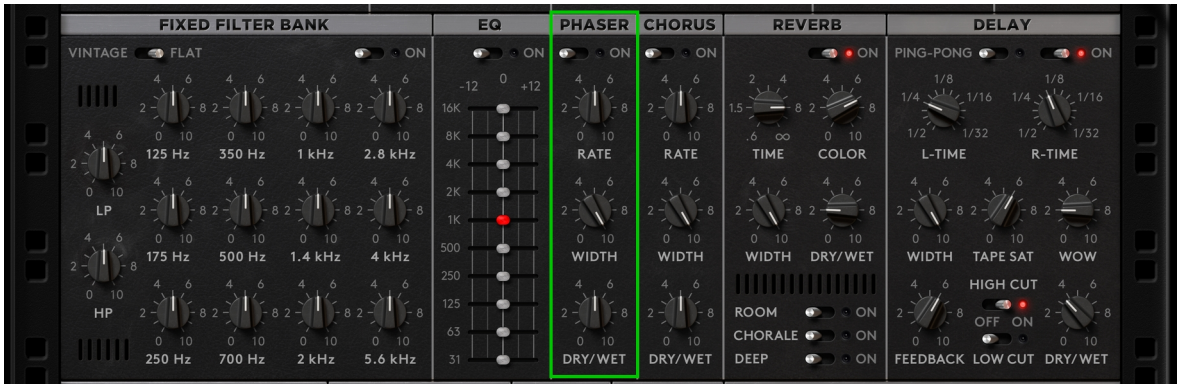
Frequency Sliders (31 Hz – 16 kHz)

Ten individual vertical sliders control the gain of specific center frequencies: 31 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz.

Gain (-12 to +12)

Dragging a slider upwards boosts the amplitude of that specific frequency band by up to +12 dB. Dragging a slider downwards attenuates the band by up to -12 dB. Leaving the slider in the center position (0) leaves that frequency band unaffected.

4.2.3. Phaser



Phasers create enharmonic notches in the frequency spectrum of a sound. They accomplish this by shifting the phase of a sound source's signal and then adding it back to the original.

At lower settings this can be used to add an element of motion to a sound.

OFF/ON

Toggles the PHASER unit in the "ON" or "OFF" position. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

RATE

Sets the modulation rate of the PHASER. Lower settings correlate to a slower modulation rate, whereas higher settings correlate to a faster modulation rate.

WIDTH

Sets the stereo width of the phasing effect, ranging from full mono (0) to full stereo (10).

DRY/WET

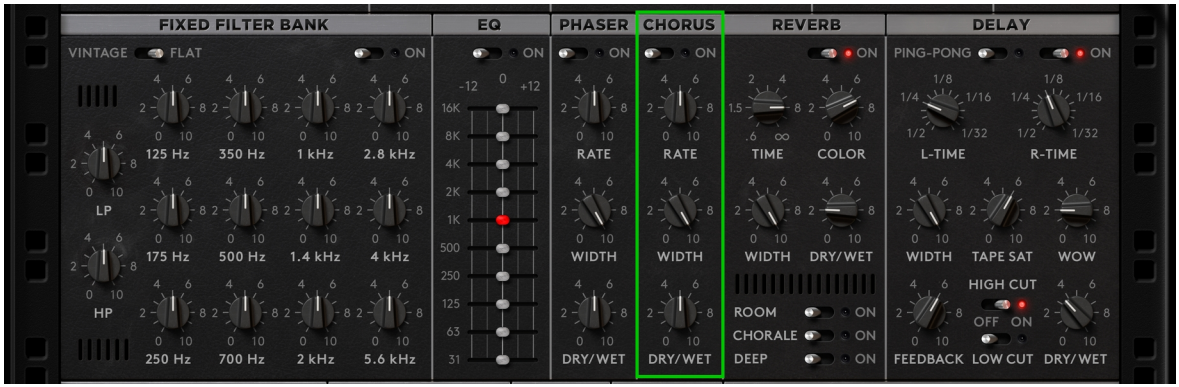
Adjusts the amount of phasing applied to the sound by blending between the dry (unprocessed) and the wet (processed) signal.

4.2.4. Chorus

Chorus units mimic the sound that occurs when slight imperfections (in both pitch and time) between two or more approximate voices come together.

Since the two voices are approximate, the sound produced is both richer and wider than if they were identical.

Chorus is commonly used for thickening pad sounds or adding a bit of shimmer to lead sounds.



OFF/ON

Toggles the CHORUS unit in the "ON" or "OFF" position. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

RATE

Sets the modulation rate of the CHORUS unit.

Lower settings correlate to a slower modulation rate, whereas higher settings correlate to a faster modulation rate.

WIDTH

Sets the stereo width of the chorus effect, ranging from full mono (0) to full stereo (10).

DRY/WET

Adjusts the amount of chorusing applied to the sound by blending between the dry (unprocessed) and the wet (processed) signal.

4.2.5. Reverb

The Legend HZ's reverb unit is particularly suited to the unique sonic challenges that arise when trying to get a synthesizer to sit well within certain spaces. Synthetic sound sources like plain oscillators can be static and even boring when compared to an organic sound source like the human voice.

Though the human voice can be easily recorded in a cathedral, the same can't be said for a synthesizer, which needs some form of manipulation to achieve pleasing results. To counter this problem, The Legend HZ's reverb unit automatically applies modulation to the signal to create a richer, more interesting timbre.

OFF/ON

Toggles the REVERB unit in the "ON" or "OFF" position. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

TIME

Adjusts the reverb time in seconds. The knob ranges from 600ms on the bottom left to infinite on the bottom right.

COLOR

Adjusts the bass reverb time relative to the main reverb time.

The Legend HZ's reverb unit is a two-band design, so that bass and treble frequencies reverberate with different times. Set to the central position, the bass reverb time and treble reverb time will be the same.

WIDTH

Sets the stereo width of the reverb, ranging from full mono (0) to full stereo (10).

DRY/WET

Adjusts the amount of reverb applied to the sound by blending between the dry (unprocessed) and the wet (processed) signal.

ROOM

Simulates the reverb of a small room.

This setting is more suitable for shorter reverb times (2.0 seconds or less).

CHORALE

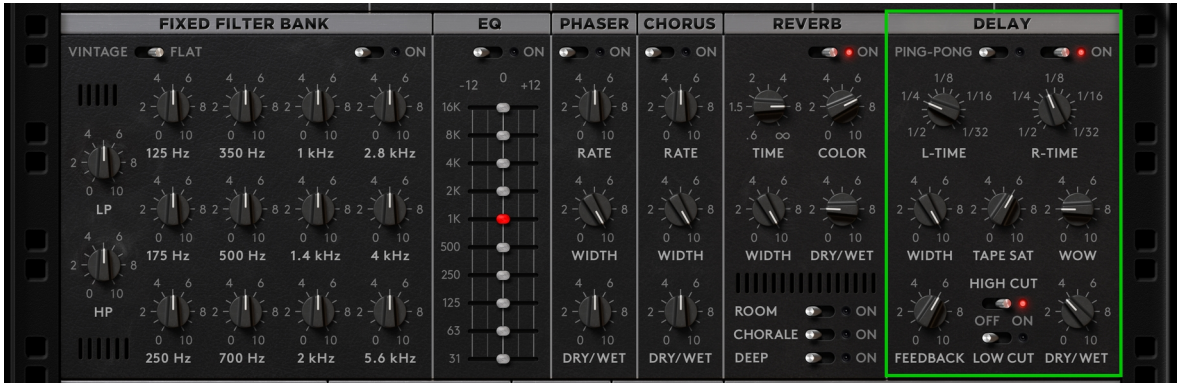
Introduces a formant-type effect to the reverberated signal.

With CHORALE toggled in the "ON" position, the COLOR knob can be used to change the vowel produced, from AH (as in "far") at 0 to OO (as in "too") at 10.

DEEP

Increases the perceived depth/distance between the source (The Legend HZ's sound sources) and the simulated environment.

4.2.6. Delay



The Legend HZ contains a tape delay unit that recreates the effect of using analog recording tape to create a series of echoes.

The DELAY unit comes with two separate delay types and a range of controls. These are covered below.

PING/PONG

Toggles between The Legend HZ's two available delay types: a simple delay, and PING/PONG.

The simple delay works in standard fashion, which is to create a series of echoes that are centered in the stereo field. PING-PONG creates a series of echoes that alternate between the left and right channels.

Note that The Legend HZ is set to PING/PONG by default.

OFF/ON

Toggles the DELAY unit in the "ON" or "OFF" position. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

L-TIME

Sets the delay time for the left channel.

The values given range from a dotted half note (1/2*) to a 1/32 note delay.

R-TIME

Sets the delay time for the right channel.

The values given range from a dotted half note (1/2*) to a 1/32 note delay.

WIDTH

Sets the stereo width of the delay, ranging from full mono (0) to full stereo (10).

TAPE SAT

Adjusts the amount of saturation added to the delay signal.

WOW

Adjusts the amount of "wow" applied to the DELAY.

The term wow describes slow fluctuations in pitch that occur because of the irregular movement of tape. Lower settings will yield a chorus-type effect, whereas higher settings yield extreme pitch-shifting effects and the "rubbery" noise of analog tape.

FEEDBACK

Adjusts the length of time the echoes will be repeated via a feedback loop.

Set to its maximum value (100%), the delay unit will create an infinite series of echoes.

Set to 50%, the delay cuts the level of subsequent echoes in half, and so on.

HIGH CUT

Toggles the DELAY unit's designated HIGH CUT filter in the "ON" or "OFF" position. When toggled in the "ON" position, there will be a noticeable dampening of the echoes produced.

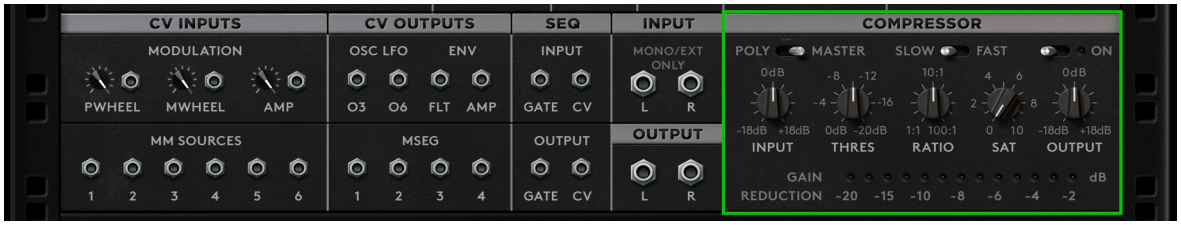
LOW CUT

Toggles the DELAY unit's designated LOW CUT filter in the "ON" or "OFF" position. When toggled in the "ON" position, there will be a noticeable attenuation of bass frequencies. This can be helpful for preventing the DELAY from muddying the mix when using other instruments.

DRY/WET

Adjusts the amount of delay applied to the sound by blending between the dry (unprocessed) and the wet (processed) signal.

4.2.7. Compressor



The Legend HZ makes use of a relatively straightforward, yet versatile, compressor unit with simple controls and an accessible interface.

OFF/ON

Toggles the compressor in the "ON" or "OFF" position. Note this will have no effect if the EFFECTS toggle switch on the front panel is in the "OFF" position.

SLOW/FAST

SLOW/FAST refers to the release time of the compressor. This switch was provided since The Legend HZ's COMPRESSOR unit doesn't have an attack or release setting.

Toggling the switch in one position or the other will select between a slow release time or a fast release time (the time it takes for the signal to return to its initial state after being compressed).

POLY/MASTER

Toggles between the COMPRESSOR's two primary settings: POLY and MASTER.

Toggling the switch in the POLY position will allow the compressor to work polyphonically. In this case, each individual voice will have its own compressor.

Since it works polyphonically, this setting is best suited to POLY mode. It can also be used in MONO mode, at which point it would be placed before the FX chain (instead of at the end of it).

By default, this is set to MASTER.

INPUT

Adjusts the input level of the compressor in decibels (dB).

INPUT controls the level at which the sound is being driven into the compressor. It therefore has a direct effect on the amount of compression that can and will occur.

THRES

Sets the level at which the compressor will start working.

This specifies when a passage or note should be considered too loud by the compressor.

If the threshold is set to -10 dB, then everything below this level will pass uncompressed, while anything above this level will be reduced by the reduction amount set by the RATIO knob.

RATIO

Specifies the scale to which passages that are louder than the level set by the THRESHOLD knob are lowered (compressed). RATIO depends on THRESHOLD to function. The values given range from 1:1 up to 100:1. The higher the ratio, the more a sound is compressed.
At a ratio of 1:1, the sound will come out as it is (uncompressed).
At a ratio of 2:1, the signal will be reduced by a factor of two (the output produced will be half as loud as the input).
At a ratio of 4:1, the signal will be reduced by a factor of four (the output level will be 4x quieter than the input level), and so on.

SATURATION

Adjusts the amount of saturation applied to the compressed signal. At lower settings, it adds subtle color and thickness to the sound, while higher settings yield a more aggressively driven and overdriven character.

Note that when saturation is applied in POLY mode, the saturation will affect the output of each voice individually. In MASTER mode, saturation will affect the entire output.

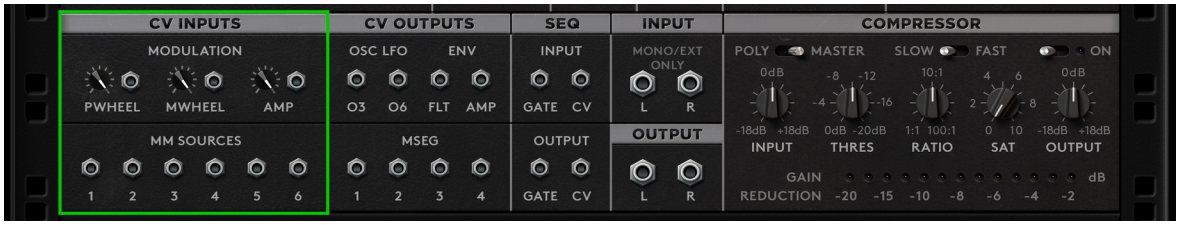
OUTPUT

Adjusts the output level of the compressor in decibels (dB). The OUTPUT knob serves to make up for the gain reduction caused by the compressor by increasing the level after the compressor has affected the sound.

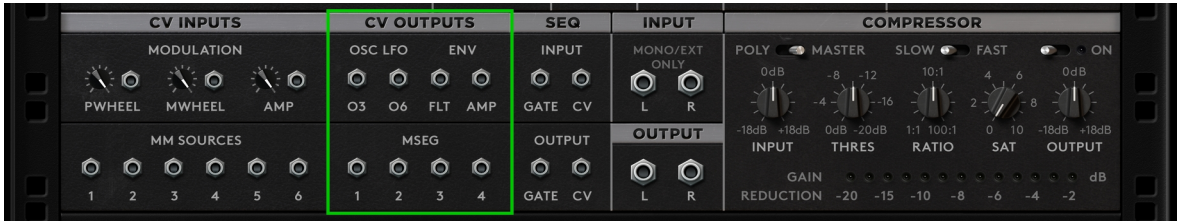
4.3. Audio and CV connections

4.3.1. CV Inputs

The Global CV inputs allow to modulate the pitch, modulation wheel and amplifier amounts and add six CV sources to the modulation matrix.



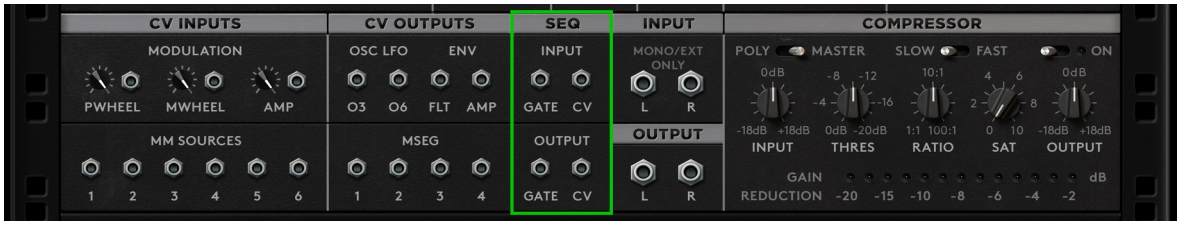
4.3.2. CV Outputs



The Global CV outputs allow to modulate the external Reason devices.

The outputs send the current The Legend HZ's values of Oscillator 3, Oscillator 6, Filter Envelope, Amplifier Envelope, and four MSEGs.

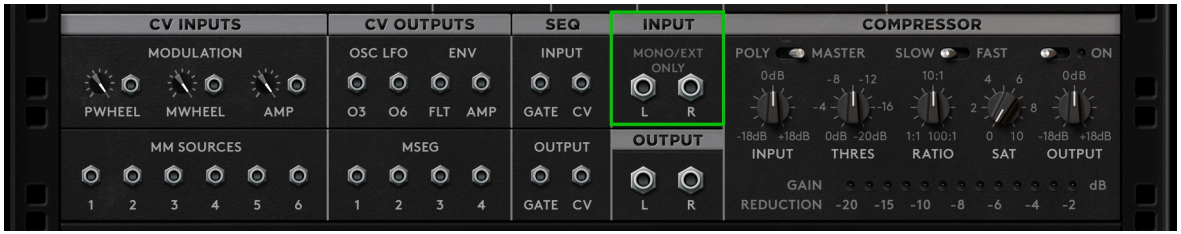
4.3.3. Sequencer Inputs/Outputs



The sequencer inputs can be used to connect Reason's step sequencers (such as Matrix, RPG-8, or Thor's) to program monophonic note sequences using Gate/CV signals.

The sequencer outputs send note sequences using Gate/CV signals to other Reason devices.

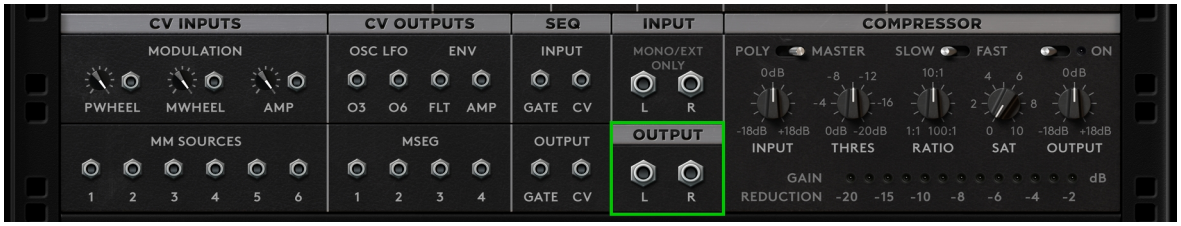
4.3.4. Audio Input



A pair of audio inputs, which allow you to connect other stereo devices to The Legend HZ. Any stereo audio signal can be treated with the filter, drive, saturation, global feedback and the effects of The Legend HZ.

Note: To be able to process audio input, the POLYPHONY musts be set to MONO/EXT.

4.3.5. Audio Output



This section hosts the stereo output of The Legend HZ.

For mono output, use the left (L) connector.

5. Arpeggiator/Sequencer

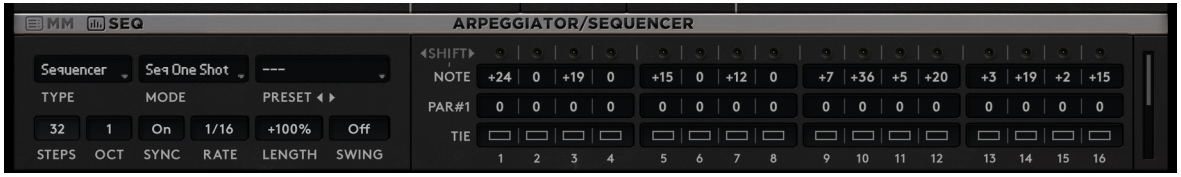
This chapter provides an in-depth look at The Legend HZ's internal ARP/SEQUENCER.

It's important to become familiar with the contents of this chapter both to understand how the ARP/SEQUENCER functions independently, and how to utilize it effectively as a modulation source in the Mod Matrix.

The Legend HZ's ARP/SEQUENCER is accessible on the bottom row of the user interface on the front panel.

Designed with ease of use in mind, the ARP/SEQUENCER has an accessible and straightforward interface that simplifies the process of adding rhythmic or cyclical elements to a patch.

Simple though it may be, it's also highly programmable and capable of complex modulations by virtue of its inclusion as a modulation source in the Mod Matrix.



TYPE

By default, TYPE is set to Sequencer. Clicking on the display above "TYPE" will prompt a dropdown menu that shows the ARP/SEQUENCER's other TYPE: MIDI. The two types are covered below.

- **Sequencer** - makes it possible to create monophonic patterns of up to 32 steps. These patterns may be user-generated or chosen from among 20 factory presets.
- **MIDI** - makes it possible to choose standard MIDI files for creating sequenced patterns. Note that these files should be monophonic, and only a single track.

MODE

MODES determine the behavior of the playback sequence.

The Legend HZ's ARPEGGIATOR/SEQUENCER has 12 modes that can be chosen by clicking on the display above MODE.

- **UP** - Successively triggers each note pressed in order of lowest to highest. The sequence restarts once the highest note has been reached.
- **Down** - Successively triggers each note pressed in order of highest to lowest. The sequence restarts once the lowest note has been reached.
- **Up/Down** - Successively triggers each note pressed in order of lowest to highest, then back down to the lowest note. The sequence restarts after the second lowest note has been reached.
- **Down/UP** - Successively triggers each note pressed in order of highest to lowest, then back up to the highest note. The sequence restarts after the second highest note has been reached.
- **Alt Up** - A variation of UP mode. The sequencer alternates the note order of arpeggiation going up. In a four note, one octave chord (for example, DFAD), the sequencer plays an Up-Down-Up pattern, or D-A-F-D, starting from the low D.
- **Alt Down** - A variation of Down mode. The sequencer alternates the note order of arpeggiation going down. In a four note, one octave chord (for example, DFAD), the sequencer plays a Down-Up-Down pattern, or D-F-A-D, starting from the high D.
- **Random** - Triggers each note held in a random order.
- **Chord** - Makes the arpeggiator/sequencer polyphonic. Chords will be chopped into rhythmic patterns according to the notes held by the user.
- **Seq Forward** - The sequencer will play back the notes programmed for each step by moving forward from step 1 to the sequence's final step. Once the final step of the sequence has been reached, the sequencer will start again at step 1.

- **Seq Backward** - The sequencer will play back the notes programmed for each step by moving backward from the sequence's final step to step 1. Once step 1 has been reached, the sequencer will start again at the sequence's final step.
- **Seq Ping Pong** - The sequencer will play back the notes programmed for each step by moving forward from step 1 to the final step of the sequence. Once the final step of the sequence has been reached, the sequencer will move backward to step 1, at which point it will start again.
- **Seq One Shot** - Works the same as Seq Forward, with one exception. When the sequence reaches its final step, the sequencer will not start again until a new note is triggered. This is highly effective for musical sections that require a short, unrepeated sequence to arpeggiate.

PRESET

Factory presets can be loaded into the sequencer by clicking on the display above PRESET. This will prompt a dropdown menu with additional “Initialize Sequencer” choice, which simply initializes the sequencer to the default/empty state.

STEPS

Specifies the length of a sequence in steps. This will change depending on the Sequencer TYPE chosen. The length of the sequence can be changed by dragging up or down on the display above "STEPS" in Sequencer Type or "BARS" in MIDI type.

With Sequencer selected as the TYPE, the specified length will be given in STEPS. By default, the sequencer is set to 8 steps, however up to 32 steps can be used in a sequence.

With MIDI selected as the TYPE, the specified length will be given in BARS.

OCT

Specifies the number of octaves a sequence uses.

By default, OCT is set to 1, meaning the sequence will span only one octave. In this case, the sequencer uses only the keys pressed.

Set to more than one octave, the sequencer will repeat the keys pressed for the number of octaves specified.

To specify the number of octaves used by the sequencer, drag up or down on the display above OCT.

RATE

Specifies the note values used in the arpeggiated sequence.

Since the ARPEGGIATOR/SEQUENCER is synced to the host DAW or hardware, this is given in musical values. These range from 1 dotted measure (1/1*) on the low end when dragging the display of RATE all the way down, to 128th note triplet (1/128T) when dragging it all the way up. The special symbols (*) and (T) correlate to a dotted note and a triplet, respectively.

LENGTH

Changes the duration of every note in the sequence by either shortening or elongating it.

The values given range from -100% to +100%. Negative values correlate to shorter note durations that yield a staccato effect between notes, while positive values correlate to longer note durations that yield smoother transitions between notes.

The LENGTH is specified by dragging on the display above LENGTH.

SWING

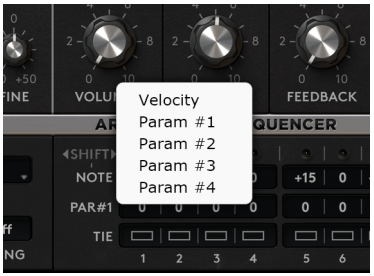
Creates a shuffle effect by altering the rhythmic placement of every other note (2, 4, 6, 8, 10, 12, etc.). Typical swing feels can be achieved at settings of +33% and above. By default, SWING is set in the "Off" position. Drag up on the display to give the arpeggiated sequence a more pronounced shuffling effect.

NOTE

Specifies the MIDI note number of a step in relation to the input note pitch. Set to its default value (0), the ARP/SEQUENCER will only play back the note pressed on the keyboard/MIDI controller.

Drag up or down on the display next to NOTE to set the desired note for a specific step. Steps are numbered below the boxes next to TIE. The values given range from -36 to +36, which correlate to 36 semitones (3 octaves) below or above the input pitch, respectively. Dragging all the way down to the symbol (---) bypasses that step and starts/continues the sequence on the next active step.

PAR 1 - 4



The ARP/SEQUENCER contains 4 parameters (PARs) that are usable only as modulation sources in the Mod Matrix. The use of the four parameters, NOTE values, TIE, and Velocity are only available when Sequencer is chosen as the TYPE. The desired parameter can be chosen by clicking on the display. By default, the display shows PAR#1.

PARs 1-4 are particularly useful for programming precise rhythmic modulations that are synced to the host tempo. Each parameter can produce modulation sequences of up to 32 steps, the speed of which depends on the RATE of the sequencer.

The values given for each parameter's modulation amount range from -100 to +100.

The value can be specified by dragging up or down within each step's designated box next to the PAR#1-4 dropdown menu. A value of 0 correlates to the current value set for the destination parameter. The parameter will therefore have no effect on the destination assigned to it when set to the default position (0) in every active step.

As an example of how this can work, Initialize the patch, set the CUTOFF frequency to around 25 Hz, and set just enough of an ENV AMT so that you can start to hear the note pitch. Now set the FILTER ENVELOPE and AMP ENVELOPE DECAY time to 1.2 s with ATTACK, SUSTAIN, and RELEASE at their minimum values.

Next, toggle the ARP switch on and assign Arp Param 1 in the MOD MATRIX with Filter Cutoff as the destination and the AMT knob turned to +100. Using an 8-step sequence, program each step to increase in value by around +15 with 0 as the first step (0, +15, +30, +45, ...). The result should be that the parameter opens the filter throughout virtually its entire range within an 8-step sequence.

VELOCITY

Velocity can also be chosen as a modulation parameter from the same dropdown menu as Parameters 1-4. The ARP/SEQUENCER's Velocity functions almost identically to the ARP parameters as a modulation source. The primary difference is that velocity amounts are unipolar, ranging from 0 to +127.

TIE

Attaches one step to the next following step(s) by elongating the step by the length of the following step(s). To tie a step, click on the hollow box next to TIE and above the desired step number. When one of the boxes next to TIE is filled, this means that step number has TIE activated.

6. Modulation Matrix

The Legend HZ's Mod Matrix (MM) can be found on the bottom row of the front panel.

As the primary location for assigning one or more of the synth's modulation destinations to a modulation source, the Mod Matrix is an incredibly useful tool in making sounds come alive. It's also where MIDI controllers or control surfaces can be assigned to one of The Legend HZ's many sound parameters.

Modulation sources can be either internal or external. Two examples of internal modulation sources are an LFO and an envelope generator. These (and other sources) can be used to modulate one of The Legend HZ's internal sound parameters, such as CUTOFF frequency, ENV AMT, and oscillator fine tune. These are just a few examples however, as The Legend HZ offers far more capabilities than this.

The Mod Matrix contains 12 separate slots, which means up to 12 simultaneous source-destination combinations are possible. The 12 slots are identical in both form and function. Each slot is designated with its own number (#1-#12) that appears in the grey button under SOURCE. This button also operates as an on/off switch, making it possible to bypass the effect of that slot without having to tamper with the AMT knob setting.

The three essential functions of the Mod Matrix's slots are covered below.

SOURCE

Prompts a dropdown menu from which one of The Legend HZ's modulation sources can be chosen.

AMT

Adjusts the amount of modulation applied to the DESTINATION by the SOURCE. For all 12 MOD MATRIX slots the AMT knob is bipolar. In general, this means that setting the AMT knob to values below 0 will have the opposite effect of setting it to values above 0.

DESTINATION

Prompts a dropdown menu from which one of The Legend HZ's modulation destinations can be chosen.

6.1. Sources

Listed below are the Mod Matrix's available modulation sources, which can be accessed by clicking on the display above SOURCE.

All sources in The Legend HZ are converted to the same range: [0, +1] for unipolar sources, and [-0.5, +0.5] for bipolar sources.

The current value of a source is multiplied by the amount value [-100 to +100] within the same modulation slot. The result of this modulation is then added to the selected destination parameter.

CV 1,2, 3, 4, 5, 6

The CV Input signals coming from the back panel.

Velocity (+)

Transmits MIDI Note-ON velocity information above the AMT knob setting the instant a key is pressed. The harder keys are hit, the higher the transmitted values will be. The range of these values is determined by the AMT knob, with higher values corresponding to a wider range.

Velocity (+/-)

Like Velocity (+), but bipolar. Transmits MIDI Note-ON velocity information either above or below the destination parameter's setting, depending on how hard a key is pressed. Softer hit notes correlate to values at or below the destination parameter's setting, whereas harder hit notes correlate to values at or above its setting.

As an example of how this works, if Velocity (+) is assigned to the destination Filter Cutoff with the AMT knob at +100 and the CUTOFF frequency set to 800Hz, the velocity information sent by a MIDI controller will only transmit cutoff frequencies of 800Hz and above (up to 28kHz). With the same settings, Velocity (+/-) will let velocity information transmit cutoff frequencies both above and below 800Hz, making it possible to utilize The Legend HZ's entire CUTOFF range (depending on play style, the sensitivity of the controller, and velocity settings).

ARP Velocity

Assigns the velocity information sent from the arpeggiator as the modulation source.

This can be used to create rhythmic modulations that are synced to the host tempo.

ARP Param 1-4

Assigns ARP Param (parameter) 1-4 as the modulation source.

Like ARP Velocity, these can be used to create rhythmic modulations.

Modwheel

Assigns the modwheel (CC#01) as the modulation source.

Aftertouch

Assigns aftertouch (pressure information) as the modulation source.

PolyAT

Assigns Polyphonic Aftertouch as the modulation source. Unlike aftertouch, which is transmitted for the entire keyboard, PolyAT is transmitted on a per-note basis. The effects of this assignment can only be heard on MIDI controllers with polyphonic aftertouch.

Foot

Assigns MIDI Foot controller (CC#04) as the modulation source.

Expression

Assigns MIDI Expression (CC#11) as the modulation source.

Bright (74)

Assigns the current value of MIDI Brightness (CC#74) as the modulation source. With MIDI Polyphonic Expression (MPE), brightness values can be sent individually for each key pressed.

Bright > 100

Assigns the current value of MIDI Brightness (CC#74) as the modulation source for values above 100.

Breath

Assigns MIDI Breath controller (CC#02) as the modulation source.

Const

Sets a constant value for the modulation destination. This can be useful to set values for parameters only available in the Mod Matrix, to limit the possible range of modulation, or to prevent a parameter from being changed at a later stage.

Random 1-4

Sends a random value to a destination parameter whenever a voice is triggered.

This is useful for adding unpredictability to a sound. Note that each random source is different than the others.

Keytrack C0 / C3 / C6

Assigns the MIDI note number as the modulation source, relative to C0 / C3 / C6.

Osc 3 / Osc 6

Assigns Osc 3 / Osc 6 as the modulation source (LFO).

Osc 3*MW

Assigns the value of Osc 3 multiplied by modulation wheel information as the source.

Osc 3's modulation depth will be controlled by the mod wheel.

Osc 6*MW

Assigns the value of Osc 6 multiplied by modulation wheel information as the source.

Osc 6's modulation depth will be controlled by the mod wheel.

MSEG 1-4

Assigns the output of MSEG 1-4 as the modulation source.

MSEG 1-4*Vel

Assigns the output of MSEG 1-4 multiplied by velocity information as the modulation source.

MSEG1-4*MW

Assigns the output of MSEG 1 multiplied by modulation wheel information as the modulation source. The depth of the chosen MSEG's modulation will be controlled by the mod wheel.

MSEG1-4*AT

Assigns the output of MSEG1-4 multiplied by aftertouch as the modulation source. The depth of the chosen MSEG's modulation will be controlled by aftertouch.

6.2. Destinations

Virtually all of The Legend HZ's sound parameters can be modulated via the Mod Matrix by assigning them as destinations. This also includes nearly every effect parameter on the back panel. All Mod Matrix destinations are listed below.

Filter Cutoff

Assigns the FILTER section's CUTOFF frequency as the destination.

Filter Reso

Assigns the FILTER section's RESONANCE amount as the destination.

Filter Drive

Assigns the FILTER section's DRIVE amount as the destination.

Mod Amt

Assigns the modulation amount as the destination. The mod wheel is most often used to control this parameter, but it may also be desirable to use a source like Aftertouch to control the Mod Amt. Note that one or both toggle switches in the CONTROLS section needs to be switched in the "ON" position for this to have any effect.

Env Amt

Assigns the FILTER section's envelope amount (Env Amt) as the destination.

Pulse Width

Assigns the pulse width (PW) of all oscillators as the destination. Note that one or more of the oscillators needs to be set to Square, Wide Pulse, or Narrow Pulse for this to work. For control over the pulse width of a specific oscillator, use the Osc PW destination instead.

Mixer Volume

Assigns the volume of all sound sources (oscillators and the noise generator) as the destination. Useful for when the pre-filter volume level needs to be automated.

Master Volume

Assigns the master volume (all sound sources and effects) as the destination.

Glide

Assigns the GLIDE amount as the destination.

Filter Attack

Assigns the FILTER ENVELOPE's ATTACK time as the destination.

Filter Decay

Assigns the FILTER ENVELOPE's DECAY time as the destination.

Filter Sustain

Assigns the FILTER ENVELOPE's SUSTAIN amount as the destination.

Filter Rel

Assigns the FILTER ENVELOPE's RELEASE time as the destination.

Amp Attack

Assigns the AMPLIFIER ENVELOPE's ATTACK time as the destination.

Amp Decay

Assigns the AMPLIFIER ENVELOPE's DECAY time as the destination.

Amp Sustain

Assigns the AMPLIFIER ENVELOPE's SUSTAIN amount as the destination.

Amp Release

Assigns the AMPLIFIER ENVELOPE's RELEASE time as the destination.

Pitch Coarse

Assigns COARSE pitch (GLOBAL) as the destination.

Pitch Fine

Assigns FINE pitch (GLOBAL) as the destination.

Detune

Assigns DETUNE (OUTPUT) as the destination.

Spread

Assigns SPREAD (OUTPUT) as the destination.

Osc 1-6 Semi

Assigns oscillator SEMI (coarse tuning) as the destination.

Osc 1-6 Fine

Assigns oscillator FINE (fine tuning) as the destination.

Osc 1-6 PW (Pulse Width)

Assigns PULSE WIDTH for the chosen oscillator as the destination.

No equivalent knob exists on the front panel that can be used to control oscillator pulse width, since the WAVEFORM selector remains locked on the chosen oscillator type.

Pulse Width Modulation (PWM) can therefore only be accomplished via the Mod Matrix.

Osc 1-6 Vol

Assigns oscillator VOLUME as the destination.

Osc 1-6 Range

Assigns the RANGE of the chosen oscillator as the destination.

Noise Mix

Assigns the noise volume in the MIXER section as the destination.

MM 1-12 AMT (Amount)

Assigns one of the twelve MOD MATRIX slot's Amount number as the destination.

Phas Rate

Assigns the PHASER unit's RATE as the destination.

Phas Width

Assigns the PHASER unit's stereo WIDTH as the destination.

Phas Dry/Wet

Assigns the PHASER unit's DRY/WET ratio as the destination.

Chr Rate

Assigns the CHORUS unit's RATE as the destination.

Chr Width

Assigns the CHORUS unit's stereo WIDTH as the destination.

Chr Dry/Wet

Assigns the CHORUS unit's DRY/WET ratio as the destination.

Delay Time

Assigns the DELAY unit's L-TIME as the destination.

Delay Wow

Assigns the DELAY unit's WOW knob as the destination.

Delay Tape

Assigns the DELAY unit's TAPE SAT amount as the destination.

Delay Fbk

Assigns the DELAY unit's Feedback amount as the destination.

Delay Width

Assigns the DELAY unit's stereo WIDTH as the destination.

Delay Dry/Wet

Assigns the DELAY unit's DRY/WET ratio as the destination.

Rvrb Time

Assigns the REVERB unit's TIME setting as the destination.

Rvrb Color

Assigns the REVERB unit's COLOR ratio as the destination.

Rvrb Width

Assigns the Reverb unit's WIDTH setting as the destination.

Rvrb Dry/Wet

Assigns the REVERB unit's DRY/WET ratio as the destination.

MSEG 1-4 Rate

Assigns the RATE of the chosen MSEG as the destination.

This makes it possible to change the MSEG's RATE of modulation over time with an LFO, or to base it on pitch information via one of the keytracking sources, etc.

MSEG 1-4 Trigger

Assigns the Trigger of the chosen MSEG as the destination.

This makes it possible to trigger the MSEG only when it receives information from a destination source.

Note that it's necessary to have two available modulation slots for this to function: one to assign a destination parameter to an MSEG for modulation (for instance, CUTOFF), and one to assign a source to trigger the MSEG (Aftertouch, etc.).

FFB LP

Assigns the FIXED FILTER BANK's LOW PASS filter as the destination.

FFB 125

Assigns the FIXED FILTER BANK's 125 Hz filter as the destination.

FFB 175

Assigns the FIXED FILTER BANK's 175 Hz filter as the destination.

FFB 250

Assigns the FIXED FILTER BANK's 250 Hz filter as the destination.

FFB 350

Assigns the FIXED FILTER BANK's 350 Hz filter as the destination.

FFB 500

Assigns the FIXED FILTER BANK's 500 Hz filter as the destination.

FFB 700

Assigns the FIXED FILTER BANK's 700 Hz filter as the destination.

FFB 1K

Assigns the FIXED FILTER BANK's 1 kHz filter as the destination.

FFB 1.4K

Assigns the FIXED FILTER BANK's 1.4 kHz filter as the destination.

FFB 2K

Assigns the FIXED FILTER BANK's 2 kHz filter as the destination.

FFB 2.8K

Assigns the FIXED FILTER BANK's 2.8 kHz filter as the destination.

FFB 4K

Assigns the FIXED FILTER BANK's 4 kHz filter as the destination.

FFB 5.6K

Assigns the FIXED FILTER BANK's 5.6 kHz filter as the destination.

FFB HP

Assigns the FIXED FILTER BANK's HIGH PASS filter as the destination.

Comp Input

Assigns the COMPRESSOR unit's INPUT level as the destination.

Comp Thres

Assigns the COMPRESSOR unit's THRESHOLD amount as the destination.

Comp Ratio

Assigns the COMPRESSOR unit's RATIO setting as the destination.

Comp Output

Assigns the COMPRESSOR unit's OUTPUT level as the destination.

Comp Sat

Assigns the COMPRESSOR unit's SATURATION amount as the destination.

Arp Rate

Assigns the ARP RATE setting as the destination.

Mixer Pan

Assigns the panorama of all sound sources (oscillators and the noise generator) as the destination. Useful for when the pre-filter panorama needs to be automated.

Master Pan

Assigns the master panorama (all sound sources and effects) as the destination.

EQ 16k

Assigns the EQ's 16 kHz band as the destination.

EQ 8k

Assigns the EQ's 8 kHz band as the destination.

EQ 4k

Assigns the EQ's 4 kHz band as the destination.

EQ 2k

Assigns the EQ's 2 kHz band as the destination.

EQ 1k

Assigns the EQ's 1 kHz band as the destination.

EQ 500

Assigns the EQ's 500 Hz band as the destination.

EQ 250

Assigns the EQ's 250 Hz band as the destination.

EQ 250

Assigns the EQ's 125 Hz band as the destination.

EQ 63

Assigns the EQ's 63 Hz band as the destination.

EQ 31

Assigns the EQ's 31 Hz band as the destination.

Appendix A. MIDI Implementation Chart

Parameter	CC#
Glide	5
Modulation Mix	16
Modulation Osc	14
Modulation Filter	15
Tuning Coarse	20
Tuning Fine	21
Oscillator 1 Active	22
Oscillator 1 Waveform	23
Oscillator 1 Range	24
Oscillator 1 Semi	40
Oscillator 1 Fine	41
Oscillator 2 Active	25
Oscillator 2 Waveform	26
Oscillator 2 Range	27
Oscillator 2 Semi	42
Oscillator 2 Fine	43

Parameter	CC#
Oscillator 3 Active	28
Oscillator 3 Keytrack	31
Oscillator 3 Waveform	29
Oscillator 3 Range	30
Oscillator 3 Semi	44
Oscillator 3 Fine	45
Oscillator 4 Active	33
Oscillator 4 Waveform	34
Oscillator 4 Range	35
Oscillator 4 Semi	36
Oscillator 4 Fine	37
Oscillator 5 Active	56
Oscillator 5 Waveform	57
Oscillator 5 Range	58
Oscillator 5 Semi	59
Oscillator 5 Fine	60

MIDI Implementation Chart cdn.

Parameter	CC#
Oscillator 6 Active	61
Oscillator 6 Keytrack	62
Oscillator 6 Waveform	63
Oscillator 6 Range	65
Oscillator 6 Semi	66
Oscillator 6 Fine	67
Oscillator 1 Volume	46
Oscillator 2 Volume	47
Oscillator 3 Volume	48
Oscillator 4 Volume	53
Oscillator 5 Volume	54
Oscillator 6 Volume	55
Noise Amount	49
Noise Type	50
Drive Amount	51
Feedback Amount	52

Parameter	CC#
Filter Type	70
Filter LP/BP	84
Filter Keytrack 1	78
Filter Keytrack 2	79
Filter Cutoff	74
Filter Resonance	71
Filter Envelope Amount	77
Filter Envelope Attack	80
Filter Envelope Decay	81
Filter Envelope Sustain	82
Filter Envelope Release	83
Amplifier Envelope Attack	73
Amplifier Envelope Decay	75
Amplifier Envelope Sustain	76
Amplifier Envelope Release	72
Polyphony	8

MIDI Implementation Chart cdn.

Parameter	CC#
Volume	7
Unison Spread	18
Unison Detune	19
Unison Mode	17
Effects Active	12
ARP Active	13
MSEG 1 Sync	180
MSEG 2 Sync	181
MSEG 3 Sync	182
MSEG 4 Sync	183
MSEG 1 Rate	184
MSEG 1 Rate Sync	185
MSEG 2 Rate	186
MSEG 2 Rate Sync	187
MSEG 3 Rate	188
MSEG 3 Rate Sync	189

Parameter	CC#
MSEG 4 Rate	190
MSEG 4 Rate Sync	191
MM #1 Amount	140
MM #2 Amount	141
MM #3 Amount	142
MM #4 Amount	143
MM #5 Amount	144
MM #6 Amount	145
MM #7 Amount	146
MM #8 Amount	147
MM #9 Amount	148
MM #10 Amount	149
MM #11 Amount	150
MM #12 Amount	151

MIDI Implementation Chart cdn.

Parameter	CC#
MM #1 Mute	152
MM #2 Mute	153
MM #3 Mute	154
MM #4 Mute	155
MM #5 Mute	156
MM #6 Mute	157
MM #7 Mute	158
MM #8 Mute	159
MM #9 Mute	160
MM #10 Mute	161
MM #11 Mute	162
MM #12 Mute	163

Parameter	CC#
ARP Octave	110
ARP Sync	111
ARP Rate	112
ARP Length	113
ARP Swing	114
ARP Slide	115

Appendix B. Remote Map

Synapse Audio	The Legend HZ				
Note On	0	1		Toggle	ValueOutput
Volume	0	10		Value	ValueOutput
Polyphony	0	4		Value	ValueOutput
Unison Spread	0	10		Value	ValueOutput
Unison Detune	0	10		Value	ValueOutput
Unison Mode	0	1		Toggle	ValueOutput
Effects Active	0	1		Toggle	ValueOutput
ARP Active	0	1		Toggle	ValueOutput
Glide	0	10		Value	ValueOutput
Modulation Mix	-10	10		Value	ValueOutput
Modulation Osc	0	1		Toggle	ValueOutput
Modulation Filter	0	1		Toggle	ValueOutput
Tuning Coarse	-2	2		Value	ValueOutput
Tuning Fine	-100	100		Value	ValueOutput

Remote Map cdn.

Synapse Audio	The Legend HZ				
Oscillator 1 Active	0	1		Toggle	ValueOutput
Oscillator 1 Waveform	0	6		Value	ValueOutput
Oscillator 1 Range	0	5		Value	ValueOutput
Oscillator 1 Semi	-7	7		Value	ValueOutput
Oscillator 1 Fine	-50	50		Value	ValueOutput
Oscillator 2 Active	0	1		Toggle	ValueOutput
Oscillator 2 Waveform	0	6		Value	ValueOutput
Oscillator 2 Range	0	5		Value	ValueOutput
Oscillator 2 Semi	-7	7		Value	ValueOutput
Oscillator 2 Fine	-50	50		Value	ValueOutput
Oscillator 3 Active	0	1		Toggle	ValueOutput
Oscillator 3 Keytrack	0	1		Toggle	ValueOutput
Oscillator 3 Waveform	0	6		Value	ValueOutput
Oscillator 3 Range	0	5		Value	ValueOutput
Oscillator 3 Semi	-7	7		Value	ValueOutput
Oscillator 3 Fine	-50	50		Value	ValueOutput

Remote Map cdn.

Synapse Audio	The Legend HZ				
Oscillator 4 Active	0	1		Toggle	ValueOutput
Oscillator 4 Waveform	0	6		Value	ValueOutput
Oscillator 4 Range	0	5		Value	ValueOutput
Oscillator 4 Semi	-7	7		Value	ValueOutput
Oscillator 4 Fine	-50	50		Value	ValueOutput
Oscillator 5 Active	0	1		Toggle	ValueOutput
Oscillator 5 Waveform	0	6		Value	ValueOutput
Oscillator 5 Range	0	5		Value	ValueOutput
Oscillator 5 Semi	-7	7		Value	ValueOutput
Oscillator 5 Fine	-50	50		Value	ValueOutput
Oscillator 6 Active	0	1		Toggle	ValueOutput
Oscillator 6 Keytrack	0	1		Toggle	ValueOutput
Oscillator 6 Waveform	0	6		Value	ValueOutput
Oscillator 6 Range	0	5		Value	ValueOutput
Oscillator 6 Semi	-7	7		Value	ValueOutput
Oscillator 6 Fine	-50	50		Value	ValueOutput

Remote Map cdn.

Synapse Audio	The Legend HZ				
Oscillator 1 Volume	0	10		Value	ValueOutput
Oscillator 2 Volume	0	10		Value	ValueOutput
Oscillator 3 Volume	0	10		Value	ValueOutput
Oscillator 4 Volume	0	10		Value	ValueOutput
Oscillator 5 Volume	0	10		Value	ValueOutput
Oscillator 6 Volume	0	10		Value	ValueOutput
Noise Amount	0	10		Value	ValueOutput
Noise Type	0	1		Toggle	ValueOutput
Drive Amount	0	10		Value	ValueOutput
Feedback Amount	0	10		Value	ValueOutputt

Remote Map cdn.

Synapse Audio	The Legend HZ				
Filter Type	0	1		Toggle	ValueOutput
Filter LP/BP	0	1		Toggle	ValueOutput
Filter Keytrack 1	0	1		Toggle	ValueOutput
Filter Keytrack 2	0	1		Toggle	ValueOutput
Filter Cutoff	0,025	28		Value	ValueOutput
Filter Resonance	0	10		Value	ValueOutput
Filter Envelope Amount	0	10		Value	ValueOutput
Filter Envelope Attack	0,002	35		Value	ValueOutput
Filter Envelope Decay	0	10		Value	ValueOutput
Filter Envelope Sustain	0	10		Value	ValueOutput
Filter Envelope Release	0	10		Value	ValueOutput
Amplifier Envelope Attack	0,002	35		Value	ValueOutput
Amplifier Envelope Decay	0	10		Value	ValueOutput
Amplifier Envelope Sustain	0	10		Value	ValueOutput
Amplifier Envelope Release	0	10		Value	ValueOutput

Remote Map cdn.

Synapse Audio	The Legend HZ				
MM #1 Amount	-100	100		Value	ValueOutput
MM #1 Mute	0	1		Toggle	ValueOutput
MM #2 Amount	-100	100		Value	ValueOutput
MM #2 Mute	0	1		Toggle	ValueOutput
MM #3 Amount	-100	100		Value	ValueOutput
MM #3 Mute	0	1		Toggle	ValueOutput
MM #4 Amount	-100	100		Value	ValueOutput
MM #4 Mute	0	1		Toggle	ValueOutput
MM #5 Amount	-100	100		Value	ValueOutput
MM #5 Mute	0	1		Toggle	ValueOutput
MM #6 Amount	-100	100		Value	ValueOutput
MM #6 Mute	0	1		Toggle	ValueOutput
MM #7 Amount	-100	100		Value	ValueOutput
MM #7 Mute	0	1		Toggle	ValueOutput
MM #8 Amount	-100	100		Value	ValueOutput
MM #8 Mute	0	1		Toggle	ValueOutput

Remote Map cdn.

Synapse Audio	The Legend HZ				
MM #9 Amount	-100	100		Value	ValueOutput
MM #9 Mute	0	1		Toggle	ValueOutput
MM #10 Amount	-100	100		Value	ValueOutput
MM #10 Mute	0	1		Toggle	ValueOutput
MM #11 Amount	-100	100		Value	ValueOutput
MM #11 Mute	0	1		Toggle	ValueOutput
MM #12 Amount	-100	100		Value	ValueOutput
MM #12 Mute	0	1		Toggle	ValueOutput
ARP Octave	0	3		Value	ValueOutput
ARP Sync	0	1		Toggle	ValueOutput
ARP Rate	0	23		Value	ValueOutput
ARP Length	-100	100		Value	ValueOutput
ARP Swing	0	75		Value	ValueOutput

Remote Map cdn.

Synapse Audio	The Legend HZ				
MSEG 1 Sync	0	1		Toggle	ValueOutput
MSEG 2 Sync	0	1		Toggle	ValueOutput
MSEG 3 Sync	0	1		Toggle	ValueOutput
MSEG 4 Sync	0	1		Toggle	ValueOutput
MSEG 1 Rate	0,1	10		Value	ValueOutput
MSEG 1 Rate Sync	0	26		Value	ValueOutput
MSEG 2 Rate	0,1	10		Value	ValueOutput
MSEG 2 Rate Sync	0	26		Value	ValueOutput
MSEG 3 Rate	0,1	10		Value	ValueOutput
MSEG 3 Rate Sync	0	26		Value	ValueOutput
MSEG 4 Rate	0,1	10		Value	ValueOutput
MSEG 4 Rate Sync	0	26		Value	ValueOutput