

SINGLE-CYCLE FM SYNTHESIZER

LH RESISTOR

User Manual

Expressive sound shaping. Evolving modulation.



SYNTH workspace — Source, SVF, Motion, Index Modulation, envelopes, performance controls, and keyboard

Product 1.0.0 | User Manual 1.0 | August 2026

AU | VST® 3 | Standalone | 64-bit

Contents

Use the first half for sound design; the second covers system behavior, persistence, and reference data. Experienced users can jump directly to Source and FM, Motion, the SVF, or the FX Rack.

Start here

- Welcome to LH RESISTOR
- Quick Start: a playable moving sound
- Interface Overview

Sound design

- Presets and Wave Libraries
- Source and FM
- State Variable Filter
- Motion
- Index Modulation
- Envelopes and Performance
- FX Rack

Control and system

- MIDI Control
- Settings: Libraries, Performance, Audio, About
- What Is Saved Where
- Troubleshooting

Reference

- Parameter Reference
- FX Quick Reference
- MIDI Target Reference
- File Types, Credits, and Legal

Reading strategy Start with Waveform, Index, Cutoff, one Motion destination, and one FX instance. Use the deeper chapters when you need the underlying interaction.

START HERE

Welcome to LH RESISTOR

LH RESISTOR is a single-cycle FM synthesizer built around waveform identity, FM harmonic shaping, a three-branch state-variable filter, nested cyclic modulation, and a serial effects chain.

The instrument in one sentence

A selected single-cycle waveform drives the carrier and internal FM relationship; the result enters parallel LOW, BAND, and HIGH filter branches with independent amplitude envelopes, then the summed signal passes through the serial FX Rack and final Master stage.

SIGNAL PATH

SOURCE > SVF > ENVELOPES > FX > MASTER Source establishes pitch, waveform and FM spectrum. The SVF splits that spectrum into three coordinated layers. LOW/BAND/HIGH envelopes articulate each layer independently. The FX Rack processes the summed result from left to right. Master is the final gain stage.

What makes LH RESISTOR different

- Index, Mod Ratio, Ratio Fine, and Index Modulation directly shape the FM spectrum.
- The SVF is a parallel spectral mixer. LOW, BAND, and HIGH can have different levels, motion amounts, and envelopes.
- Motion has a main LFO whose rate can itself be modulated by a second LFO, producing movement that does not repeat as mechanically as a single fixed-rate LFO.
- The FX Rack is part of each sound. Instances can be repeated and reordered, and each instance keeps its own state.

A useful working method

Build from identity to movement: choose a waveform, set the FM relationship, establish the SVF balance, shape envelopes, then add motion and effects. If a patch becomes hard to understand, temporarily bypass FX and disable unused modulation routes until the core tone is clear again.

START HERE

Quick Start

This path creates a playable moving sound without requiring detailed synthesis knowledge.

1. Open the Preset Library from the folder button and load a sound close to the role you need, or choose NEW INIT for a neutral starting point.
2. Return to SYNTH. In Source, choose a single-cycle waveform. Use the selector, arrow buttons, or mouse wheel over the waveform field to audition nearby waves.
3. Raise INDEX slowly. Then change MOD RATIO. Listen for the point where the harmonic structure becomes useful rather than simply brighter.
4. Set SVF CUTOFF, then balance LOW, BAND, and HIGH. Disable branches you do not need. For a simple baseline, start with LOW only.
5. In Motion, enable one route and use a small signed amount. PITCH gives vibrato; LOW/BAND/HIGH animate the branch levels; MOD RATIO and MOD FINE move the FM relationship.
6. Open FX, choose ADD FX, add one effect, and compare it at matched loudness. Drag cards to change serial order.
7. Use SAVE AS to create a User preset. The modified asterisk beside the preset name clears after a successful save.

Three fast sound-design starting points

Goal	Start here	Then add
Warm pad	LOW dominant; low Index; slow LOW/BAND Attack and Release	Small Motion on BAND; Studio or Decay Reverb
Metallic pluck	Higher Index; non-trivial Mod Ratio; short envelopes	Ratio Fine movement; short delay or light saturation
Moving texture	Two or three SVF branches; moderate Index	Slow Motion plus Rate Mod LFO; stereo delay/reverb

Gain staging Master can add gain, and several FX can add level. When comparing edits, watch the output meter and level-match processed versus bypassed sound. Louder is not automatically better.

[START HERE](#)

Interface Overview

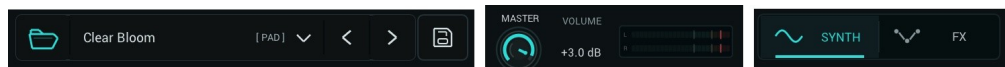


Primary SYNTH workspace

Three work areas

- SYNTH: Source, SVF, Motion, Index Modulation, three branch envelopes, performance controls, and keyboard.
- FX: the serial effect chain plus the detailed editor for the selected effect.
- Settings: Libraries, MIDI, Performance, Audio, and About. The performance strip remains available below the settings pages.

Top bar



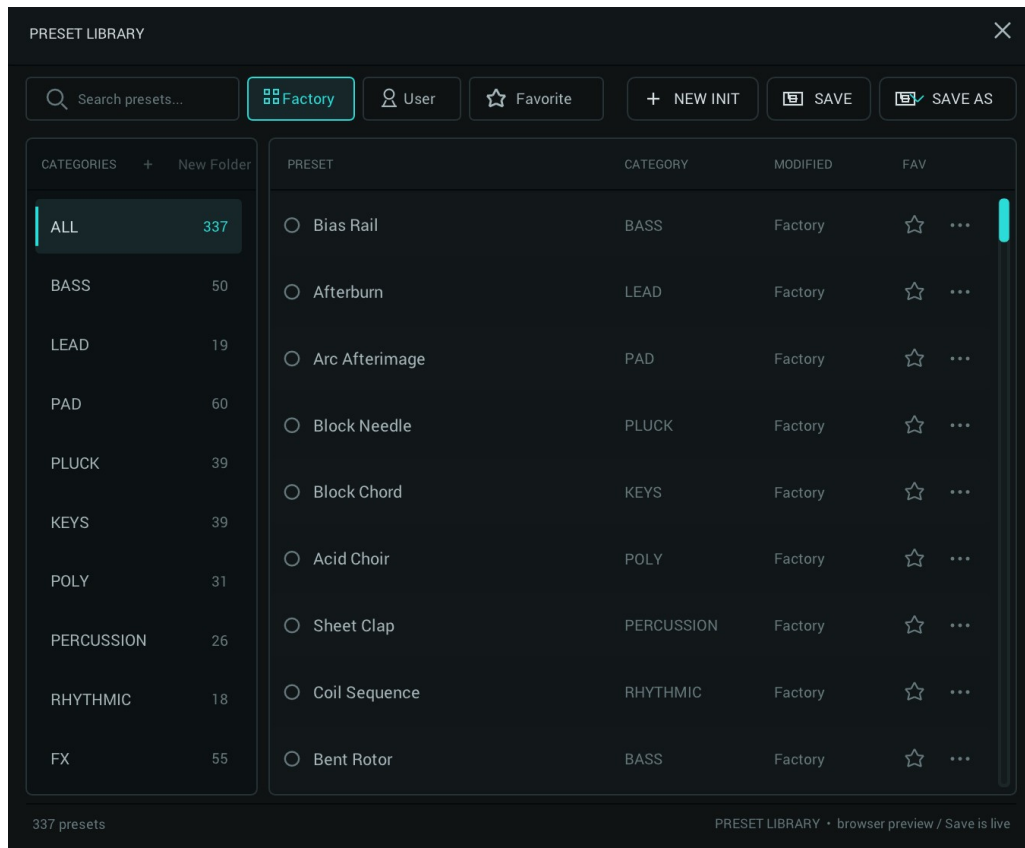
- Settings opens system and environment pages.
- The folder button opens the Preset Library. The preset field shows the current sound; an asterisk means the sound has changed since its last saved state.
- Previous and Next step through the active preset list. Save writes the current editable User preset; Save As creates a new User preset.
- Master and the stereo meter show final instrument output after the FX Rack. SYNTH and FX switch the primary workspace.

Common interaction

- Drag knobs vertically; use the mouse wheel for fine, repeatable changes. Use the value readout when an exact setting matters.
- A lit or colored power state means a branch, route, or effect is active. An explicit OFF state removes that processing route without changing its stored amount.
- Envelope points and range handles are edited directly in their graphs. Sync controls change rate interpretation from free-running time to host-tempo divisions.

SOUND DESIGN

Presets and Wave Libraries



Preset Library — Factory/User/Favorite views, categories, presets, initialization, and save actions

Browsing and loading

- Choose Factory, User, or Favorite, then select a category and preset. The star adds or removes a preset from Favorite.
- NEW INIT starts with a neutral sound and an empty FX chain.
- Factory presets are read-only product content. Use SAVE AS to make an editable User copy before you want to preserve changes.

Version 1.0 Search field Search is not available in version 1.0.

Saving User presets

- SAVE writes back to the current User preset. SAVE AS creates a new preset file and does not silently replace another preset.
- User categories correspond to real folders. Rename, Move, and Delete operate on User preset files, not on Factory content.
- Deleting the currently loaded preset does not immediately silence the instrument: the sound remains in memory until replaced. Save it again if you want to keep it.

Understanding preset state

An asterisk marks direct edits made in LH RESISTOR since the current preset was saved; hosted DAW automation is not counted by this indicator. Factory presets are read-only, SAVE AS creates a User copy, and Favorite is only a browser filter. Save important work before using top-bar Previous/Next for rapid auditioning.

SOUND DESIGN

Waveform Browser and External Libraries



Waveform Browser — browsing and selecting single-cycle assets

Browsing waveforms

- Open the Source waveform field to browse available single-cycle assets. Select a library on the left, then choose a waveform from the preview list. The current waveform also appears in the Source header; the arrow buttons or mouse wheel are useful for faster nearby auditioning.
- The sublabel shows the source library and the waveform's position in that library.
- Factory waves are built into LH RESISTOR. Additional compatible WAV folders can be registered from Settings > Libraries and then appear in the waveform browser.
- Registered folders are scanned when added. Unsupported or invalid WAV files are skipped rather than inserted into the playable library.

Portable sounds

A .lhres preset remembers the waveform identity, but an external WAV is not copied into the preset. When moving a sound to another computer, move the referenced WAV or waveform folder as well and register it on the destination system. If the waveform is unavailable, LH RESISTOR can load the remaining sound with a fallback waveform; verify that replacement before saving.

Library management

Settings > Libraries is a registry of content locations. Missing registered folders remain manageable so they can be relocated or removed. Registration does not transfer ownership of waveform or preset files.

SOUND DESIGN

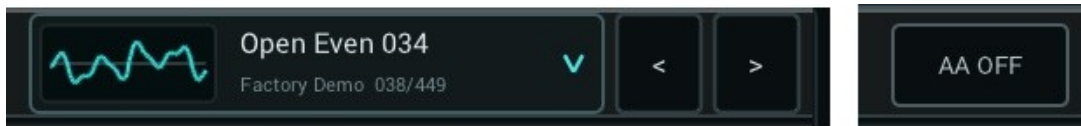
Source and FM



Source — waveform, anti-alias mode, FM controls, unison, and phase

Source defines the periodic waveform, octave, FM relationship, FM depth, unison, and phase behavior.

Waveform and anti-alias mode



Source header — waveform selector and Anti-Alias state

- The selected single-cycle waveform supplies the oscillator identity used by the voice. Click the waveform field to browse; use the arrows or mouse wheel to step through nearby waves.
- AA ON uses band-limited playback levels to reduce high-frequency aliasing as pitch and spectral complexity rise.
- AA OFF uses raw-table playback retained for compatibility and deliberate color. It can be brighter or rougher at the top end.

AA is part of patch design Anti-Alias state is saved with the sound but is not a realtime automation target.

Pitch and FM controls

Control	Range	What it changes
OCT	-3 to +3 oct	Whole-octave carrier transposition.
MOD RATIO	1:1 to 9:1	Frequency relationship of the internal FM oscillator. Integer ratios usually preserve a clearer harmonic relationship.
RATIO FINE	-1.00 to +1.00	Offsets the selected ratio. Useful for beating, metallic spectra, and less strictly harmonic sidebands.

Control	Range	What it changes
INDEX / MOD MIX	Index 0–60; Mix 0–1	INDEX sets the final FM-depth scale; MOD MIX crossfades Index Envelope and Index LFO before that final scaling.

SOUND DESIGN

Source: Unison, Phase, and Listening Strategy

Unison and phase

- UNISON sets 1 to 9 oscillator copies per note. More voices can increase width and CPU use.
- DETUNE spreads unison voices in pitch. Small values thicken the sound; larger values create obvious ensemble-like pitch spread.
- PHASE sets the starting phase. PHASE RANDOM introduces start-phase variation between triggers and voices, changing transient consistency and stereo behavior.

How to tune FM by ear

1. Set INDEX low enough that the original waveform is still recognizable.
2. Choose MOD RATIO for the broad spectral family. Ratios such as 1:1, 2:1, 3:1 and 4:1 often produce recognizably different harmonic balances.
3. Use RATIO FINE only after the ratio is useful. Fine offsets quickly move the spectrum from stable/harmonic toward beating or metallic color.
4. Raise INDEX last. The same Index value can sound radically different on a different waveform or ratio.

Interaction with modulation

Source Index is the final FM-depth ceiling. Index Modulation determines how that depth evolves during the note. Motion can independently move MOD RATIO or MOD FINE, which changes where FM sidebands appear rather than simply making FM stronger.

A practical distinction INDEX sets the overall FM depth. MOD MIX blends the Index Envelope and Index LFO that drive it. Motion on MOD RATIO/MOD FINE changes the FM relationship itself.

SOUND DESIGN

State Variable Filter



SVF response display — LOW, BAND, and HIGH branches share Cutoff and Resonance

The SVF is a parallel filter bank rather than one serial filter mode selector. A single oscillator signal is processed into LOW, BAND, and HIGH branches. Each branch has an independent level, ON/OFF state, amplitude envelope, and Motion destination amount.

Shared filter controls

- CUTOFF: 40 Hz to 4 kHz. It moves the shared crossover/center region of all three responses.
- RESONANCE: 0.30 to 1.50. It emphasizes energy around the cutoff region.
- The spectrum trace behind the response curves shows recent output energy.

Three parallel branches

Branch	Role	Typical use
LOW	Material below the cutoff	Body, fundamental weight, conventional low-pass behavior
BAND	Energy around the cutoff	Presence, nasal/tonal focus, moving mid-band articulation
HIGH	Material above the cutoff	Air, edge, noise-like detail, transient brightness

SOUND DESIGN

SVF as a Three-Layer Spectral Mixer

Branch level and branch power are different

Use the branch level to balance an active layer. Use its power state when you want that route explicitly removed. Keeping a route disabled is clearer than leaving it active at an accidental near-zero level, especially when Motion or envelopes are involved.

A useful construction order

1. Start with LOW only and set CUTOFF/RESONANCE until the basic tonal center is correct.
2. Enable BAND and use its level to add presence. Give BAND a different envelope if you want that presence to appear only during the attack or sustain.
3. Enable HIGH only when the patch benefits from edge or air. A short HIGH envelope can make a transient brighter without making the entire sustain bright.
4. Add Motion to LOW/BAND/HIGH only after the static balance works. Those Motion routes move branch levels; they do not move the shared Cutoff.

Why independent branch envelopes matter

A conventional low-pass synth often has one amplitude envelope and one filter envelope. LH RESISTOR can instead make the low-frequency body, mid-band presence, and high-frequency edge arrive and leave at different times. This creates layered articulation without adding more oscillators.

Example For a struck or plucked texture, keep LOW Release moderate, make BAND Decay shorter, and make HIGH Attack/Decay very fast. The three layers then behave like body, presence, and transient detail.

SOUND DESIGN

Motion



Motion — main LFO, Rate Mod LFO, and six signed destinations

Motion is a dedicated cyclic routing system. Its main LFO creates the modulation shape; a second Rate Mod LFO changes the speed of that main LFO, producing acceleration and deceleration over time.

Main Motion LFO

- Waveforms: Sine, Triangle, Square, Saw Up, Saw Down.
- RATE: free-running 0 to 20 Hz, or host-synced musical divisions when SYNC is enabled.
- RETRIG: restarts the main LFO on note-on. Turn it off for a phase that continues across notes.

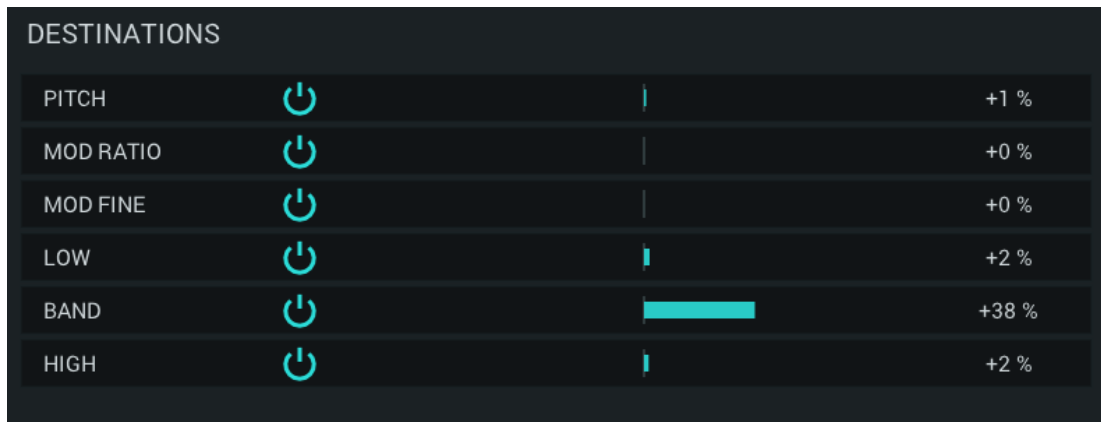
Rate Mod LFO

- Waveforms: the same five shapes as the main LFO.
- RATE: 0.001 to 6 Hz in free mode, or host-synced divisions when its own SYNC is enabled.
- DEPTH: 0 to 100% of the available rate modulation. It changes main-LFO speed, not the target parameter directly.

SOUND DESIGN

Motion Destinations and Timing

Destinations



Motion destinations — per-route power and signed amount

Destination	What moves	Common use
PITCH	Voice pitch	Vibrato, periodic dive/rise, slow pitch drift
MOD RATIO	FM oscillator ratio	Moving sideband structure; animated harmonic relationships
MOD FINE	Fine offset around FM ratio	Metallic beating and subtler spectral movement
LOW	LOW branch level	Body breathing or tremolo-like low-band movement
BAND	BAND branch level	Moving presence/formant-like emphasis
HIGH	HIGH branch level	Shimmer, edge, or high-band pulses

Signed depth

Each destination has its own ON/OFF state and signed amount from -100% through 0 to +100%. Positive and negative values reverse modulation direction.

SYNC and RETRIG answer different questions

- SYNC asks “how is rate measured?” Free mode uses hertz; Sync mode derives a tempo-relative musical rate from the host tempo.
- RETRIG asks “where does the main LFO phase begin?” On restarts per note; Off allows a continuing phase across notes.

Making motion feel less repetitive

Set the main Motion LFO to a slow, obvious movement, then give the Rate Mod LFO a much slower rate and moderate depth. The main LFO speed will expand and contract over time.

SOUND DESIGN

Index Modulation



Index Envelope, Index LFO, and purple Rate Mod LFO

Index Modulation controls how FM intensity evolves. Source > MOD MIX blends the Index Envelope and Index LFO; Source > INDEX scales that result into the final FM depth.

Index Envelope

- Attack: 0.1 ms to 20 s. Decay: 1 ms to 10 s. Sustain: 0 to 1. Release: 1 ms to 16 s.
- Fast Attack/Decay can create a bright transient that settles into a simpler sustain. Longer times create slowly evolving spectral intensity.

Index LFO

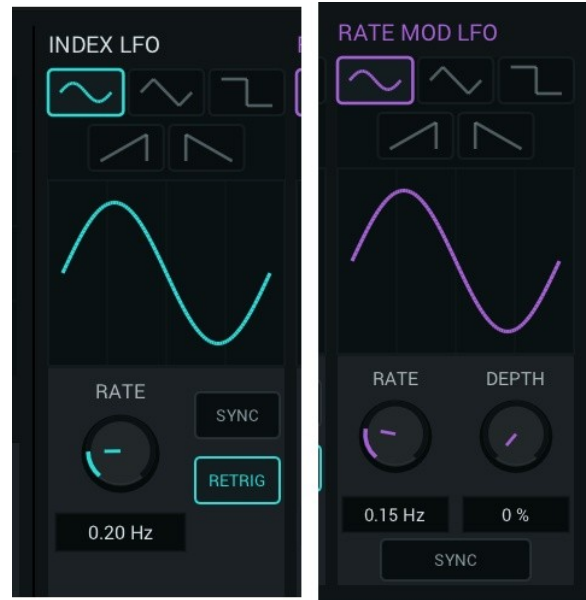
- Waveforms: Sine, Triangle, Square, Saw Up, Saw Down.
- Rate: 0.001 to 20 Hz in free mode, or host-synced divisions with SYNC.
- RETRIG restarts the main Index LFO on note-on.

Index Rate Mod LFO

- This second LFO modulates the speed of the Index LFO. Its free rate is 0.001 to 6 Hz, it has independent SYNC, and DEPTH controls the amount of rate variation.

SOUND DESIGN

Index Modulation in Practice



Index LFO and Rate Mod LFO

MOD MIX is a crossfade, not another Index amount

At one end, modulation follows the Index Envelope. At the other end, it follows the Index LFO. The midpoint blends the two. The final Source INDEX control multiplies that mixed source into the effective FM index.

Four useful patterns

Pattern	Envelope	LFO / Rate Mod	Result
Transient bite	Fast A, short D, low S	Little or no LFO	Bright attack with a cleaner sustain
Evolving pad	Slow A/D, medium-high S	Slow LFO	Continuous harmonic breathing
Rhythmic FM	Moderate envelope	Synced LFO, square/saw	Tempo-related harmonic pulses
Non-mechanical motion	Moderate envelope	LFO plus slow Rate Mod	Cyclic color whose speed itself evolves

Avoiding an over-dense patch

If FM becomes noisy or hard to tune, reduce Source INDEX first. Then simplify either the envelope or LFO contribution using MOD MIX. Finally, disable Motion routes to MOD RATIO/MOD FINE until the static spectrum is clear. This separates “too much FM depth” from “too much FM relationship movement.”

SOUND DESIGN

Envelopes and Performance



Independent LOW, BAND, and HIGH ADSR envelopes

Three independent amplitude envelopes

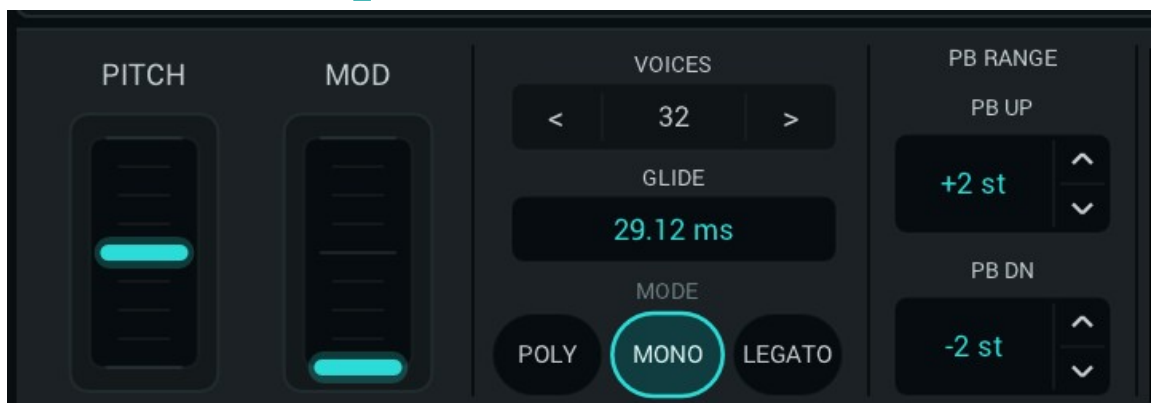
Each SVF branch has its own ADSR. The envelope controls the branch amplitude after filtering, so the three spectral regions can enter, sustain, and release independently.

Stage	Range	Behavior
Attack	0.1 ms to 20 s	Time from note-on to peak.
Decay	1 ms to 10 s	Time from peak to Sustain.
Sustain	0.000 to 1.000	Level held while the note remains active.
Release	1 ms to 16 s	Return to silence after note-off.

Envelope controls are perceptually mapped Envelope time controls use nonlinear UI mapping so useful timing regions receive more control travel. Use the displayed value when exact timing matters.

SOUND DESIGN

Performance Strip



Pitch/Mod wheels, Voices, Glide, Play Mode, and independent pitch-bend ranges

Voice allocation and articulation

- VOICES sets the polyphony ceiling from 1 to 64. Lower values can reduce CPU pressure when a sound uses high Unison, long releases, or a heavy FX chain.
- POLY allows simultaneous notes up to the current voice limit.

- MONO keeps one active voice and retriggers articulation for new notes.
- LEGATO keeps one active voice and favors connected transitions when notes overlap.
- GLIDE sets pitch transition time from 0 to 2000 ms.
- PB UP and PB DN set independent pitch-bend ranges from 0 to 24 semitones.

Pitch and Mod wheels

The left wheel provides pitch bend according to PB UP/PB DN. The Mod wheel provides the instrument's modulation-wheel input. Use Settings > MIDI for explicit controller mappings.

SOUND DESIGN

FX Rack



FX workspace — serial chain, selected editor, and input/output metering

The FX Rack processes the summed synthesizer output from left to right. Each card is an independent instance with its own parameters and state, so the same effect type can appear more than once in a sound.

Building and editing a chain

1. Choose ADD FX and select an effect from the grouped catalogue.
2. Select a card to open its detailed editor in the lower panel.
3. Drag the card handle to reorder it. Audio processing follows the visible left-to-right order.
4. Use ON/OFF to bypass the selected instance, or use the corresponding card power state. Bypass preserves the stored effect settings.
5. Use X to remove an instance completely.
6. Adjust MIX or SEND when the effect provides it, then compare input/output level and bypassed/processed loudness.

Bypass is not the same as MIX = 0 Card power is the execution gate. A time-based stage may remain active at zero SEND/MIX so an existing tail can decay naturally. Use OFF when you want the stage truly bypassed.

Automation policy in 1.0

The complete FX chain is saved with the sound, including instance order and state. Dynamic per-instance FX controls are not exposed as a stable set of DAW automation targets in version 1.0. Automate stable synthesizer/performance parameters instead, and treat the rack as preset state.

SOUND DESIGN

FX Catalogue

The ADD FX browser is grouped by musical role. The table summarizes each effect and its main controls; the selected editor shows the exact available parameters.

Group	Effect	Primary job / controls
Mix / Tone / Dynamics	Gain	Trim or drive level; -60 to +24 dB.
	Param EQ	Eight bands; each band has enable, Frequency 20 Hz–20 kHz, Gain ± 18 dB, Q 0.30–6.00.
	Tone EQ	Low / Mid / High tone gains plus output, each ± 18 dB.
	Compressor	Threshold, Ratio, Attack, Release, Makeup. Control dynamics and density.
	Limiter	Input Gain, Ceiling, Lookahead, Release, Softness. Catch peaks at the end of a chain.
Character	Saturator	Drive, Tone, Softness, Mix, Output. Add nonlinear harmonic color.
	LoFi	Age, Noise, Wow, Dust, Tone, Mix. Degrade and age the signal.
	14-Bit	Fixed 14-bit quantization character.
	Crush	Bits, Rate, Jitter, Clip, Mix. Stronger digital reduction.
	Punch	Comp, Amount, Attack, Release, Makeup, Mix. Shape transient impact and density.

SOUND DESIGN

FX Catalogue: Motion, Rhythm, and Space

Group	Effect	Primary job / controls
Modulation / Motion	Ensemble	Rate, Depth, 2–6 Voices, Width, Mix. Multi-voice widening and movement.
	Phaser	Rate, Depth, Feedback, 2/4/6/8 stages, Mix. Swept phase coloration.
	Warble	Wow, Flutter, Drift, Drop, Mix. Pitch-instability / worn-medium motion.
	Auto Pan	TREM/PAN mode, Rate, Depth, Shape, Phase. Amplitude or stereo-position movement.
Rhythm	Gate	Synced Rate, Shape, Depth, Hold, Mix. Tempo-patterned level gating.
	Stutter	Synced Rate, Size, 1–8 repeats, Decay, Chance, Mix. Captured repeat gestures.
Time / Space	Stereo Delay	Independent L/R time or sync division, feedback, high cut, mix.
	Studio Reverb	Room, Damp, Pre-delay, High Cut, Width, Mix. Room-oriented algorithm.

Group	Effect	Primary job / controls
Onboard	Decay Reverb	Decay 0.35–8 s, Pre-delay, Tone, High Cut, Width, Mix. Decay-time-oriented reverb.
	Onboard Chorus	OFF / LIGHT / MEDIUM / STRONG. Compact legacy chorus character.
	Onboard Delay	Time 0.01–2.0 s and Send. Compact built-in delay.
	Onboard Reverb	OFF / I / II / III / IV plus Send. Discrete legacy reverb modes.

Effect naming “Onboard” effects are the compact original chorus/delay/reverb algorithms. Studio Reverb and Decay Reverb are separate rack effects with dedicated editors and more continuous shaping controls.

SOUND DESIGN

FX Order, Level, and CPU

Order changes the sound

Because the rack is serial, moving a card is not cosmetic. Saturation before reverb distorts only the dry/source material; saturation after reverb also distorts the reverb tail. A gate before delay rhythms the input to the echoes; a gate after delay can chop the echoes themselves.

Useful order experiments

Goal	Try this order	Why
Controlled bright patch	Param EQ > Compressor > Stereo Delay > Reverb	Clean tone first, stabilize dynamics, then create space.
Aggressive texture	Crush/Saturator > Gate/Stutter > Delay	Character feeds rhythm; repeats preserve the processed gesture.
Wide pad	Ensemble > Tone EQ > Reverb	Movement first, tonal correction second, shared space last.
Final peak control	... > Limiter	A final limiter sees the combined level of everything before it.

CPU pressure usually compounds

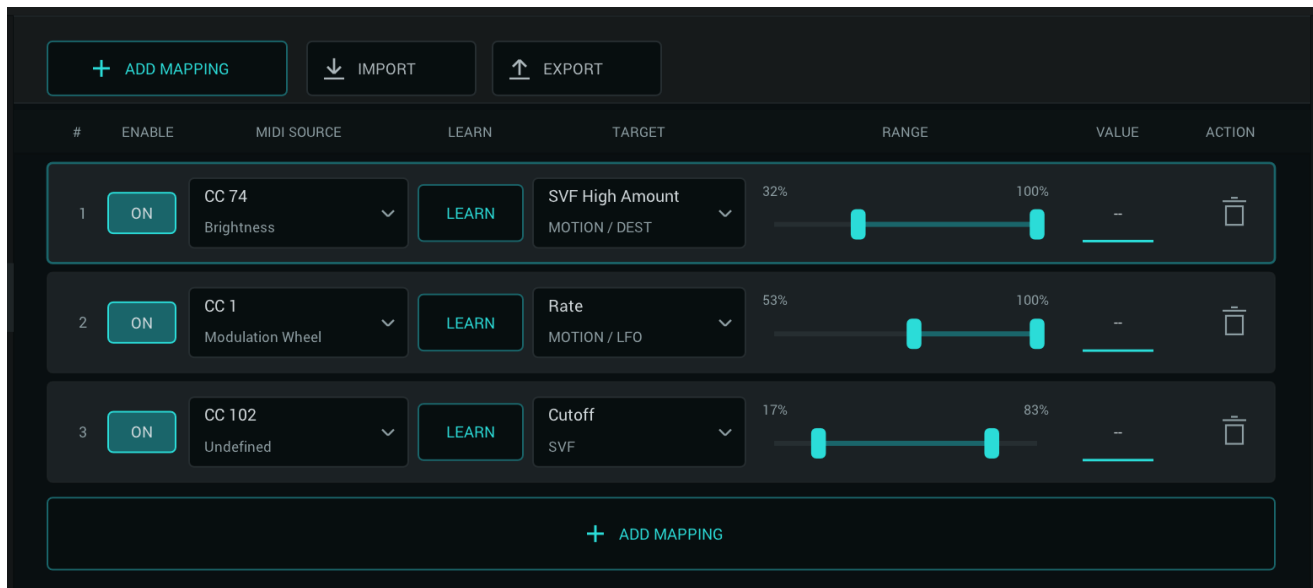
High polyphony, high Unison, long releases, long reverb tails, and a large FX chain all increase CPU load. When CPU is high, reduce VOICES and UNISON first, then shorten long tails or simplify the FX chain. In Standalone, increasing the audio buffer is another option.

Metering discipline

Use the FX input/output meters and editor displays to check level and behavior. Level-match processed and bypassed sound when judging an effect.

CONTROL AND SYSTEM

MIDI Control



MIDI mapping rows — source, Learn, target, range, live value, and actions

The MIDI page creates an explicit controller map without changing the .lhres sound-preset format. Version 1.0 supports MIDI CC and Channel Aftertouch (Channel Pressure) as mapping sources.

Create a mapping

1. Choose CCs or Aftertouch in the left column, then select ADD MAPPING.
2. Choose a MIDI source and a target, or arm LEARN and move the intended controller.
3. Drag the two RANGE handles to define the target minimum and maximum.
4. Use ENABLE to suspend the mapping without deleting it. The live VALUE field shows incoming controller activity.
5. Delete a mapping when you no longer want it; up to 64 mappings can be stored.
 - Only one mapping is armed for Learn at a time.
 - Aftertouch means Channel Pressure, not Polyphonic Aftertouch.
 - Version 1.0 mapping ranges run from minimum to maximum; range inversion is not supported.

CONTROL AND SYSTEM

Hosted Plug-in and Standalone

Who controls the environment

- The synthesis engine and .lhres sound format are shared, but audio and MIDI routing belong to the environment that hosts the instrument.

Area	AU / VST 3	Standalone
Audio	Device, sample rate, buffer and routing are managed by the host.	Configured in Settings > Audio.
MIDI input	Host MIDI / Host Routing.	Physical MIDI input; All Channels or receive channel 1–16.
MIDI mappings	Stored with plug-in / host state.	Restored from Standalone mapping state.
Sound presets	.lhres	.lhres

MIDI import and export

- EXPORT writes the complete controller map to a .resmm file.
- IMPORT validates the selected .resmm file and replaces the current mapping set with the imported map.

Where mappings live

- In plug-in formats, mappings are stored with host project/state.
- Standalone mappings are restored through Standalone mapping state.
- Mappings are not embedded in .lhres sound presets, and NEW INIT does not clear them.

Controller map vs sound preset Mappings can change without rewriting the sound, and presets can change without replacing the controller map.

CONTROL AND SYSTEM

Settings: Performance



Settings > Performance — velocity response and master tuning

Velocity Response

Velocity Response reshapes Note On velocity before it reaches the synth voice. Four starting curves are provided: Soft, Normal, Linear, and Firm. The Curve control then refines the response continuously.

Preset	Curve tendency	When it is useful
Soft	More output from a lighter touch	Quiet playing, light controllers, or patches that need easier access to higher velocity.
Normal	Gentle lift relative to strict linear	General performance starting point.
Linear	1:1 response	Predictable controller-to-engine relationship.
Firm	Requires stronger input for the same output	Controllers/players that naturally generate high velocities.

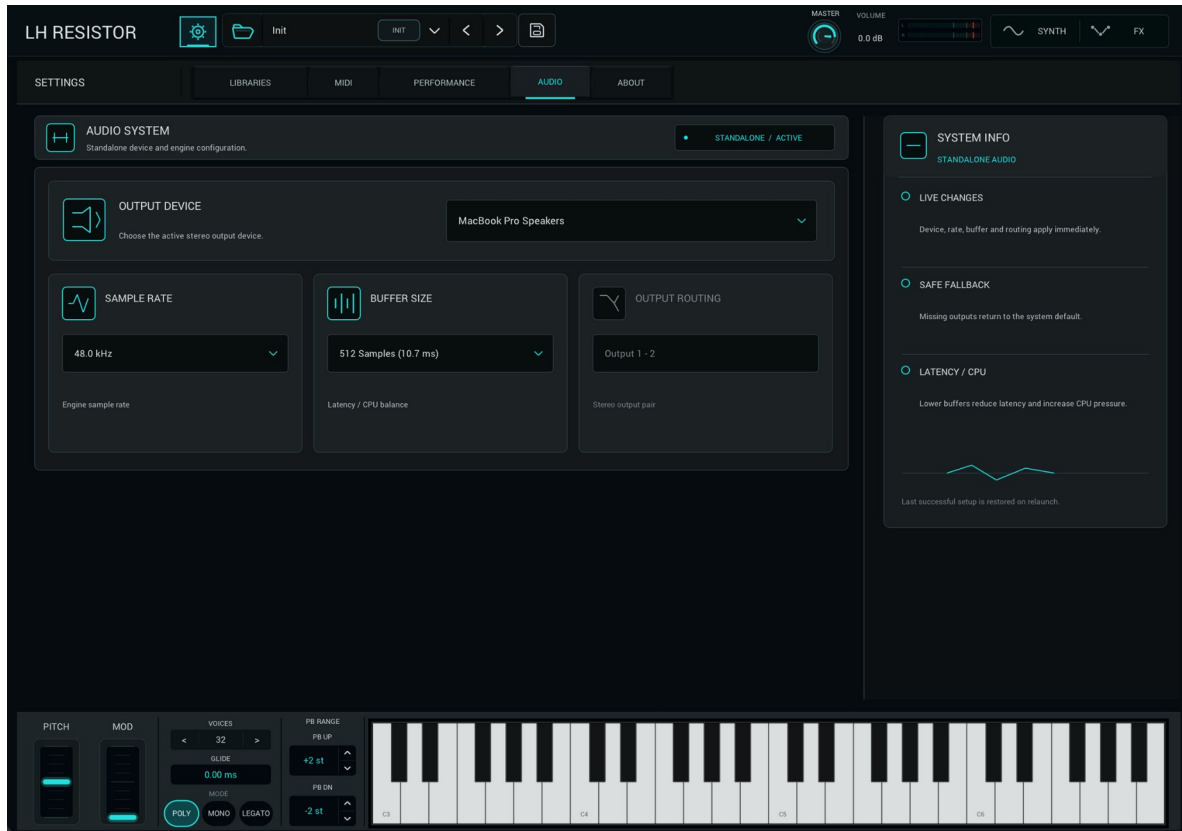
Master Tuning

Master Tuning offsets the complete instrument from -100 to +100 cents. 0 cents is concert-pitch neutral. Double-click resets to 0 cents; use the value readout for exact cent adjustments.

Global, not patch-specific Performance Settings belong to project/Standalone performance state rather than the portable .lhres sound payload. This prevents a sound preset from unexpectedly changing a player's global touch curve or master tuning policy.

CONTROL AND SYSTEM

Settings: Audio



Settings > Audio — Standalone device, sample rate, buffer, and output routing

AU and VST 3

In AU and VST 3, output device, sample rate, buffer size, and audio routing are host-managed, so these controls are disabled in LH RESISTOR.

Standalone

- Choose the active output device, supported sample rate, buffer size, and stereo routing from the live audio system.
- The last successful Standalone setup is restored on relaunch.
- A smaller buffer reduces monitoring latency but increases real-time CPU pressure. A larger buffer gives the processor more time at the cost of latency.
- If a requested audio setup fails, LH RESISTOR attempts to keep or restore the previous working setup instead of silently leaving audio unusable.

Practical buffer choice

For live playing, choose the smallest buffer that remains stable under the patch's worst-case polyphony. For sound design or playback where latency is less important, a larger buffer can provide useful CPU margin for long releases and larger FX chains.

CONTROL AND SYSTEM

Settings: About

About shows the installed version, supported formats and architecture, official website, contact email, credits, and User Manual entry. Include the installed version when reporting a problem.

Support information to include

- LH RESISTOR version.
- macOS version.
- Format: AU, VST 3, or Standalone.
- Host and host version when using a plug-in format.
- Sample rate and, for Standalone, buffer size.
- The shortest sequence of steps that reproduces the problem.

SUPPORT

Website: liuhao-art.com/apps/lh-resistor-desktop

Email: liuhao.talk@gmail.com

CONTROL AND SYSTEM

What Is Saved Where

LH RESISTOR separates sound design, controller behavior, performance configuration, and the machine/host environment. This keeps sound presets portable and prevents a patch from silently replacing unrelated system settings.

Content	Stored / owned by	In .lhres?
Synth parameters	.lhres; also host plug-in state	Yes
Waveform identity / reference	.lhres; external WAV remains on disk	Reference
FX chain order and state	.lhres; also host plug-in state	Yes
MIDI mappings	Host state or Standalone mapping state; optional .resmm export	No
Velocity Response / Master Tuning	Host state or Standalone Performance settings	No
Audio device / rate / buffer / routing	Host in AU/VST 3; Standalone audio settings in APP	No
Waveform / preset folder registrations	Local library registry	No
External WAV file itself	File system / registered waveform library	No

Portable sound is not the same as portable workstation state: .lhres moves the patch, .resmm moves a controller map, external WAVs move separately, and device/host routing is recreated by the environment.

Preset portability checklist

1. Copy the .lhres file.
2. If it uses an external waveform, also copy the referenced WAV or waveform folder.
3. Register that waveform folder on the destination system.
4. Load the preset and confirm that no fallback waveform warning appears.
5. Export and transfer a .resmm file only if the same MIDI controller layout is required.
6. Recreate audio-device choices on the destination system.
7. Check Velocity Response and Master Tuning if matching the original performance setup matters.

CONTROL AND SYSTEM

Troubleshooting

Troubleshoot from the smallest relevant layer outward: MIDI input > synthesis > FX > Master output > host/Standalone audio. This keeps an audio-device problem from being mistaken for a synthesis problem, and vice versa.

Symptom	Check first	Then
No sound	Master + output meter; at least one SVF branch ON	Temporarily bypass FX; verify host/Standalone audio output.
Notes do not arrive	Host track/routing or Standalone MIDI input/channel	Confirm MIDI Off is not selected; test with keyboard UI if appropriate.
Controller does not move target	Mapping ENABLE, source, target, range, live VALUE	Re-arm LEARN and move only the intended control.
Audio controls are disabled	Check whether you are in AU/VST 3	Expected: hosted formats are controlled by the host.
External folder missing	Settings > Libraries	Relocate or unregister it. Unregistering leaves files intact.
Preset loads with missing wave	Choose fallback only if you want to hear the rest of the sound	Confirm replacement before saving.
CPU is high	Reduce VOICES or UNISON	Shorten long releases/tails, simplify FX, or raise Standalone buffer.
Output clips	Lower Master and gain-producing FX	Level-match bypass/processed signal; do not compensate only at the end.

A patch sounds unexpectedly bright or rough at high pitch

Check Source AA. AA OFF retains raw-table playback; AA ON uses band-limited levels to reduce high-frequency aliasing. If the sound is still dense, reduce Index or simplify ratio/motion modulation.

A patch changed after moving to another computer

Check external waveform availability first. A .lhres file can move successfully while its referenced external WAV does not. MIDI mappings, Performance settings, and audio-device choices are separate layers and may also differ by design.

REFERENCE

Parameter Reference: Source, SVF, Performance

The ranges below describe the principal controls in product 1.0. Where UI mapping is nonlinear, the displayed value is the reference for exact settings.

Group	Control	Range / states
Source	Octave	-3 to +3 octaves
Source	Mod Ratio	1:1 to 9:1
Source	Ratio Fine	-1.00 to +1.00
Source	Index	0 to 60
Source	Index Env/LFO Mix	0.000 to 1.000
Source	Unison	1 to 9 voices per note
Source	Detune	0 to 1
Source	Phase	0–360° presentation of normalized phase
Source	Phase Random	0–100% presentation of phase variation
Source	Anti-Alias	OFF / ON; saved, non-automatable
SVF	Cutoff	40 Hz to 4 kHz
SVF	Resonance	0.30 to 1.50
SVF	LOW/BAND/HIGH Level	0.000 to 1.000 each
SVF	LOW/BAND/HIGH Power	OFF / ON each
Envelope	Attack	0.1 ms to 20 s
Envelope	Decay	1 ms to 10 s
Envelope	Sustain	0.000 to 1.000
Envelope	Release	1 ms to 16 s
Performance	Voices	1 to 64
Performance	Glide	0 to 2000 ms
Performance	Mode	POLY / MONO / LEGATO
Performance	Pitch Bend Up / Down	0 to 24 semitones independently
Master	Master Tuning	-100 to +100 cents
Master	Master Volume	Mute to +6.0 dB; 0.0 dB unity default

Display vs processing The SVF graph spans a wider frequency display for context than the Cutoff knob's actual 40 Hz–4 kHz control range. Do not infer the parameter range from the graph axis alone.

REFERENCE

Parameter Reference: Motion and Index

Group	Control	Range / states
Motion	Main LFO Wave	Sine / Triangle / Square / Saw Up / Saw Down
Motion	Main Rate	0–20 Hz FREE; host-synced divisions in SYNC
Motion	Main Retrigger	FREE / RETRIG
Motion	Rate Mod Wave	Sine / Triangle / Square / Saw Up / Saw Down
Motion	Rate Mod Rate	0.001–6 Hz FREE; host-synced divisions in SYNC
Motion	Rate Mod Depth	0–100%
Motion	Destinations	Pitch, Mod Ratio, Mod Fine, LOW, BAND, HIGH
Motion	Destination Amount	-100% to +100% each; independent route ON/OFF

Group	Control	Range / states
Index	Envelope A/D/S/R	A 0.1 ms–20 s; D 1 ms–10 s; S 0–1; R 1 ms–16 s
Index	Main LFO Wave	Sine / Triangle / Square / Saw Up / Saw Down
Index	Main Rate	0.001–20 Hz FREE; host-synced divisions in SYNC
Index	Main Retrig	FREE / RETRIG
Index	Rate Mod Wave	Sine / Triangle / Square / Saw Up / Saw Down
Index	Rate Mod Rate	0.001–6 Hz FREE; host-synced divisions in SYNC
Index	Rate Mod Depth	0–100%

Rate terminology

“Rate Mod” always refers to the second LFO that modulates the speed of the main LFO. It is not an additional direct destination. Motion and Index Modulation each have their own independent main LFO and Rate Mod LFO pair.

REFERENCE

FX Quick Reference

Effect	Key ranges / states
Gain	-60 to +24 dB
Param EQ	8 bands; 20 Hz–20 kHz; Gain -18 to +18 dB; Q 0.30–6.00
Tone EQ	Low/Mid/High/Out each -18 to +18 dB
Compressor	Threshold -36–0 dB; Ratio 1–20:1; Attack 0–120 ms; Release 20–500 ms; Makeup -5–+15 dB
Limiter	Input -6–+18 dB; Ceiling -18–0 dB; Lookahead 0–8 ms; Release 15–500 ms; Softness 0–1
Saturator	Drive/Tone/Softness/Mix 0–100%; Out -18–+18 dB
LoFi	Age/Noise/Wow/Dust/Mix 0–100%; Tone -100–+100
Crush	Bits 4–16; Rate/Jitter/Clip/Mix 0–100%
Punch	Comp/Amount/Mix 0–100%; Attack 0–120 ms; Release 20–500 ms; Makeup 0–18 dB
Gate	Rates 1/32, 1/16T, 1/16, 1/8T, 1/8, 1/4T, 1/4, 1/2; Shape/Depth/Hold/Mix 0–100%
Stutter	Same rate set; Size 0–100%; Repeat 1–8; Decay/Chance/Mix 0–100%

Effect	Key ranges / states
Warble	Wow/Flutter/Drift/Drop/Mix 0–100%
Ensemble	Rate/Depth/Width/Mix 0–100%; Voices 2–6
Phaser	Rate/Depth/Feedback/Mix 0–100%; Stages 2/4/6/8
Auto Pan	Mode TREM/PAN; Rate/Depth/Shape/Phase 0–100%
Stereo Delay	L/R Time 5–2000 ms or synced divisions 1/32–1 BAR; L/R Feedback 0–0.96; High Cut 0–1; Mix 0–1
Studio Reverb	Room/Damp/High Cut/Width/Mix 0–100%; Pre-delay 0–180 ms
Decay Reverb	Decay 0.35–8 s; Pre-delay 0–180 ms; Tone/High Cut/Width/Mix 0–100%
Onboard Chorus	OFF / LIGHT / MEDIUM / STRONG
Onboard Delay	Time 0.01–2.0 s; Send 0–1
Onboard Reverb	OFF / I / II / III / IV; Send 0–1

FX automation These ranges describe rack-instance controls and saved sound state. Version 1.0 does not expose stable per-instance FX automation lanes because the chain is dynamic and reorderable.

REFERENCE

MIDI Target Reference

MIDI targets are intentionally limited to stable synthesis and performance parameters. Version 1.0 does not expose waveform selection, Anti-Alias mode, or dynamic FX instances as MIDI mapping targets.

Group	Available targets
Source	Mod Ratio; Mod Ratio Fine; FM Index; Index Env/LFO Mix; Unison Detune; Octave
SVF	Cutoff; Resonance; LOW Level; BAND Level; HIGH Level
Motion LFO	Wave; Rate; Sync; Retrigger
Motion Rate Mod LFO	Wave; Rate; Depth; Sync
Motion Destinations	Pitch Amount; Mod Ratio Amount; Mod Ratio Fine Amount; SVF LOW/BAND/HIGH Amount
Index Envelope	Attack; Decay; Sustain; Release
Index LFO	Wave; Rate; Sync; Retrigger
Index Rate Mod LFO	Wave; Rate; Depth; Sync
Performance / Master	Glide Time; Master Volume

Mapping source limits

- MIDI CC and Channel Aftertouch are supported mapping sources in product 1.0.
- Mappings have explicit min/max output range, per-route enable state, and live-value feedback.
- The map has a fixed maximum of 64 stored mappings.

REFERENCE

File Types, Credits, and Legal

File types

File / resource	Purpose
.lhres	LH RESISTOR sound preset: synth parameters, waveform identity/reference, and FX chain/state.
.resmm	Exported MIDI mapping set. Separate from sound presets.
Single-cycle .WAV	External waveform asset that can be registered through Settings > Libraries.
Host project/state	Stores plug-in state, including sound/controller/global state as owned by the host.
Standalone preferences/state	Stores Standalone environment choices such as audio and controller configuration.

Credits

Programming & Design: Liu Hao

Technology: Built with iPlug2

Special thanks: testers, users, and everyone who provided feedback.

Legal

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End of manual For synthesis: Source > SVF > Envelopes > Motion/Index > FX. For system: MIDI input > synthesis > FX > Master > host/Standalone audio.