

MOSASAUR LABS

# MOSASAUR

Mono



## Complete User Guide

Detailed feature reference, practical instruction  
and sound-design tutorials

Edition 1.30.101 · Revised 23 October 2026

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Control tables show the interface names, ranges and starting values. A saved preset can use different values. Read the surrounding explanation for timing multipliers and controls that depend on the selected mode.

## GETTING STARTED

# 01 / Welcome to Mosasaur Mono

Mosasaur is a two-layer hybrid synthesizer. Oscillators, filters and envelopes provide a subtractive foundation; oscillator interactions, custom waves, wavetable scanning, vocal synthesis, physical resonance and sampled audio extend that foundation. Each layer has its own generators, source and layer processing, modulation and stereo placement. The master rack processes their sum.

Mosasaur Mono plays one monophonic note line through both layers. It includes three main oscillators per layer, Sub, Noise, routing, effects, a personal sample library, resampling, Multiband, Mixer and Analyzer. Unison copies enrich that one played note. Sounds saved in an incompatible Poly mode are rejected when imported into Mono; your current sound is retained.

## How to use this guide

This guide explains Mosasaur Mono 1.30.101 in detail. Start with [Chapter 2](#), [Chapter 3](#), [Chapter 4](#), then follow the sound reference in signal-flow order or use the linked contents and topic finder. Read the CPU chapter before building a dense two-layer performance patch. The separate Quick Start provides a short route to a first session.

Each feature chapter explains what the feature does, where its controls act, how to make it audible, and practical ways to use it. Recipes are adjustable starting points, not claims that a setting suits every note or mix. Where a control is mode-dependent, the text identifies the condition. Repeated oscillator, layer and slot controls are described once with their ownership made explicit.

## Illustrations and control references

Screenshots show the current interface with example settings. Each chapter explains which layer, source or effect slot owns the controls and how to make the feature audible. Control tables use the names and units you see while editing.

Mosasaur Mono is free. Visit [mosasaurlabs.com](https://mosasaurlabs.com) for downloads and the Contact page. For help or bug reports, email [hello@mosasaurlabs.com](mailto:hello@mosasaurlabs.com). Include the instrument version, your host and the steps needed to reproduce the problem; the troubleshooting chapter provides a useful reporting guide.

## Learning by listening

Begin with one audible source and a comfortable monitoring level. Add one process, compare bypassed and active at similar level, then save a variation. Use Analyzer taps to inspect where a change occurs and the Mixer to compare sources. A brighter or louder result is not automatically a better result. Keep editable originals before Bake, destructive table edits, factory updates or major tuning experiments.

## GETTING STARTED

## 02 / Installation, updates and backups

### Select the correct edition

Install Mosasaur Mono using the download and instructions from [mosasaurlabs.com](https://mosasaurlabs.com). Logic uses the Audio Unit; a compatible VST3 host uses the VST3. The standalone provides its own audio-device and MIDI settings. Save and close hosts before replacing plugins. A host may keep its old binary in memory until it exits, even if the file on disk has changed.

| Item         | Current user-level location                                 |
|--------------|-------------------------------------------------------------|
| Audio Unit   | ~/Library/Audio/Plug-Ins/Components/Mosasaur Mono.component |
| VST3         | ~/Library/Audio/Plug-Ins/VST3/Mosasaur Mono.vst3            |
| Standalone   | ~/Applications/Mosasaur Mono.app                            |
| Product data | ~/Library/Application Support/Mosasaur Audio/Mosasaur Mono/ |

Mosasaur Mono keeps its presets, samples and interface preferences in its own product folder. Personal wavetable and tuning libraries can be shared with other Mosasaur installations. The folder name "Mosasaur Audio" is retained for file compatibility; the product brand is Mosasaur Labs.

### First run in Logic

1. Open a new software-instrument track in a disposable project.
2. Choose the appropriate Mosasaur edition as its instrument and open its editor.
3. Confirm the version in the header or Details. Load Init from PRESETS.
4. Send MIDI from your controller or Logic Musical Typing. Set the sample rate and I/O buffer in Logic's audio settings. Start at 44.1 or 48 kHz and a manageable buffer such as 128 frames, then adjust for your session.
5. Save a test preset and reopen the project once before relying on a long performance setup.

If the host does not list the instrument, check its format, bundle location, architecture support and plugin validation controls. Save the exact validation message if it fails. An old system-level Mosasaur installation is a different product; choose Mosasaur Mono intentionally. Avoid keeping duplicate copies of the same edition in multiple scan locations.

### Updating factory sounds

Factory bank updates and binary updates are separate. After a bank change, Refresh the browser once and reload the desired preset. A project retains the sound state it saved; reopening the editor need not replace it with the latest factory version. Existing User overrides can intentionally take precedence over a factory sound with the same identity.

## Preserve personal work

Back up the complete product data folder, not just Library.xml. User states and backups are separate files; managed Samples includes payloads as well as metadata. Save host projects and portable preset exports separately. Embedded sample and custom-wave data travel with a saved portable sound, but host routing and instance MIDI Learn are not interchangeable with an ordinary preset export.

Keep source audio and exported WAV files where you can find them. A prepared sample in RAM, a managed library entry and a preset's embedded recording are three different copies with different purposes. See [Chapter 35](#) for the sample-library backup and portability workflow.

## Reverting or removing an installation

Close audio hosts before replacing or removing the instrument. Keep a copy of the previous installer or plugin bundles when updating. Restore only the matching application/plugin files when reverting; do not copy an old data folder over newer personal work. Removing the plugin or app does not require deleting your User sounds, Samples or shared libraries. Back up personal data before removing it.

## GETTING STARTED

## 03 / Build your first patch

### Start with a sound you can hear clearly

Turn the monitoring level down, load Init in PRESETS, select Layer A and play a middle-register note. Init is deliberately plain. Oscillator 1 provides a saw wave; the other generators and Layer B are not automatically a second audible sound. Leave Motion off and make one change at a time. Save the host project before building a long session.

### Make a rounded bass

1. Keep Oscillator 1 on Saw and one unison copy. Choose a low register with Range or Transpose. Enable the oscillator if its Power switch is off.
2. Lower the layer filter Cutoff until the saw loses its sharp edge. Add a little Resonance. Compare the initial and edited sound at a similar listening level.
3. Set amp Attack to a few milliseconds, Sustain high, and Release short enough to stop cleanly. Check AMP SPEED: displayed times already include it.
4. To add a pluck, lower the filter's base cutoff, set positive Sweep Amount, shorten filter Decay and lower filter Sustain. The filter envelope moves brightness; the amp envelope moves level.
5. Add Sub at a restrained level for a steadier low foundation. Check its Power and octave. Keep stereo bass changes modest and listen in mono through the Mixer.
6. Save as a personal preset, then reload it once. A host project also retains the arrangement, automation and instance-specific MIDI Learn mappings.

### Give the sound a second character

Enable Oscillator 2, choose a different waveform, and raise its level slowly. Slight Fine Tune differences produce beating. A full octave Transpose produces a stable harmonic relationship. Try the two separately before combining them. A source that is mixed quietly may still be needed by an oscillator-routing connection.

Now add three unison copies to Oscillator 1. Increase Uni Detune and Spread a little. These are copies of the same played note; they do not add keyboard polyphony. Compare the CPU meter and stereo image before and after. More copies are a sound-design choice, not a default requirement.

### Hear one modulation route

On MODULATION MATRIX, use an unused row. Choose LFO 1 as Source, Cutoff as Destination, a small positive Amount and None as Via. Lower the base cutoff enough to leave room for movement. Set LFO 1 to Sine with a slow free rate. Hear the sweep, then set the row Amount to zero for comparison. Drawing or starting an LFO alone does not assign it to a destination.

## Turn a hidden oscillator into a PM modulator

Return to Init. Use a Sine on Oscillator 1. Enable Oscillator 2 and select Sine, but keep its audible mixer level at zero. Raise Osc 2 > Osc 1 PM gently on OSC ROUTING. Harmonics appear in the carrier even though Oscillator 2 is not mixed directly. Change the modulator's register to change sideband spacing. Restore the PM amount to zero to hear the original sine.

## Save useful variations

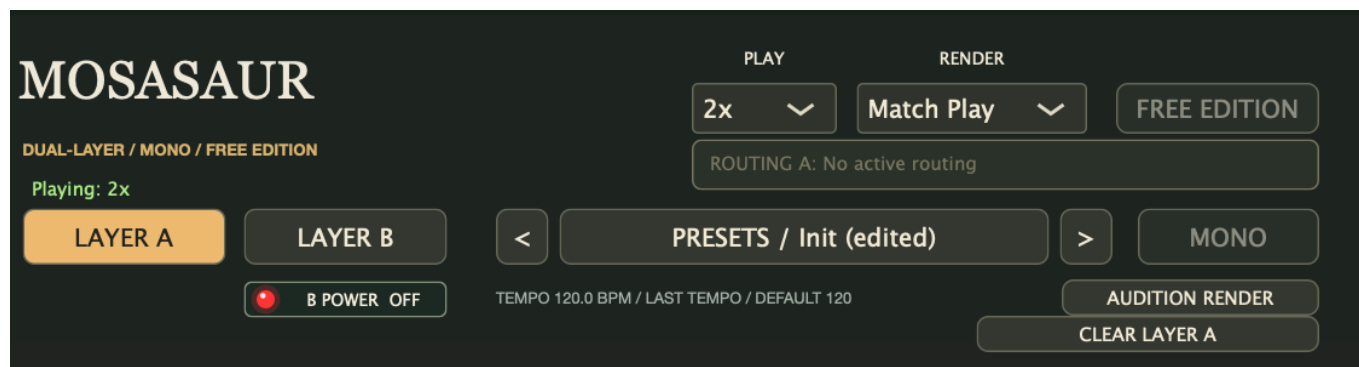
Save a clean version before extreme WRECK, damage or feedback experiments. Give each variation a meaningful name. Use a macro for a controlled range of movement, or Workflow comparison slots to compare two states. Clear Mixer solos and temporary mutes before deciding that a preset is complete. [Chapter 33](#) explains history, locks, comparison and performance exports.

## Where to go next

[Chapter 6](#) explains the basic sources. Chapters 7-14 explore Character, unison, custom waves, wavetable, samples, vocal synthesis and routing. [Chapter 15](#) covers filters and [Chapter 16](#) envelopes. [Chapter 19](#) explains the rack effects. For movement, use [Chapter 24](#) for LFOs and matrix routing, [Chapter 25](#) for macros, [Chapter 27](#) for lanes, and [Chapter 28](#) for generated notes. The linked contents and topic finder let you study one feature at a time.

## GETTING STARTED

## 04 / Finding and using controls



The header keeps layer, preset, quality and output controls together.

### Layers, pages and auxiliary editors

The selected LAYER A or LAYER B determines which layer-specific controls you edit. It does not mute the other layer or change automation addressed to that layer. The bottom page strip groups SOUND, HARMONIC CHARACTER, OSC ROUTING, UNISON, OSCILLATOR ENV, EQUALIZER, DIRECTION, EFFECTS, MODULATION MATRIX, MOTION, MACROS, RESONANCE and XY PAD.

The persistent area contains the preset name, layer selection, macro strip, Play/Render quality, master output, MIXER and ANALYZER buttons, waveform monitor, interface Size and Theme, Multicore and AUTOMATION. DETAILS identifies the actual loaded build and processing configuration. WORKFLOW opens capture/export, section locks and comparison. TUNING opens scale, mapping and MTS controls. LEGAL contains the supplied licence and notices.

### Arrange tabs and use pop-out editing

Drag a bottom tab left or right to reorder your editing workspace. Right-click a tab for its available layout options. This arranges access to controls; it does not reorder audio processing. The signal path remains the one described in [Chapter 5](#).

POP OUT opens the current feature page in its own window where offered, so another page can remain visible in the main editor. RETURN TO TAB or closing that window docks it again. It is another view of the same instance, not a second independent patch. Check the editing layer and keyboard mode when moving between windows; text-edit focus and host performance typing have different purposes.

## Read the complete panel

Some pages are taller than the visible editor. Scroll inside the page to reach lower source rows, route damage, tuning and other controls. An Edit button opens a feature editor without changing the rest of the sound. Close or Back returns to the containing view. Detached Mixer, Analyzer and XY windows have their own size and position behavior; their chapters describe keyboard focus and closing.

A disabled control normally belongs to a mode or feature that is not active. Its stored setting can remain in a preset for later use. Selecting a different waveform, effect or filter can make those settings relevant again. A stored value can remain visible while the source is silent. Check Power, Enable, Mix, level, dependencies and the selected layer.

## Mouse gestures and exact values

Drag a normal rotary control to change its value. Start the drag with Shift for a finer adjustment. Double-click the value field to type an exact value. Where units are accepted, include a useful unit such as ms, s, Hz or kHz. The ordinary ExactSlider controls disable accidental wheel changes. Custom grids, graphs and waveform editors have their own gestures, described beside those features.

Right-click a supported control for Reset, MIDI Learn, modulation and macro assignment. A modulation badge indicates existing ownership or assignment. When a macro owns a destination, edit its endpoints or remove that assignment before expecting independent base-value editing. The matrix can add modulation on top of a macro-owned base.

## Finding an unfamiliar parameter

Open AUTOMATION and search by visible words, group or stable ID. The initial Macros + XY view is useful for performance. Current setup filters configuration relevance; All parameters also shows inactive and compatibility entries. It does not mean every listed setting currently changes the output. Select a result to inspect its host name and ID or open its assignment actions. Copy Host Name helps find the same control in the host.

## Theme and size

Theme changes Dark/Light presentation without changing the sound. Each already-open editor retains its own palette; newly opened editors restore the saved preference. Size scales the editor. Auto Fit is convenient on a laptop; explicit percentages can help on a large display. These are interface choices rather than musical preset settings. Scopes and analysis graphs keep dark plotting backgrounds where contrast is useful.

## Power, bypass and listening controls

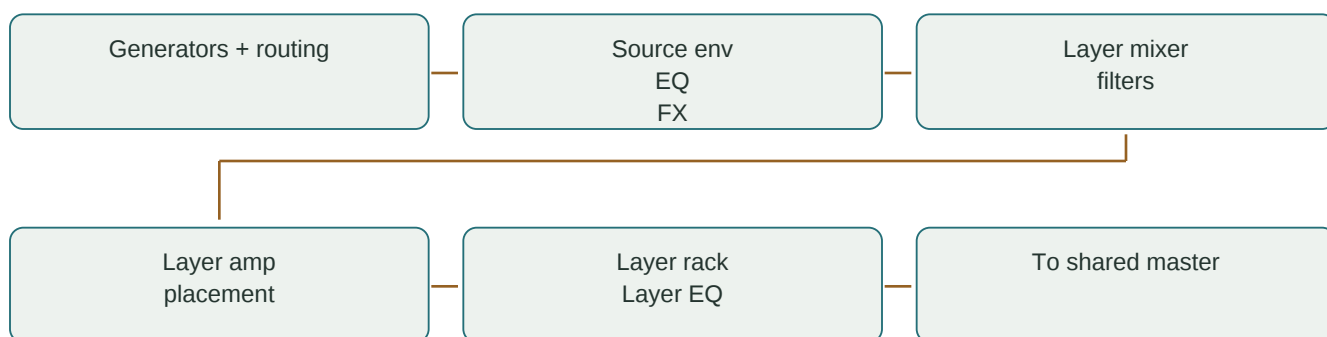
Power is a deliberate source or layer shutdown. Enable selects processing in an effect or optional module. Mix blends dry and wet signal. A fader changes level. Mixer Mute/Solo and Mono Check are temporary inspection tools. These operations have different purposes and are not interchangeable CPU switches. In particular, B POWER Off fades then suspends the whole B layer, including its tails.

## SOUND REFERENCE

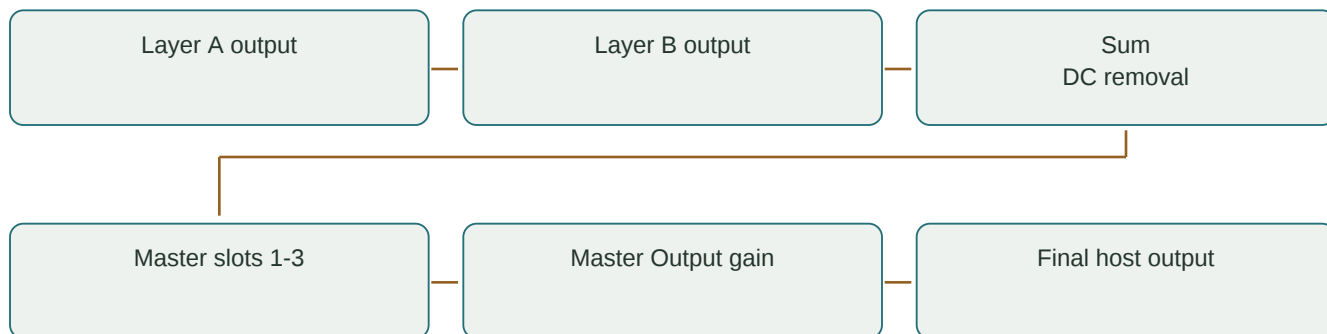
## 05 / Follow the signal

### The layer and master paths

Each layer has three main oscillators, Sub, Noise and two derived Logic sources. A generator can feed another generator's modulation network even when it is not mixed directly. Character, WRECK/NUKE, source envelopes, source EQ, placement and source effects shape the branches. Their sum feeds the appropriate filter/amp path and the layer's output processing. The two layer outputs meet at the shared master rack before Master Output gain and the final host output.



Signal-flow overview. The surrounding text explains routing, layer processing and the shared master.



Signal-flow overview. The surrounding text explains routing, layer processing and the shared master.

### Why the order matters

A source distortion changes that source before it mixes with others. Filter Drive affects the signal reaching the filter. A layer effect processes the layer mixture; a master effect processes both layers together. If you distort a bass and pad separately, they do not intermodulate in the same way as when their sum enters one shared nonlinear processor. Moving an effect to a shared tier can save repeated work but can change the sound.

Source EQ, per-slot EQ, Layer EQ and master processing have separate targets. Check the selected target before adjusting a graph. The source meters are upstream of the combined layer filter; layer meters include

the layer output processing; the master meter reads the final output. Comparing two meters requires knowing their positions.

## Source scaling and stereo

Mixer Scaling chooses the existing source-summing rule. Active Sources normalizes by the sum of source-level coefficients with a minimum denominator of one; it is not automatic loudness normalization. Legacy/Fixed retains the older scale. Envelopes, phase cancellation and distortion can change peaks independently of that rule.

Unison Spread distributes oscillator-copy contributions. Source Width scales their existing side information; it cannot create independent stereo content from a perfectly mono signal by itself. Noise can supply a separate side stream. Stereo samples carry their recorded stereo material into playback. Layer Pan and Direction/Width act at different points, and subsequent effects may change the image again.

## Modulation is a control path

Macros establish effective base values. Matrix rows add relative modulation. Motion lanes supply sources to those rows; drawing a lane does not assign it to a knob. Audio-rate PM/FM, sync, ring, shape, fold, Logic and Filter FM are separate signal interactions. A normal low-frequency matrix route is not a substitute for the audio-rate oscillator network.

Mono uses the complete two-layer monophonic signal path. A source needed by an audible interaction can remain active even when its direct mixer level is zero; use its Power switch when you intend to shut it down.

## The capture points

Sample Layer Pre-effects is after the layer's oscillator, filter, envelope, level and placement processing, immediately before its layer rack and Layer EQ. Layer Post-effects includes those latter stages. Master Output includes both layers and the master chain. Recording Pre-effects therefore does not mean raw oscillator capture. The Analyzer provides additional diagnostic taps that are distinct from the resampler's five recording choices.

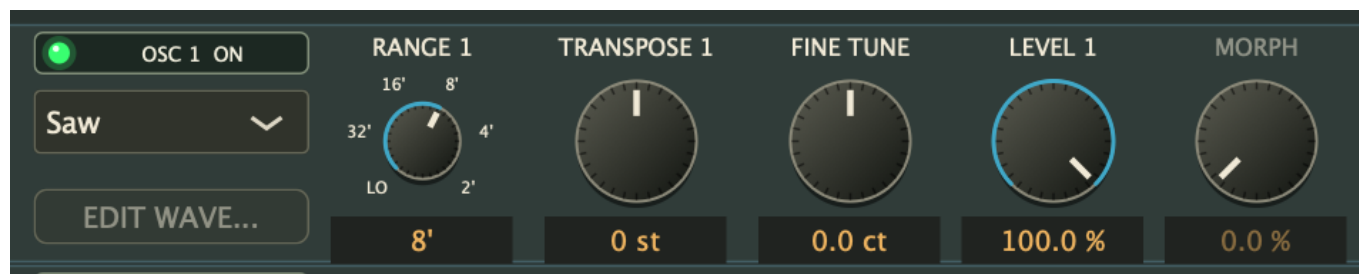
## Headroom and the final output

SoftClipper is an optional master-slot effect, not an unconditional limiter after the output fader. A later effect or Master Output gain can still change its result. Lowering a downstream gain reduces listening level but cannot remove distortion already created upstream. When troubleshooting, lower the input to the stage producing the distortion, then match a later output level for comparison.

Layer B Master Start Delay schedules its entry into a phrase; it is not an audio echo of B's finished output. B's envelope Delay is another timing stage. Long delays, amp attacks, sample silence and glide can all affect perceived onset. Use Init and one active source to isolate an unexpected delay.

## SOUND REFERENCE

## 06 / Oscillators, pitch and noise



Oscillator 1 waveform, tuning and level controls on Sound.



Sound brings the oscillator bank, envelopes, filters and layer mix together.

Select Layer A or B before editing a source. Oscillators 1-3 have the same waveform and tuning controls. Their levels are independent. Mono Init opens Oscillator 1 and leaves the other sources inactive or down. The sub is a separate generator with a more limited waveform set.

### Waveform and pitch

Sine contains the fundamental; Triangle emphasizes odd harmonics with a steeper rolloff than Square. Saw has both odd and even harmonics. Square has fixed half-cycle width; Pulse uses the shared Pulse width control. Tri / saw blends the two shapes, and Double saw combines two ramps with a small built-in frequency difference. Waveform choice is separate from Character and from distortion.

Range sets the main oscillator's register. LO is the lowest register; 32', 16', 8', 4' and 2' ascend by octaves, with 8' at the normal register. Transpose adds semitones and Detune adds cents. Layer octave, transpose and fine tuning affect the layer as a whole. The sub offers one or two octaves below the layer note.

| Control            | Range / choices                                                                                      | Default   |
|--------------------|------------------------------------------------------------------------------------------------------|-----------|
| Wave menu          | Sine; Triangle; Saw; Square; Pulse; Tri / saw; Double saw; Custom; Wavetable; Voice; Glottal; Sample | Saw       |
| Level 1            | 0.0 % to 100.0 %                                                                                     | 100.0 %   |
| Range 1            | LO; 32'; 16'; 8'; 4'; 2'                                                                             | 8'        |
| Transpose 1        | -12 st to 12 st                                                                                      | 0 st      |
| Detune 1           | -50.0 ct to 50.0 ct                                                                                  | 0.0 ct    |
| Pulse width        | 5.0 % to 95.0 %                                                                                      | 50.0 %    |
| Sub wave           | Sine; Square; Saw; Double saw                                                                        | Sine      |
| Sub octave         | -1 octave; -2 octaves                                                                                | -1 octave |
| Sub level          | 0.0 % to 100.0 %                                                                                     | 0.0 %     |
| Voices 1           | 1 to 8                                                                                               | 1         |
| Uni detune 1       | 0.0 ct to 50.0 ct                                                                                    | 0.0 ct    |
| Spread 1           | 0.0 % to 100.0 %                                                                                     | 0.0 %     |
| Character 1        | Standard; Rounded; Hollow; Nasal; Bright; Reedy; Metallic; Body; Splice                              | Standard  |
| Character amount 1 | 0.0 % to 100.0 %                                                                                     | 0.0 %     |
| Nasty 1            | 0 to 400 %                                                                                           | 0 %       |
| Saturation 1       | 0 to 200 %                                                                                           | 0 %       |
| WRECK 1            | 1x; 5x; 10x; NUKE                                                                                    | 1x        |
| Noise type         | White; Pink; Brown; Blue; Violet; Velvet; Dust; Crackle; Stepped; Air                                | White     |
| Noise level        | 0.0 % to 100.0 %                                                                                     | 0.0 %     |
| Noise width        | 0.0 % to 100.0 %                                                                                     | 0.0 %     |

The Wave menu also offers Custom, Wavetable, Voice, Glottal and Sample. Custom is explained in [Chapter 9](#), Wavetable in [Chapter 10](#), Sample in [Chapter 11](#), and Voice/Glottal in [Chapter 12](#). Select Voice in Wave to enable its vocal source; [Chapter 12](#) explains the editor and performance controls.

Oscillator phase is not reset by an ordinary envelope retrigger: restarting an envelope and restarting a waveform are different operations. Hard sync can reset a slave's phase. Resetting the processing path or changing quality can also reset oscillator state; do not use such changes as a performance phase-control technique.

## Noise

| Type    | Spectral or time behavior                                         |
|---------|-------------------------------------------------------------------|
| White   | Broadband random samples.                                         |
| Pink    | Low-frequency-weighted noise from filtered white components.      |
| Brown   | More strongly low-frequency-weighted, integrated noise.           |
| Blue    | A high-passed white component plus a sample-difference component. |
| Violet  | Successive-sample differences emphasize high frequencies.         |
| Velvet  | Sparse positive or negative impulses distributed in short cells.  |
| Dust    | More widely spaced random impulses.                               |
| Crackle | Random impulses with decaying tails.                              |
| Stepped | Random values held between updates.                               |
| Air     | High-passed white noise.                                          |

Noise has its own level, envelope, stereo width, source rack, Character and source distortion. Its spectral tilt changes what is available to excite the filter. Comparing Pink with Violet at the same filter cutoff is not a controlled comparison of filter responses.

SOUND REFERENCE

# 07 / Harmonic Character, WRECK and Splice



Character and source distortion settings are independent for each source.

## Character

Find these controls on **HARMONIC CHARACTER**, between Sound and Oscillator Routing. Sub Character is disabled on Sine; select Square, Saw or Double saw to enable its menu. Body changes saw-bearing waves only, so it will not alter a Sub square. Noise has its own spectral Character versions.

The original Characters change harmonic weighting without changing the waveform selector. Amount blends toward the selected contour. Splice instead creates a time-varying phase-splice texture, with its own Amount and controls. Amount changes the strength of each contour; waveform, pitch and later processing also shape the result.

| Character | What changes                                                |
|-----------|-------------------------------------------------------------|
| Standard  | Uses the selected waveform without a Character-table blend. |

| Character | What changes                                                                                      |
|-----------|---------------------------------------------------------------------------------------------------|
| Rounded   | Reduces upper-harmonic weighting as harmonic number rises.                                        |
| Hollow    | Removes even harmonics from the character table.                                                  |
| Nasal     | Emphasizes a region around the fifth harmonic.                                                    |
| Bright    | Raises upper-harmonic weighting, with a bounded boost.                                            |
| Reedy     | Favors odd harmonics, especially around the third.                                                |
| Metallic  | Favors harmonics 2, 5 and 9 relative to the others.                                               |
| Body      | Adds weight to the lower harmonics of saw-bearing waveforms, making them sound fuller.            |
| Splice    | Random phase-spliced texture on Oscillators 1-3, including Sine and Triangle; unavailable on Sub. |

**Waveform limitation:** the six table-based characters are **Rounded, Hollow, Nasal, Bright, Reedy and Metallic**. They affect Saw, Square, Pulse, Tri / saw and Double saw, but not Sine or Triangle. **Body is separate from those six:** it adds its contour only to Saw, Tri / saw and Double saw; it does not change Sine, Triangle, Square or Pulse. This limitation does not apply to Splice.

## WRECK and source distortion

Type selects Warm, Hard Clip, Asymmetric, Wavefold, Tear, Fuzz, Gated Fuzz, Bit Crush, Sample Crush or Rectify. Warm bends peaks smoothly; Hard Clip truncates them; Asymmetric treats positive and negative halves differently. Wavefold folds excursions back; Tear combines folding with another nonlinear contour. Fuzz rapidly saturates small excursions, while Gated Fuzz suppresses low-level input. Bit Crush quantizes amplitude; Sample Crush holds values over several samples. Rectify reshapes by absolute magnitude.

Nasty spans **0-400%** and Saturation spans **0-200%** on all five sources in both layers. Nasty controls drive intensity. Saturation from 0-100% blends dry to shaped sound; above 100% it adds input drive, reaching 2x at 200%. Zero Saturation is dry bypass. These ranges do not represent a direct output-volume multiplier.

The button cycles **WRECK 1x > WRECK 5x > WRECK 10x > NUKE**. NUKE uses red text and a dedicated extreme circuit for each of the ten types. The original three are:

| NUKE Type  | Audible design                                                                      |
|------------|-------------------------------------------------------------------------------------|
| Wavefold   | Repeated asymmetric folding with a second folding stage; dense, metallic edges.     |
| Tear       | Folding and threshold-dependent polarity changes; jagged tearing contours.          |
| Gated Fuzz | Strong fuzz with a hysteretic gate and quantized contour; broken, chattering edges. |

The expanded circuits are:

| NUKE Type    | Audible design                                                      |
|--------------|---------------------------------------------------------------------|
| Warm         | Two soft saturation stages with signal-driven supply sag.           |
| Hard Clip    | Sharp clipping, a narrow central notch and contour-dependent edges. |
| Asymmetric   | Unequal positive/negative knees with input-following bias.          |
| Fuzz         | Square-root gain into a non-monotonic soft knee.                    |
| Bit Crush    | Coarse quantization with contour-dependent shaping.                 |
| Sample Crush | Fractional-rate sample-and-hold with signal-dependent timing.       |
| Rectify      | Full-wave octave coloration, original polarity and a notched knee.  |

These circuits are available for all five sources in both layers. Sharp and digital modes can intentionally produce alias components. NUKE is a shaping mode, not a 100x gain or loudness setting. Compare it with WRECK 10x using the same Type and audible Saturation. Match later output levels when judging texture.

Review recorded automation when opening older projects that used earlier WRECK or distortion ranges. [Appendix B](#) explains compatibility and migration.

WRECK acts before source EQ and source level. Filter drive acts later on the whole layer. Reducing a source level therefore reduces how hard that branch contributes to the filter input; it does not reduce the internal drive already used by its WRECK shaper.

## Power and expanded Character ranges

Source Power is an explicit saved shutdown, separate from the source fader. Enable a generator before expecting it to sound or supply an interaction. A zero direct level can still leave a needed routing source running; Power Off deliberately removes its contribution/dependency according to the transition rules. Check source Power when a legacy recipe describes raising an oscillator that Init now leaves off.

Character range controls allow 1x, 2x, 5x, 10x and NUKE (20x), with Follow choices retaining the saved layer/range relationship. The visible source range determines how strongly Character Amount can be pushed; it is separate from the source-distortion WRECK range. Increase one range at a time and compare at a later matched output level. Splice has a separate density range of 1x/2x/5x/10x. A higher range increases sound-design intensity; it does not add unison voices or multiply output gain by the displayed factor.

## Noise Character and distortion

On Harmonic Character, the Noise row offers Standard, Rounded, Hollow, Nasal, Bright, Reedy, Metallic and Body. Amount blends the spectral colour: Rounded softens highs; Hollow reduces mids; Nasal focuses mids; Bright emphasizes highs; Reedy emphasizes an upper-middle band; Metallic separates upper bands; Body emphasizes lows. These are noise spectral blends, not pitched-waveform replacements. Splice is available only on the three main oscillators.

Noise distortion follows Character and precedes Noise EQ. Choose any of the ten types and cycle WRECK through 1x, 5x, 10x and NUKE. Start with Noise Level audible, Character Amount 50%, and modest

Nasty/Saturation, then compare. Zero Saturation bypasses distortion. Older sounds start with neutral Noise Character and zero Noise Saturation. Noise shaping adds processing only when used; the tab itself adds no audio processing stage.

## Audition recipes

Use these settings as starting points and adjust them by ear for the chosen note and patch.

- **Fat unison lead:** start from Init, use three voices on Oscillator 1, raise Uni detune modestly, then Spread. Keep the other source levels down initially so you can hear unison alone. Expect beating and stereo movement rather than three independent notes.
- **Hollow sync:** use a saw master and a pulse slave, select the master as the slave's sync source, then sweep the slave's Transpose or Coarse offset. The master sets the repeating reset interval; the slave pitch changes the harmonics within it.
- **Metallic ring:** raise Oscillator 2, tune it away from an octave relationship, and increase Ring 1 x 2. Expect sum/difference components rather than a conventional detuned pair.
- **Dirty single saw:** keep one saw active, raise Saturation and Nasty, then compare WRECK 1x and 5x while matching the later layer/output level. Filter drive is a separate second nonlinear stage.
- **Bright PM tone:** use Sine on Oscillator 1, use Oscillator 2 as its PM source, and increase PM 2 > 1 from zero. Change Oscillator 2's register to change the sideband spacing. Its audible level need not be raised to make it a PM source.

## Splice Character: moving, jagged oscillator texture

On HARMONIC CHARACTER, select **Splice** in Character for Oscillator 1, 2 or 3. It works in both layers, on all main waveforms, and is not available on Sub. The adjacent Amount becomes the independent **Splice Amount**; the previous Character Amount remains separate. Open **SPLICE CONTROLS...** for timing and texture controls.

Splice runs two wet waveform readers at the oscillator's existing frequency. At each grain event, the idle reader jumps to a randomized phase offset from the active reader, then a raised-cosine crossfade transfers the signal between them. Their gains sum to one; partial cancellation is part of the texture and is not automatically made up. A separate original oscillator supplies the dry blend.

| Splice control | Range, default and use                                                                                                                |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Amount         | 0-100%, default 35%. Blend between the original waveform and spliced texture. At settled 0%, the original waveform path is unchanged. |
| Rate mode      | Free or Key-track; default Free. Both mode-specific rate values are saved independently.                                              |
| Free rate      | 1-400 Hz, exponential; default 30 Hz. Texture timing does not follow the played note.                                                 |

| Splice control | Range, default and use                                                                                                                       |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Key ratio      | 0.125x-8x oscillator frequency, exponential; default 1x. Texture timing follows pitch and tuning.                                            |
| Jitter         | 0-100%, default 0%. Each interval varies by up to the selected percentage in either direction; absolute interval floor 0.1 ms.               |
| Jump           | 0-100%, default 50%. Random positive or negative phase displacement up to 0-1 cycle.                                                         |
| Splice Time    | 0-100% of the current randomized interval, default 10%; absolute crossfade floor 0.1 ms. At 100%, fades occupy the whole interval.           |
| Splice Clock   | Free running or Note reset; default Free running. Note reset restarts the grain clock on note-on, deferred until an in-flight fade finishes. |

Splice Clock does not reset the plain oscillator phase. PM applies to both wet readers; hard sync preserves their relative offset. Each unison lane has its own deterministic random stream and clock offset. The wet path has a low-frequency DC blocker. Amount changes are smoothed; new interval, jump and fade settings take effect at grain boundaries. After its exit fade, an unselected Splice Character stops processing its readers and clock.

### Pitch, noise and oversampling

Splice does not transpose the oscillator's frequency input, but random phase changes can broaden or obscure its spectral fundamental and alter perceived pitch, especially with high Jump and 100% Amount. Key-track relates grain timing to pitch; it does not guarantee a harmonic-only spectrum. Jitter at zero removes interval randomness, not the random phase offsets. Keep some dry signal when a stable tonal center matters.

Very short splices, high notes and severe distortion can produce aliasing. Crossfades soften the joins. Try Play 4x, a longer Splice Time, a lower Jump or less Amount, and compare the texture and CPU load. Fully wet Splice can shift the perceived pitch and introduce inharmonic components; blend in dry signal when a stable fundamental matters.

### Three starting sounds

- **Fixed-rate jagged:** saw, Amount 35%, Free 45 Hz, Jitter 10%, Jump 65%, Time 10%.
- **Key-tracked timbral:** saw, Amount 35%, Key-track 1x, Jitter 0%, Jump 30%, Time 35%.
- **Long-splice smear:** saw, Amount 60%, Free 12 Hz, Jitter 20%, Jump 75%, Time 100%.

Start with one oscillator, then add NUKE Tear, Wavefold or Gated Fuzz with audible Saturation. Use motion lanes or LFOs for grain rate, Jump and filter changes. The dedicated Splice matrix destinations are described in [Chapter 24](#). Rupture provides saved examples in [Appendix A](#).

## SOUND REFERENCE

## 08 / Unison, Drift, Dual and Scatter



Unison copy count, detuning and movement for the selected oscillator.

### Unison and width

Each main oscillator supports one through eight unison voices. Uni detune spreads their pitches and Spread distributes them in stereo. The mix is divided by the sum of active voice weights, so adding voices is not a direct multiplication of level. Phase relationships still change peak and perceived level. Adding voices increases oscillator work without increasing the number of independently played notes.

Use source Width and Direction for placement after source EQ. Unison Spread creates separation between voice contributions; Width changes the resulting mid/side balance. With one voice and a mono source, increasing width alone cannot produce independent stereo information.

## Analog Drift

On **UNISON**, the **Analog Drift** knob below the oscillator rows adds slow, independent pitch movement to every unison voice of the three main oscillators in the selected layer. Layer A and Layer B have separate amounts and different drift patterns. At **0%**, Drift is bypassed. A gentle setting such as **15-25%** can make sustained notes and oscillator beating feel less static. Higher settings give a more noticeably unstable tuning effect.

| Amount | Maximum pitch movement per voice |
|--------|----------------------------------|
| 0%     | Off; original pitch path         |
| 25%    | Up to 2.5 cents sharp or flat    |
| 50%    | Up to 5 cents sharp or flat      |
| 100%   | Up to 10 cents sharp or flat     |

A cent is one hundredth of a semitone. These values describe the maximum departure from the tuned pitch; each random segment can use less than that maximum. Drift adds to the existing tuning; it does not change the Fine Tune knob's stored value.

The pitch moves smoothly toward fresh random targets over independently varying **2-7 second** intervals. It does not follow a repeating vibrato waveform and does not restart with each note. Each unison voice has its own drift pattern, so the beating within a stack changes over time. Drift is added before each voice's existing unison detune. The sub oscillator stays directly undrifted, providing a steadier foundation. Sync, phase and ring interactions can still carry the main oscillators' movement into the resulting sound.

Start with two audible main oscillators, hold a note, and raise Drift gradually. Listen for the changing rate of beating between them. Turning up drift is not the same as changing the filter or mixer saturation.

Amount changes use a **10 ms** smoothing time constant (about **46 ms to reach 99%** of a change). Drift targets update every **64 host samples**, independently of the host buffer size and oversampling setting. Frequency ratios interpolate smoothly between these updates. At zero after settling, the pitch offset is bypassed exactly. The knob supports host automation and macro assignment, but does not add a modulation-matrix destination. Drift uses the current layer's pitch path. Its transient position is not a saved patch value; use a sustained comparison to hear it. Unused feature work follows the dormant processing rules described in [Chapter 38](#).

Copy, Clear and Undo include Drift. The momentary random drift position is not stored with the sound.

## Unison copies and placement

Each main oscillator supports 1-8 copies. Detune changes their pitch separation, Spread distributes them spatially and the source Direction/Width controls place the resulting branch. Sub is a single generator. More copies add processing work and can change peaks through phase relationships even with normalized mixing.

## Per-copy movement

Enable the oscillator's unison LFO and choose Sine, Triangle, Ramp Up, Ramp Down or Sample and Hold. Rate spans 0.01-20 Hz in Free mode. Depth spans 0-100%; the destination is Pitch, Direction or Both. Phase Spread distributes LFO start phases and Rate Variation varies copy speeds, both 0-100%. Compare one copy with several before adding large movement.

## Copy Scatter

Scatter selects which unison copy contributions are audible over time. It can create rotating attacks, granular pulses or moving sustained clusters while the underlying raw oscillator signals remain available to routing.

| Control          | Choices / range and use                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------------------------------|
| Mode             | Off, Per Note or Continuous. Per Note restarts its phrase selection; Continuous advances without restarting for each note. |
| Order            | Round Robin, Random, Random No Repeat, Sweep or Ping Pong.                                                                 |
| Active copies    | 1-8, clamped to the oscillator's actual unison count.                                                                      |
| Rate / timing    | 0.05-40 Hz in Free; Tempo Sync with divisions from 4 bars to 1/64 and dotted/triplet choices.                              |
| Jitter           | 0-100%, variation in event timing.                                                                                         |
| Fade             | 1-2000 ms, transition length rather than oscillator attack.                                                                |
| Overlap          | 0-100%, overlap between entering/leaving contributions.                                                                    |
| Compensate       | Off/On, default On; reduces level changes as audible copy counts vary.                                                     |
| Phase Entry      | Free or Reset. Reset is ignored on an active routing source to avoid disruptive phase jumps.                               |
| Seed             | Free or Locked; Locked makes the selection pattern repeatable.                                                             |
| Legato Retrigger | Off/On; controls restarting while the phrase is already held.                                                              |
| Link             | Off/On, default On; coordinates the three main oscillators within a layer.                                                 |

Start with four copies, moderate Spread, one active copy, slow Round Robin, a short Fade and compensation On. Listen dry, then raise Overlap and try Ping Pong. With one actual copy there is little copy selection to hear. Long fades and overlap can soften the rhythmic effect; they are not failed rate changes. This feature is distinct from Scatter Sync in [Chapter 13](#).

## Custom Morph versus Dual A+B

| Frame control | Range                  |
|---------------|------------------------|
| Level         | 0-100% for each frame. |

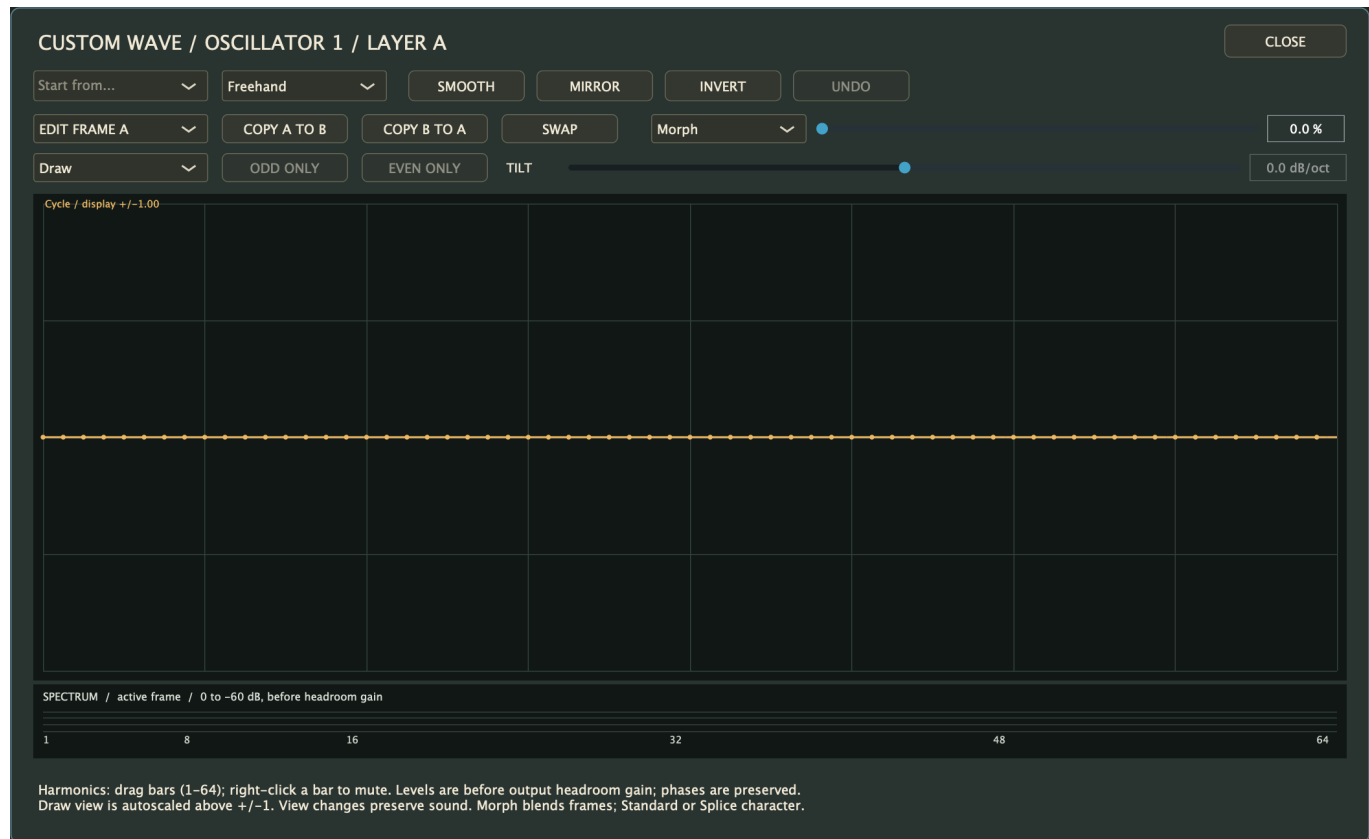
| Frame control | Range                 |
|---------------|-----------------------|
| Tune          | -48 to +48 semitones. |
| Fine          | -100 to +100 cents.   |
| Phase         | -180 to +180 degrees. |
| Direction     | -90 to +90 degrees.   |

Each frame uses a fixed half-gain contribution before its frame Level, for predictable combination. Two identical frames can reinforce; opposing phases can cancel. Match output loudness when comparing. Selecting a frame in the editor chooses what you draw, not the only frame heard in Dual mode. Morph is disabled while Dual is selected. The frames remain available when switching playback mode.

The numeric Dual fields are modulation destinations in both layers. Audio-rate Shape supports Custom Morph, but not Custom Dual. Cross-wave Fold can process either playback mode. Table-based waveform Characters retain their applicability restrictions; choosing Custom does not turn every Character into a custom-wave processor.

## SOUND REFERENCE

## 09 / Draw custom waves and edit harmonics



The Custom Wave editor works on Frame A and Frame B.

### Custom waves and two-frame morphing

On SOUND, choose Custom in the Wave menu of a main oscillator, then use EDIT WAVE to reopen its editor. Oscillators 1-3 in each layer each have Frame A and Frame B: twelve saved frames. Frame letters are separate from the synth's Layer A and Layer B. Sub and Noise do not use these custom drawings.

#### Draw and compare two frames

1. Select EDIT FRAME A and choose a template from Start from, or draw in Freehand. Move points lets you drag a point vertically.
2. Select EDIT FRAME B and make a different shape. The dim curve shows the other frame; the highlighted curve is the frame being edited.
3. Move MORPH from 0% for Frame A to 100% for Frame B. Selecting a frame only changes the editor view; it does not move Morph.

4. To animate the blend, set Morph to 50%, right-click it and select Modulate > LFO 1. Inspect the matrix row; +50% Amount lets a full bipolar LFO traverse the complete range. The shortcut starts at +10%, so increase it deliberately.

Each simple drawing uses 64 points around one repeating cycle; its right edge wraps to its left. A flat oscillator drawing is silent because DC offset is removed. Pulse Width does not reshape a Custom wave. Character supports Standard and Splice; other saved Character selections are bypassed. Distortion, WRECK/NUKE, routing, unison, EQ and effects remain available.

Morph is a linear amplitude blend, not a spectral interpolation. Opposite frames can cancel at the midpoint; a blank frame can fade the oscillator toward silence. There is no automatic upward gain compensation. Older single-frame presets copy their existing drawing to both frames with Morph at zero, so moving Morph initially makes no difference.

### Editing tools and saved data

Smooth softens the selected shape, Mirror reverses the cycle and Invert flips its polarity. Start from replaces only the selected frame. COPY A TO B, COPY B TO A and SWAP operate on the oscillator frames; SWAP leaves Morph unchanged and can change the sound. These frame buttons are different from the header's layer-copy operation.

UNDO or Command-Z restores drawing gestures, tools, copies and swaps. Morph follows normal parameter/host automation rather than drawing Undo. Editing crossfades over about 20 ms; Morph is smoothed over 5 ms at the oscillator generation rate. Switching to a built-in waveform retains the saved custom frames.

Both frames, detailed spectra and Morph are saved in presets, exports and DAW projects and participate in layer Copy, Clear and Undo. Clear Layer resets the frames to blank and Morph to zero while returning to built-in selection. Drawings and harmonic bars are patch data, not separate host automation lanes. Use Morph, macros or a matrix route for automated movement.

### Edit harmonics directly

Draw and Harmonics are two views of the same selected frame. Changing views preserves its sound and stored shape. In Harmonics, drag bars 1-64 to set magnitudes. Harmonic 1 is the fundamental, harmonic 2 is twice its frequency, and higher numbers are corresponding multiples.

The vertical scale spans -60 to 0 dB; the bottom is silence. Right-click a bar to mute it and hover to read its number and magnitude. New harmonics start at sine phase; existing phases are retained. Odd Only mutes even-numbered bars; Even Only mutes odd-numbered bars. Harmonics above 64 remain unchanged by those tools.

Tilt changes the slope in dB per octave around the unchanged fundamental. Each drag starts from the current spectrum; the control returns to zero when released. Individually edited magnitudes are capped at unit amplitude. Undo includes Tilt and Odd/Even operations.

Try Blank in Frame A, switch to Harmonics, raise bar 1 and add lower levels of bars 3, 5 and 7. Create a contrasting Frame B and move Morph to compare. Editing B while Morph stays at zero will not make B audible.

## Spectrum and output level

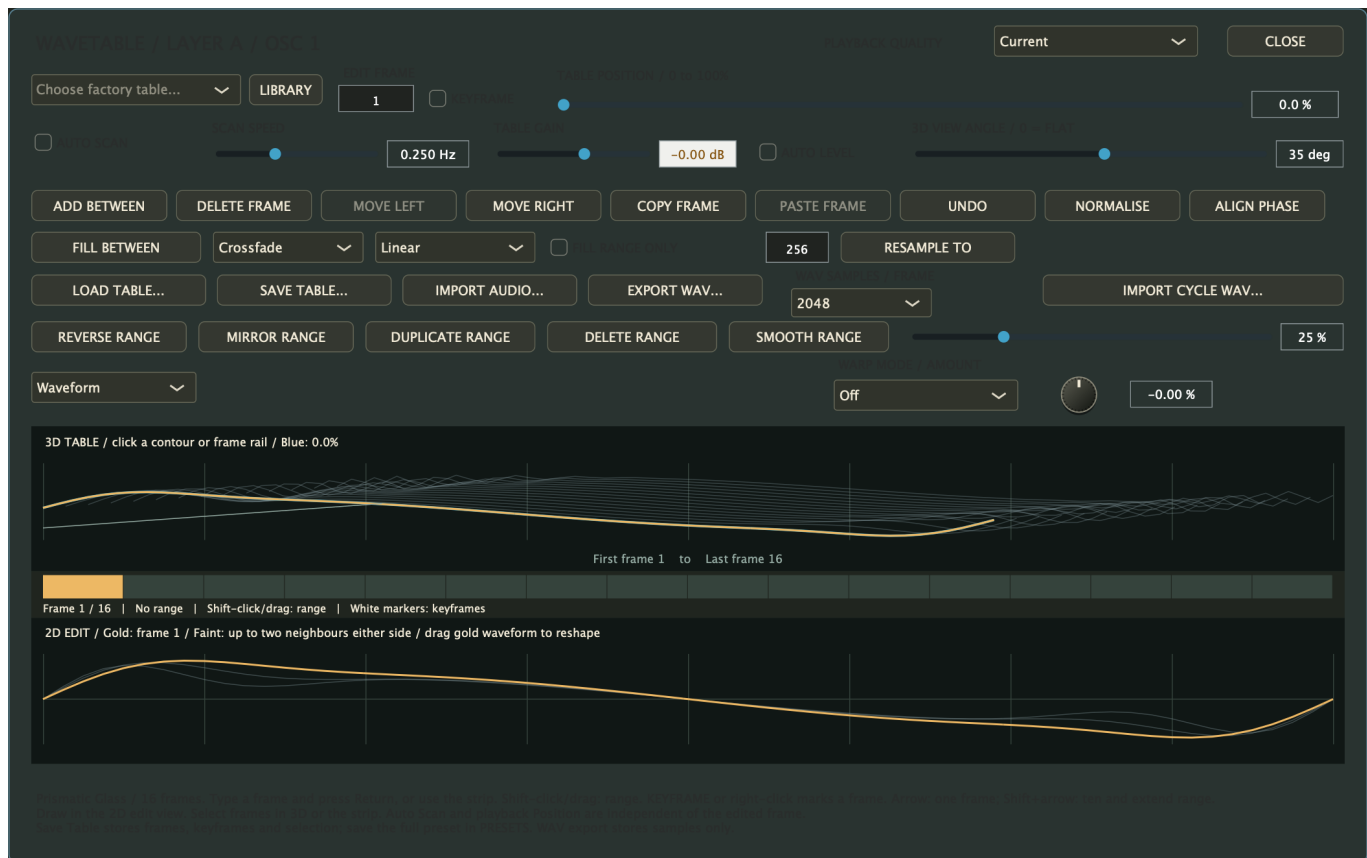
The spectrum and bars describe the active stored frame before DC removal and the engine's common headroom gain. They do not analyze the live output, the filter, distortion or the Morph blend. Bars above 0 dB are visually capped; hover reports the true magnitude. High notes can lose upper harmonics through band-limited playback.

Adding many strong harmonics can push the raw shape beyond  $\pm 1$ . Draw auto-scales and labels its vertical range. The engine applies downward-only common gain to keep playback tables bounded; adding one strong harmonic may lower the audible level of others. It does not normalize upward or clip the raw drawing.

The first harmonic edit promotes that frame from its original 64-point representation to a detailed 4096-sample cycle. Draw retains the detail: Freehand alters the painted region, Move points deforms locally, and Smooth averages adjacent samples. A template returns the selected frame to a simple drawing. Oscillator harmonic editing does not apply to drawable LFOs.

## SOUND REFERENCE

# 10 / Wavetables and scanning



Wavetable editing and scanning controls.

## What a table plays

A wavetable is an ordered set of single-cycle frames. Position selects a point between neighboring frames; the oscillator repeats the resulting cycle at the played pitch. It is different from Sample playback, which reads a recorded timeline and may loop a longer region. Choose Wavetable on a main oscillator and open EDIT TABLE.

Begin with one unison copy, no oscillator interactions and an open filter. Select a factory table and move TABLE POSITION from 0 to 100%. The first endpoint is the first frame and the other is the last. Moving the selected Edit Frame changes what you edit, not the playback position. Gold highlights the edited frame; the playback preview represents Position.

## Position, Auto Scan and quality

Turn Auto Scan off for manual Position or an LFO/envelope assignment. Auto Scan travels through the table and back, starting at the beginning on a fresh note; Scan Speed sets its rate. Position has the retained Wave Morph parameter identity even when its visible caption reads TABLE POS. Use the current control's assignment menu rather than inventing a second position parameter.

Current quality preserves established playback. Adaptive reduces wavetable aliasing with additional work and possible brightness changes. It is saved per oscillator. Try the two on the actual note range and routing you use. Global Play/Render quality and this source quality are separate choices.

Table Gain is -24 to +18 dB before downstream routing, character and filters. Auto Level prepares one fixed whole-table RMS correction toward the reference saw level; it does not chase every frame, note, filter or warp change. It preserves intended level movement across the table. Use Table Gain for an additional trim. A quiet imported table may need this deliberate adjustment rather than excessive master drive.

| Control                 | Range / choices                                                          | Default  |
|-------------------------|--------------------------------------------------------------------------|----------|
| Osc 1 Auto Scan         | Off; On                                                                  | Off      |
| Osc 1 Scan Speed        | 0.010 Hz to 20.000 Hz                                                    | 0.250 Hz |
| Osc 1 Wavetable Quality | Current; Adaptive                                                        | Current  |
| Osc 1 Table Gain        | -24.00 dB to 18.00 dB                                                    | 0 dB     |
| Osc 1 Table Auto Level  | Off; On                                                                  | Off      |
| Osc 1 Warp Mode         | Off; Bend; Asymmetry; Mirror; Window Sync; Harmonic Shift; Spectral Tilt | Off      |
| Osc 1 Warp Amount       | -100.00 % to 100.00 %                                                    | 0 %      |

Layer A controls; Layer B has its own independent settings.

## Select frames and ranges

Click a contour in the 3D view, use the frame rail/strip or type an Edit Frame number. At a flat viewing angle several contours can overlap, so the strip or typed value is more precise. Arrow keys in focused views step one frame. Shift+arrow steps ten and extends a range; Shift-click/drag selects a contiguous range. These shortcuts belong to the editor view, not a text field you are typing in.

KEYFRAME marks an anchor for filling. Right-clicking a frame in the strip/3D view can toggle its marker. Markers follow moved frames. Selecting or marking a frame does not itself change Position. Draw only in the lower 2D editing view; the 3D overview is for navigation and inspection.

## Edit and organize frames

ADD BETWEEN inserts an interpolated frame after the selected frame, or a copy at the end. DELETE FRAME retains at least two. MOVE LEFT/RIGHT reorder frames and their markers. COPY/PASTE transfers the selected waveform. A table supports up to 256 frames in the current editor; this does not mean 256 oscillators run at once.

REVERSE RANGE reverses the selection, or the complete table with no range. DUPLICATE RANGE inserts a copy after it. MIRROR RANGE inserts a reversed copy including endpoints, making a return journey. DELETE RANGE retains a legal table. Check the selected range before any operation and use Undo to compare.

## Fill and resample

Mark two or more useful keyframes, then FILL BETWEEN to generate the intervening frames. Crossfade blends samples and can cancel opposite phases. Spectral moves magnitudes/phases through a different path. Linear, Ease In, Ease Out, Ease In-Out and Exponential shape the fill progression. FILL RANGE ONLY limits edited non-keyframes to the selection while allowing surrounding keyframes as anchors.

RESAMPLE TO changes the number of frames in the selected range or whole table, preserving evenly spaced source positions. The total remains bounded by 256. Use more frames when editing detail matters; adding copies of nearly identical frames is not an automatic improvement. Cancel a long operation if you chose the wrong scope, then inspect the status before starting another.

## Smooth, normalize and phase alignment

SMOOTH RANGE blends each frame toward its neighbors, with Amount controlling the blend. Boundaries use neighbors inside the selected range. NORMALISE removes DC and uses common scaling for its chosen scope rather than independently flattening every frame's loudness. ALIGN PHASE aligns the available fundamental to reduce avoidable cancellation. Alignment can change a deliberately phase-shaped sweep; compare before keeping it.

A useful exercise is to draw a simple bright endpoint and a darker endpoint, mark them, Fill Between with Spectral, then scan slowly. Repeat with Crossfade to hear the difference. Do not judge filling while Auto Scan and several other modulation routes all run at unrelated rates.

## Harmonic editing

Switch the edit view to Harmonics. Drag magnitude bars in dB; SHOW PHASE exposes phase editing. Right-click a bar for exact dB/degrees. APPLY TO RANGE applies touched magnitudes/phases to selected frames; tools transform each frame's own spectrum. TAPER RANGE reduces the amount toward the ends, preserving endpoints for larger ranges. With one or two frames, the full edit applies.

Tools include Odd Only, Even Only, Tilt, low/high-pass rolloff, Comb every N, Randomise and Clear Above N. The harmonic-number controls can address content above the 256 visible bars, up to the supported 2048th harmonic. Higher partials can remain outside the displayed range. Set the tool's cutoff/interval and amount, apply, then compare by scanning and listening.

## Warp without redrawing the table

Warp offers Off, Bend, Asymmetry, Mirror, Window Sync, Harmonic Shift and Spectral Tilt. Amount zero preserves the unwarped wave. Bend, Asymmetry, Harmonic Shift and Tilt use the bipolar range; Mirror and Window Sync use the positive range, with negative values acting as zero. Warp is a saved playback transformation rather than a destructive rewrite of the source frames.

Start with one static frame and sweep a modest Warp Amount. Then modulate Amount while scanning. Distortion, sync and PM can add still more harmonics; high notes and extreme settings may benefit from Adaptive/global quality, at a CPU cost. Inspect the Spectrum but choose by the audible result.

### Hear the Warp modes separately

Bend compresses one part of the waveform's phase progression and expands another. Asymmetry changes the relative time occupied by the two halves of a cycle. Mirror blends toward a forward-and-back reading of the cycle. Window Sync fits more repeated waveform activity inside a windowed cycle, producing sync-like harmonic changes. Harmonic Shift moves spectral components through its shift transformation; Spectral Tilt changes their relative low/high weighting. These are waveform transformations, not additional keyboard notes or conventional playback of a long recording.

Choose a static table frame, turn other modulation off, and sweep a small amount in one mode. Return Amount to zero before selecting the next mode for a clean reference. Then animate the preferred mode. Warp can change perceived pitch, level or brightness depending on the source; Auto Level is a fixed table correction and does not follow each warped result.

## Import cycles or convert audio

IMPORT CYCLE WAV reads a file arranged as consecutive equal-size single cycles. Choose the appropriate 1024/2048/4096 samples per frame. Ordinary recordings need IMPORT AUDIO instead: choose a region and channel, then a conversion mode. Pitched uses periodic analysis, Spectral develops spectral frames, and Raw Slice uses waveform slices. These are creative conversions, not guaranteed extraction of a natural instrument at every pitch.

Set source Start/End, target frame count, frame length, smoothing, normalization and alignment as needed. CONVERT prepares a preview, PREVIEW auditions it, and IMPORT TABLE applies the completed result. Until application, do not assume the oscillator has changed. A failed conversion leaves a status message to resolve rather than a partially usable table. To play a recording's original attack/timing, use Sample instead of table conversion.

### Audio-conversion limits

The audio converter accepts mono/stereo WAV or AIFF up to 30 seconds, 256 MiB of file data and 128 MiB decoded PCM. These limits differ from the Sample oscillator's 60-second recording limit. Choose 2-256 resulting frames and a supported cycle length. If a pitched conversion reports unreliable regions, try a steadier source span or another mode instead of treating an analysis guess as a correct root for every frame.

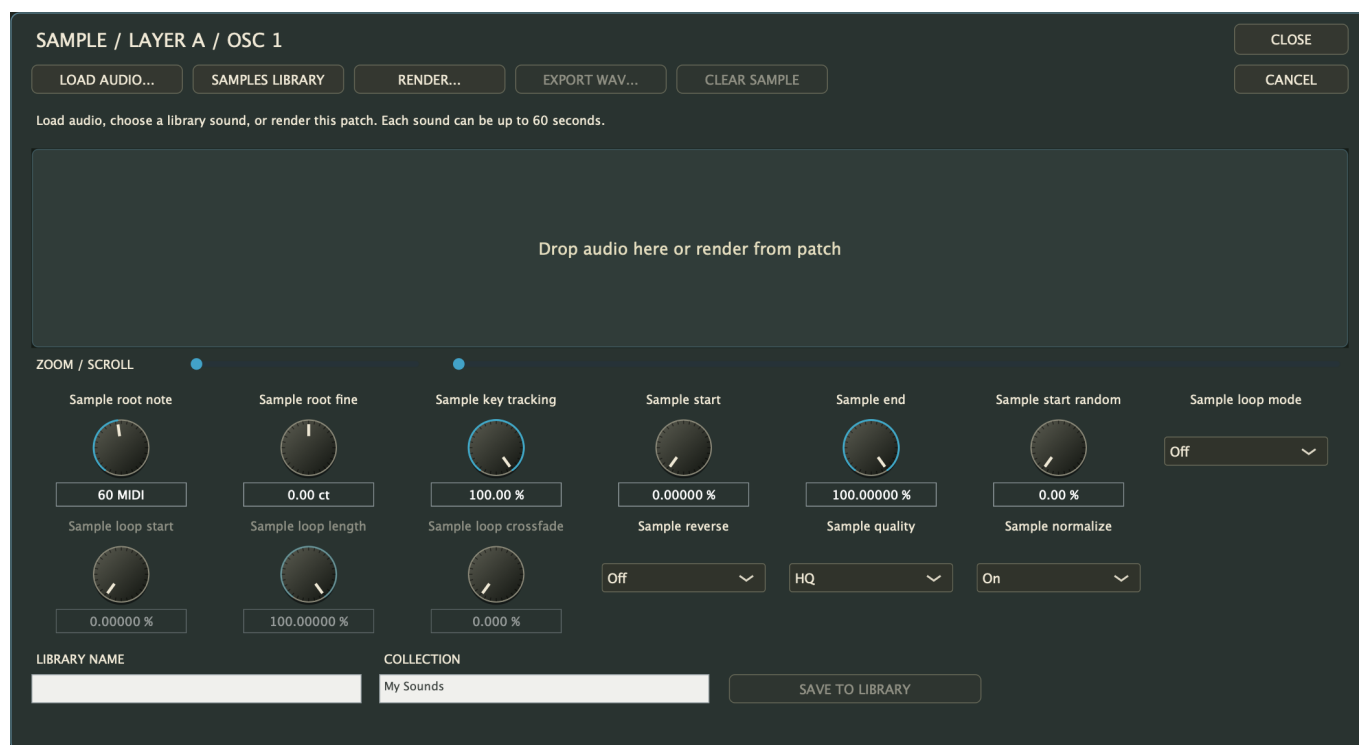
## Library, files and portability

LIBRARY browses factory and user tables. Category, text and tag filters narrow the result; Favorites makes a useful shortlist. Hold a note or choose AUDITION C3 to hear a preview that scans automatically. USE TABLE commits the choice; CANCEL restores the saved patch. Selecting a preview and committing it are different actions. Save a table to reuse it without its whole synth patch; save a preset for its oscillator settings, modulation, both layers and effects. A .mosatable retains exact table/editor data. WAV export carries cycle samples and does not retain keyframe/selection metadata. Imported and edited user tables are embedded with saved sounds/projects; factory references use the managed factory identity and restore checks.

Keep the complete personal wavetable library backed up. Loading an older preset, editing a table and saving it in a new version can require that newer reader. Preserve originals for rollback. More frames increase preparation, memory and saved-data size; playback reads the neighboring frames it needs, so frame count is not a direct simultaneous-voice multiplier.

## SOUND REFERENCE

# 11 / Sample playback



The Sample editor controls a recording as an oscillator source.

## A recording as a sound source

Sample is available on Oscillators 1-3 in both layers. It reads a single mono or stereo recording per oscillator, with region, pitch, loop and playback controls, then sends that source through the synth's existing routing and processing. It is a creative sampler/resampler without multisample zones, velocity layers, round robin, disk streaming, time stretching, slicing or third-party instrument-library formats.

No supplied sample library is required. Use your own WAV/AIFF files, library entries or captures of Mosasaur. The optional Resample Showcase presets are saved synth sounds with embedded captures, not a requirement to download a huge general-purpose library.

## Load your first recording

1. Choose the intended layer and oscillator. Enable its Power and make its level audible.
2. Select Sample in the Wave menu. Open EDIT SAMPLE if the editor is not already visible.
3. Load a WAV/AIFF, or drag a supported audio file into the editor.
4. Wait for import/preparation and read its status. The original file is unchanged.

5. Play around the Root note, inspect Start/End and choose Loop Off initially.

6. Save a full preset to retain the recording with the complete sound, or Save to Library to reuse the audio/settings separately.

Sample does not apply to Sub or Noise. Choosing another source family can retain the sample data for later use. Import prepares playback outside the audio callback; a large file can still take time to analyze and embed.

## Root, Fine and Key Tracking

Root is the MIDI key that plays the recording at its reference rate. Automatic analysis supplies a suggestion when confident. If pitch is uncertain, the suggested root defaults to MIDI 60; verify by listening rather than assuming every noisy hit has a definite fundamental. Fine adjusts the reference by up to 100 cents either way.

Key Tracking at 100% makes one semitone on the keyboard change playback by one semitone. At zero, keys trigger the same pitch: useful for percussion and one-shots. Intermediate tracking gives a compressed keyboard range. Layer tuning, oscillator tuning, glide, microtuning and expressive pitch still contribute to the effective playback calculation as applicable.

Changing rate changes both pitch and duration. A note an octave above reference reads roughly twice as fast, with a shorter attack/tail. This is ordinary transposing playback, not time stretching. A long atmospheric recording may be musically useful over a limited range even if its root detection is uncertain.

| Control                     | Range / choices         | Default |
|-----------------------------|-------------------------|---------|
| Osc 1 Sample root note      | 0 to 127                | 60      |
| Osc 1 Sample root fine      | -100 to 100 ct          | 0       |
| Osc 1 Sample key tracking   | 0 to 100 %              | 100.00  |
| Osc 1 Sample start          | 0 to 100 %              | 0       |
| Osc 1 Sample end            | 0 to 100 %              | 100     |
| Osc 1 Sample start random   | 0 to 100 %              | 0.00    |
| Osc 1 Sample loop mode      | Off; Forward; Ping-pong | Off     |
| Osc 1 Sample loop start     | 0 to 100 %              | 0       |
| Osc 1 Sample loop length    | 0 to 100 %              | 100     |
| Osc 1 Sample loop crossfade | 0 to 50 %               | 0.000   |
| Osc 1 Sample reverse        | Off; On                 | Off     |
| Osc 1 Sample quality        | Standard; HQ            | HQ      |
| Osc 1 Sample normalize      | Off; On                 | On      |

Independent controls exist on Oscillators 1-3 of both layers.

## Start and End

Start and End define the usable region as percentages of the recording. Move the region past leading silence to make attacks more immediate. A short End makes a tighter accent; a long End retains ambience. Keep Start before End. The editor maintains a legal region rather than allowing an invalid negative-length recording.

Start Random introduces variation at note onset within the legal region. Small movement can reduce repeated identical attacks; large movement can skip the transient you wanted. Reduce it to zero when diagnosing inconsistent onset. Region modulation is constrained to valid playback data, but an aggressive moving boundary can still create a deliberate timbral change.

Reverse reads the recording backward. It does not automatically remove the original tail's silence, so a reversed impact may appear slow until you trim the region. To make a prompt reverse swell, choose a useful start/end span and test the intended note length. A reversed waveform with Loop Off still reaches an end and becomes silent.

## Forward and Ping-pong loops

Loop Off plays the region once. Forward repeats its chosen subregion. Ping-pong alternates direction at the boundaries. Loop Start and Loop Length define the repeated part inside Start/End. You can retain an attack before the loop, then sustain the body. A loop must contain enough meaningful audio; a nearly silent segment will sustain silence.

Crossfade, up to half the loop span, blends the seam where appropriate. It can soften a discontinuity; listen to several repetitions to judge the seam. Long crossfades can soften rhythm or cancel opposite phases.

Ping-pong avoids the same forward jump but can reverse an audible transient. Compare the actual repeated result, not just the waveform shape.

### Make a sustained instrument from a short note

Load a stable held tone. Keep its attack before Loop Start, choose a steady middle section for the loop, and enable Forward. Add a modest Crossfade, hold the Root note and listen for a repeating click, swell or pitch wobble. Move the loop slightly and compare. Only after it sustains well should you test higher/lower keys and add modulation.

## Quality and Normalize

Standard and HQ are playback-quality choices. HQ can reduce unwanted playback artifacts with additional work; compare on the actual pitch range, especially far above the root. It does not turn a bad loop into a good one or separate several instruments in a recording.

Normalize applies the prepared level correction rather than rewriting the original file. It can make a quiet source easier to use, but downstream distortion and filters then receive a different level. Compare the source at a comfortable output. Normalize is not equal perceived loudness for every sound, and Bake deliberately suppresses it to avoid an unintended printed-level change.

## Playheads, Legato and Retrigger

Retrigger restarts sample playheads on an applicable new articulation. Legato can retain the running playhead while overlapping notes change pitch. A one-shot that already reached End can remain silent during that continuing legato articulation. Use Retrigger when repeated overlapping hits should restart. Non-overlapping notes begin fresh phrases under the existing note policy.

Copper Debris, Glass Door Hit, Reverse Impact, Submerged Spark and Trench Knock intentionally use fixed pitch. Their Key Tracking is zero. The current factory One Shots use Retrigger; an old project or personal copy can retain its earlier saved Legato state. Reload the current factory sound to compare. Fixed pitch itself is not a failed keyboard transposition feature.

## Use the synth around the recording

Sample audio can enter PM/Expo, sync, ring, fold, damage, filters, source effects and unison. PM moves playback position; Expo affects rate. These interactions can transform a simple recording into a new texture. Start with one copy and no routing so you can distinguish the source from its processing.

The dedicated Sample modulation destinations cover Start, Loop Start, Loop Length and Crossfade for each oscillator. Root/Fine/Key Tracking and other exposed controls retain their ordinary macro, MIDI Learn and automation access where supported. Shape-source controls that do not apply to Sample are disabled; stored settings for another waveform can remain.

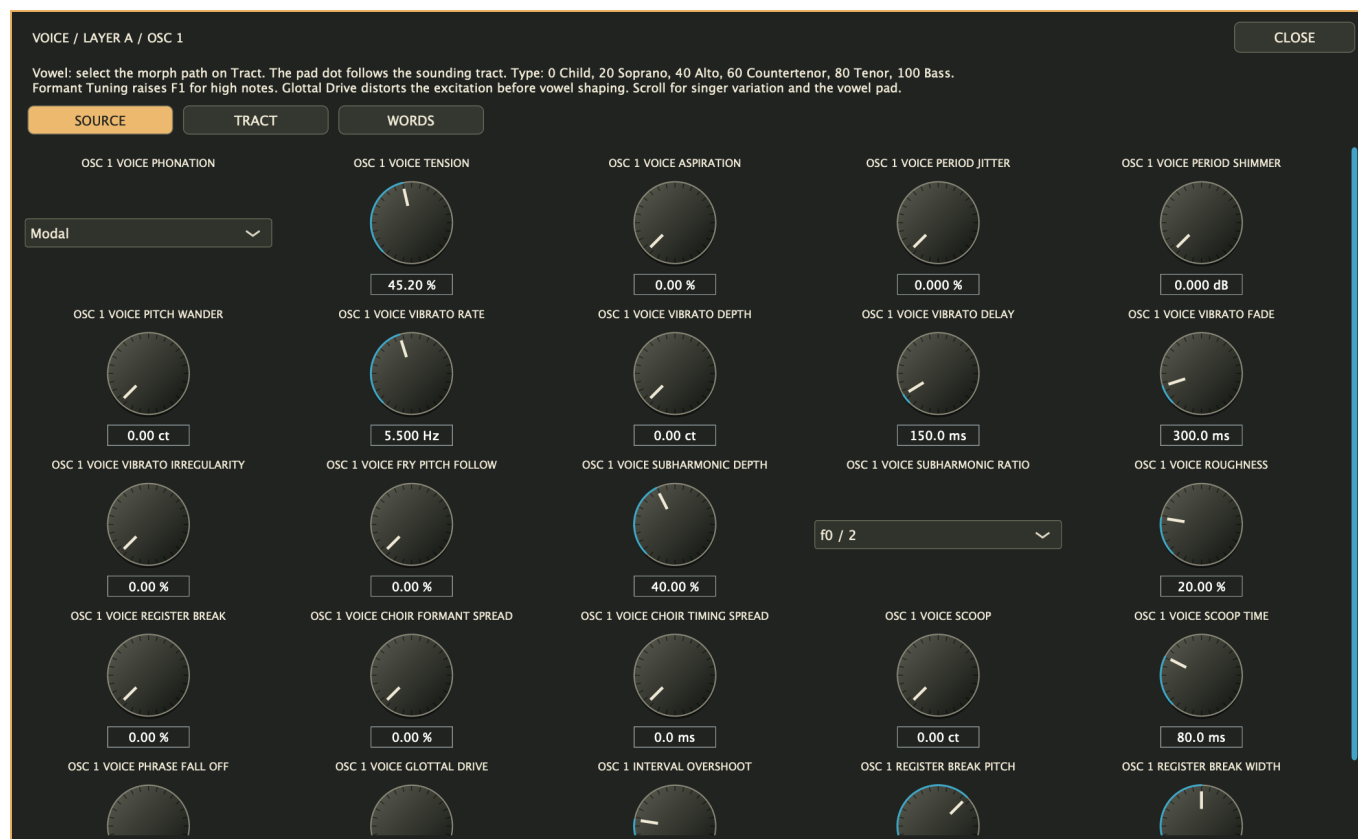
## Export audio or save a sound

EXPORT WAV writes the chosen Start/End region with Normalize at its native rate as 24-bit WAV. Loops, Reverse, pitch and effects remain playback settings rather than being printed by this source export. To print the complete sounding result, use resampling or performance capture. Saving a preset embeds its source audio and full synth state; saving a library entry stores reusable audio and sample settings.

If import fails or the sound changes during preparation, read the message and retry against the current target. An obsolete background job is not allowed to overwrite a newer sound silently. Keep a completed take by saving/exporting it before starting another capture when it matters.

## SOUND REFERENCE

# 12 / Voice and Glottal sources



The Voice editor groups source, tract and articulation controls.

## A synthesized voice

Voice combines a glottal-style excitation with vocal-tract formants, noise and articulation. It does not require recorded singers or a sample library. To enable it from Init, open oscillator 1's Wave menu on Sound and select Voice. The editor opens; use EDIT VOICE to reopen it later. Selecting another source in Wave turns Voice off for that oscillator. Each oscillator has its own Wave selection. Alternatively, load a Voice-based preset and open EDIT VOICE. Voice uses its existing saved enable parameter internally, so older Voice presets retain their sound. Each of the three main oscillators in each layer has its own vocal settings and saved text/phoneme data.

For a first sound, use one oscillator, one unison copy, Vowel playback and Modal phonation. Keep the ordinary filter open enough to hear formants. Set a sustained amp envelope. The pitch of the note and the resonances of the tract are different things: changing a vowel moves resonances without being ordinary note transposition.

## Phonation and tract controls

Phonation chooses Modal, Breathy, Pressed, Falsetto, Vocal Fry, Growl, Scream or Whisper. Tension affects source closure/brightness. Voice Type travels from smaller/higher voice types toward Bass. Tract Size shifts resonances independently of oscillator pitch; Formant Bandwidth changes how broad they are. Formant Tuning and Tracking control their pitch relationship. Singer Ring emphasizes a singing projection region.

Nasality blends nasal characteristics; its pole/zero controls set their spectral positions. Aspiration adds breath-like energy. Jitter varies period timing, Shimmer varies cycle level, and Wander supplies slower pitch instability. Add these in small amounts before stacking choir movement, unison detune or external modulation. Several simultaneous randomizers can make a voice unintentionally unstable.

| Control                              | Range / choices                                                      | Default  |
|--------------------------------------|----------------------------------------------------------------------|----------|
| Osc 1 Voice Enabled                  | Off; On                                                              | Off      |
| Osc 1 Voice Phonation                | Modal; Breathy; Pressed; Falsetto; Vocal Fry; Growl; Scream; Whisper | Modal    |
| Osc 1 Voice Tension                  | 0.00 % to 100.00 %                                                   | 45.20 %  |
| Osc 1 Voice Vowel A E I O U          | 0.00 % to 100.00 %                                                   | 0.00 %   |
| Osc 1 Voice Voice Type Child to Bass | 0.00 % to 100.00 %                                                   | 80.00 %  |
| Osc 1 Voice Tract Size               | -24.00 st to 24.00 st                                                | 0 st     |
| Osc 1 Voice Formant Bandwidth        | 0.250 x to 4.000 x                                                   | 1.000 x  |
| Osc 1 Voice Nasality                 | 0.00 % to 100.00 %                                                   | 0.00 %   |
| Osc 1 Voice Nasal Pole               | 100.0 Hz to 1000.0 Hz                                                | 250.0 Hz |
| Osc 1 Voice Nasal Zero               | 100.0 Hz to 1500.0 Hz                                                | 450.0 Hz |
| Osc 1 Voice Formant Tuning           | Off; On                                                              | On       |
| Osc 1 Voice Formant Tracking         | 0.00 % to 100.00 %                                                   | 0.00 %   |
| Osc 1 Voice Singer Ring              | 0.00 % to 100.00 %                                                   | 0.00 %   |
| Osc 1 Voice Aspiration               | 0.00 % to 100.00 %                                                   | 0.00 %   |
| Osc 1 Voice Period Jitter            | 0.000 % to 5.000 %                                                   | 0.000 %  |
| Osc 1 Voice Period Shimmer           | 0.000 dB to 6.000 dB                                                 | 0.000 dB |
| Osc 1 Voice Pitch Wander             | 0.00 ct to 100.00 ct                                                 | 0.00 ct  |
| Osc 1 Voice Vibrato Rate             | 0.500 Hz to 12.000 Hz                                                | 5.500 Hz |
| Osc 1 Voice Vibrato Depth            | 0.00 ct to 200.00 ct                                                 | 0.00 ct  |
| Osc 1 Voice Vibrato Delay            | 0.0 ms to 3000.0 ms                                                  | 150.0 ms |

| Control                          | Range / choices            | Default         |
|----------------------------------|----------------------------|-----------------|
| Osc 1 Voice Vibrato Fade         | 0.0 ms to 3000.0 ms        | 300.0 ms        |
| Osc 1 Voice Vibrato Irregularity | 0.00 % to 100.00 %         | 0.00 %          |
| Osc 1 Voice Fry Pitch Follow     | 0.00 % to 100.00 %         | 0.00 %          |
| Osc 1 Voice Subharmonic Depth    | 0.00 % to 100.00 %         | 40.00 %         |
| Osc 1 Voice Subharmonic Ratio    | f0 / 2; f0 / 3             | f0 / 2          |
| Osc 1 Voice Roughness            | 0.00 % to 100.00 %         | 20.00 %         |
| Osc 1 Voice Register Break       | 0.00 % to 100.00 %         | 0.00 %          |
| Osc 1 Voice Choir Formant Spread | 0.00 % to 15.00 %          | 0.00 %          |
| Osc 1 Voice Choir Timing Spread  | 0.0 ms to 40.0 ms          | 0.0 ms          |
| Osc 1 Voice Scoop                | 0.00 ct to 150.00 ct       | 0.00 ct         |
| Osc 1 Voice Scoop Time           | 0.0 ms to 300.0 ms         | 80.0 ms         |
| Osc 1 Voice Phrase Fall Off      | 0.00 ct to 150.00 ct       | 0.00 ct         |
| Osc 1 Voice Playback Mode        | Vowel; Lyric; Phoneme Lane | Vowel           |
| Osc 1 Voice Phoneme Transition   | 5.0 ms to 200.0 ms         | 40.0 ms         |
| Osc 1 Voice Vowel Pad Override   | Off; On                    | Off             |
| Osc 1 Voice Vowel Pad F2         | 0.00 % to 100.00 %         | 50.00 %         |
| Osc 1 Voice Vowel Pad F1         | 0.00 % to 100.00 %         | 50.00 %         |
| Osc 1 Voice Glottal Drive        | 0.00 % to 100.00 %         | 0.00 %          |
| Osc 1 Phoneme Lane Rate          | 0.05 steps to 16.00 steps  | 2.00 steps      |
| Osc 1 Phoneme Lane Gate          | 5.00 % to 100.00 %         | 90.00 %         |
| Osc 1 Phoneme Lane Length        | 1 steps to 32 steps        | 8 steps         |
| Osc 1 Phoneme Lane Sync          | Free; Tempo sync           | Tempo sync      |
| Osc 1 Phoneme Lane Retrigger     | Continue; Restart on note  | Restart on note |
| Osc 1 Reset Lyrics               | Position A; Position B     | Position A      |
| Osc 1 Vowel Glide                | 0.0 ms to 2000.0 ms        | 80.0 ms         |
| Osc 1 Articulation Rate          | 0.50 x to 2.00 x           | 1.00 x          |
| Osc 1 Coarticulation             | 0.00 % to 100.00 %         | 60.00 %         |

| Control                    | Range / choices          | Default    |
|----------------------------|--------------------------|------------|
| Osc 1 Unstressed Reduction | 0.00 % to 100.00 %       | 30.00 %    |
| Osc 1 Consonant Level      | -24.00 dB to 12.00 dB    | 0 dB       |
| Osc 1 Frication Level      | -24.00 dB to 12.00 dB    | 0 dB       |
| Osc 1 Interval Overshoot   | 0.00 % to 100.00 %       | 20.00 %    |
| Osc 1 Legato Syllables     | Off; On                  | On         |
| Osc 1 Hold Vowel           | Off; On                  | Off        |
| Osc 1 Register Break Pitch | 48.00 MIDI to 84.00 MIDI | 72.00 MIDI |
| Osc 1 Register Break Width | 0.00 st to 12.00 st      | 6.00 st    |
| Osc 1 Onset Timing         | Live; Internal pre-roll  | Live       |

Representative Voice oscillator 1 controls; repeated oscillator/layer sets are independent.

## Pitch gestures and choir behavior

Vibrato Rate and Depth set periodic pitch motion; Delay and Fade introduce it after an onset, and Irregularity disturbs perfect repetition. Scoop and Scoop Time shape the approach to a note. Phrase Fall Off shapes the ending. Register Break and its pitch/width controls can create a transition across a range. Fry Follow, Subharmonic Depth/Ratio and Roughness have their strongest meaning in the relevant phonation modes.

Choir Formant Spread and Timing Spread differentiate copies. They do not add independently played keyboard notes. Listen with one copy first, then add unison and spread. Use modest formant variation for a related ensemble; larger variation is a synthetic effect.

## Vowel mode and the pad

The vowel control travels A > E > I > O > U. The vowel pad can override that path using its F1/F2 axes. Enable the override intentionally; otherwise moving the pad is not the same as moving the active vowel selector. A useful macro can sweep vowel while another changes tract size or breath, creating a playable character control.

The custom vowel table editor lets you select a voice type and A/E/I/O/U anchor, then adjust six formants' frequency, bandwidth and gain. APPLY VOWEL TABLE commits the table. RESTORE CHANT returns that voice-type table to its supplied anchors and disables the custom override. Save the complete preset to retain these structured data; the table is not a collection of new host automation lanes.

## Lyric mode

Choose Lyric when you want text converted into a phoneme sequence. Enter a short phrase first, apply/compile it using the editor, and read its status. Unsupported or ambiguous text needs correction; listen to the compiled phrase and adjust its pronunciation as needed. The phoneme entry options allow explicit pronunciation when ordinary words are unsuitable.

Legato Syllables and Hold Vowel determine how articulation proceeds across a phrase. Phoneme Transition smooths mouth changes. Begin with clear separated notes, then try overlapping notes and adjust the global trigger policy deliberately. A sustained vowel needs an amp envelope long enough to remain audible.

Onset Timing offers Live and Internal Pre-roll. Pre-roll can prepare consonant articulation inside the voice; it is not a claim that the host or physical keyboard has negative latency. Compare the actual attack in context before choosing it for fast performance.

## Refine articulation

Vowel Glide smooths mouth transitions over its selected time. Articulation Rate scales how quickly speech gestures proceed. Coarticulation blends the influence of neighboring phones; Unstressed Reduction weakens less-emphasized vowels. Consonant Level and Frication Level balance the non-vowel material. If a phrase sounds like disconnected whistles, reduce those levels less aggressively before increasing global treble.

Interval Overshoot adds the configured vocal pitch approach around intervals. Register Break Pitch and Width locate/spread the register transition rather than changing the keyboard's tuning map. Reset Lyrics supplies an exposed reset trigger position; use the interface's reset action to return the text position instead of assuming every legato note starts the sentence again. Keep the global articulation, Legato Syllables and Hold Vowel choices consistent with how you play.

## The independent phoneme lane

Phoneme Lane has up to 32 steps and does not replace the four Motion modulation lanes. A step can contain a syllable such as moon or explicit phonemes such as {S AA1 N}; the editor supports the displayed ARPAbet/IPA entry conventions. Apply the edited lane before auditioning its result.

Length sets the visited steps. Rate is steps per beat when synced and steps per second when free. Gate shapes each step's articulation. Retrigger controls its restart behavior. Start with four simple vowel/syllable steps, a slow rate and no other Motion. Then add rhythmic notes or modulation once the lane is understandable by itself.

## Build a playable vocal patch

1. Choose one Voice oscillator and Vowel mode. Hold a comfortable note.
2. Select a phonation and adjust Tension before adding breath and instability.
3. Move Vowel through its anchors, then use Tract Size/Voice Type for the character.
4. Set a moderate amp attack/release so phrase edges are clear.
5. Assign a macro to a restrained vowel span and another to breath or vibrato depth. Save the endpoints in native units.
6. Try Lyric or Phoneme Lane only after the sustained voice works. Save a version before changing articulation data.

## The simpler Glottal oscillator

Glottal is a separate waveform choice. It supplies a pitched glottal excitation with a Tension control without the complete Voice tract/articulation system. Shape Source and the applicable Morph modulation control tension for that source. Use it with the layer Formant filter or TalkBox for a simpler vowel-like instrument. EDIT WAVE is not a custom-drawing editor for this built-in source.

## If the voice does not speak clearly

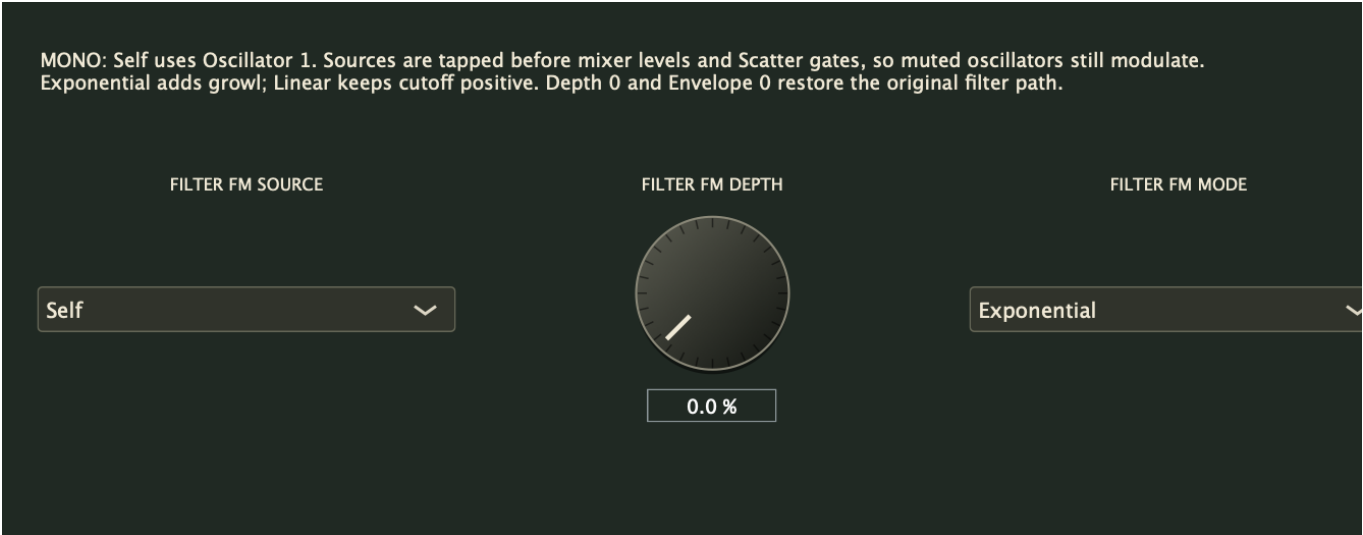
Check the active playback mode, applied text/lane, source Power, level and envelope. Open a closed ordinary low-pass filter before judging formant clarity. Reduce distortion and resonance that may mask consonants. Confirm that a pad override or macro is not holding the vowel somewhere unexpected. Voice is a creative synthesizer; extreme phonation, transposition and routing can intentionally move far from natural speech.

SOUND REFERENCE

# 13 / Oscillator routing, FM, ring and sync



Routing controls for the selected layer.



Filter FM selects an audio-rate source and its scaling.

## Phase modulation, ring modulation and sync

All sixteen directed phase-modulation routes exist among Oscillators 1, 2, 3 and Sub: each source can modulate every destination, including itself. The PM label reads source > destination. In PM row mode, each depth is a phase index in radians. Expo FM row mode instead displays semitones. [Chapter 13](#) defines the current range controls. The generator reads causal feedback history, so a PM loop does not become an instantaneous circular computation.

In PM and Ring automation IDs and numbered table labels, **1, 2 and 3 mean Oscillators 1, 2 and 3; 4 means Sub**. For example, a\_phase1to4 is Oscillator 1 > Sub, a\_ring1x4 is Oscillator 1 x Sub, and a\_ring3x4 is Oscillator 3 x Sub.

| Control            | Range / choices                                    | Default          |
|--------------------|----------------------------------------------------|------------------|
| PM 1 > 1           | 0 to 4 rad (base range)                            | 0 rad            |
| PM 1 > 2           | 0 to 4 rad (base range)                            | 0 rad            |
| PM 1 > 3           | 0 to 4 rad (base range)                            | 0 rad            |
| PM 1 > 4           | 0 to 4 rad (base range)                            | 0 rad            |
| Ring 1 x 2         | 0.0 % to 100.0 %                                   | 0.0 %            |
| Ring 1 x 3         | 0.0 % to 100.0 %                                   | 0.0 %            |
| Ring 2 x 3         | 0.0 % to 100.0 %                                   | 0.0 %            |
| Ring 1 x 4         | 0.0 % to 100.0 %                                   | 0.0 %            |
| Ring 2 x 4         | 0.0 % to 100.0 %                                   | 0.0 %            |
| Ring 3 x 4         | 0.0 % to 100.0 %                                   | 0.0 %            |
| 1 Sync source      | Off; Oscillator 1; Oscillator 2; Oscillator 3; Sub | Off              |
| PM feedback timing | Legacy / 1 sample; Fixed / 22.68 us                | Fixed / 22.68 us |
| Sync correction    | Legacy; Band-limited                               | Band-limited     |

The PM rows show the base 0-4 radian range. Extended cross-PM and the destination WRECK range can raise the effective range; see [Chapter 13](#) before copying a depth between modes.

PM feedback timing offers Legacy / 1 sample and Fixed / 22.68 us. The fixed mode is the new-patch default; retaining a legacy timing choice matters to the sound of older feedback patches.

Ring pairs are 1 x 2, 1 x 3, 2 x 3, 1 x Sub, 2 x Sub and 3 x Sub. A pair multiplies raw operands and blends that product into both participating branches. Multiple pairs are mixed in parallel with bounded wet weighting. A source's level can be low while its raw waveform still supplies modulation to another source.

Each oscillator and the sub can choose a sync source. The slave resets on the source's wrap. Self-links and circular chains are prevented by the sync graph handling. Band-limited sync correction is the new-patch default; Legacy remains for compatibility.

**Per-oscillator pitch modulation is supported.** Matrix destinations include Coarse offset and Fine offset for each main oscillator. This lets you sweep a sync slave's pitch without moving the master.

## Oscillator routing workbench

The current workbench covers all 35 connection contexts and the seven interaction families. The workbench sections below explain line editing, family views, saving, bypass, PM/FM envelope-follow and expanded PM ranges. Personal routing presets live under `~/Library/Application Support/Mosasaur Audio/Mosasaur Mono/User/Routing/`. A routing preset is smaller than a full sound preset.

## Find and read the diagram

OSC ROUTING includes PM/Expo, Sync, Ring, PM scaling, Fold and Logic; scroll to reach the lower sections. Shape is on SOUND and Filter FM has its dedicated page, but both are represented in the routing workbench. Fold also appears on HARMONIC CHARACTER. Select the intended Layer A/B before editing.

Open **ROUTING PRESETS & DIAGRAM**. The diagram now covers **35 editable connection contexts**: four Sync, sixteen PM/Expo, six Ring, three Shape, one Filter FM, three Fold and two Logic. The family selector offers All, Sync, PM/Expo, Ring, Shape, Filter FM, Fold and Logic. Changing this selector only changes the view.

Arrows indicate direction; Ring is a symmetric pair. Dashed lines identify bypassed/dormant connections. A white editing marker identifies the selected connection. An asterisk indicates matrix-driven modulation. The drawing shows stored base controls rather than live effective signal values. Clicking a line opens the matching context; available mode, source and extra controls depend on its family. The overview represents the Mono shared-filter topology.

**Bypass Connection** applies to the original 26 Sync, PM and Ring contexts. It preserves their settings and also silences matrix contributions to that link. Shape, Filter FM, Fold and Logic do not have the same per-connection bypass contract; use their own source/amount/level controls. A line can be dormant because its required mode or waveform is not selected.

Save Routing Preset stores routing settings, not the entire patch: it does not substitute for saving waveforms, envelope times, matrix rows or effect racks. Clear Routing clears its routing settings while keeping unison and matrix programming. Undo Routing applies to the routing-preset action until subsequent patch edits; it is not an unlimited general undo history. Deleting a stored routing preset does not itself clear the currently loaded routing.

Route Damage adds signal-processing slots to these existing connections; it does not create a new set of oscillator arrows. Gold squares identify damaged connections, and node badges distinguish Source from Self damage. The summary counts damage slots. [Chapter 14](#) shows where to edit them.

## 1. Audio-rate Filter FM

Open **FILTER FM** from SOUND. Source choices are Self, Osc 1, Osc 2, Osc 3, Sub and White Noise. Depth is 0-100% with a nonlinear response for finer control at small values. Mode selects Expo or Linear cutoff modulation. Key Track 0-100% reduces modulation range as played pitch rises, with MIDI 60 as reference and bounded scaling. Envelope -100 to +100% subtracts/adds depth from the filter envelope; effective depth remains bounded.

Self uses Osc 1 to modulate the shared layer filter. A specifically selected oscillator/Sub source fans out to applicable filters. White Noise is a dedicated modulation source; its availability does not require audible mixer Noise. Muting a modulator's level does not disable raw modulation.

Filter FM may become active through a positive envelope contribution even at base Depth zero. Try a moderate base cutoff, little resonance and a Sine carrier, then increase Depth slowly. An already fully open filter can hide its effect. Compare Linear/Expo and different source pitches with later volumes matched. 4x oversampling is a useful audition setting; watch CPU headroom.

Depth, Key Track and Envelope have continuous matrix destinations for each layer.

## 2. Exponential FM and PM range

Each destination row has **Mod Type: PM / Expo FM**. It changes all four incoming links in that row, including self-feedback. PM is phase displacement measured in radians. Expo FM changes frequency exponentially and displays a depth of 0-48 semitones. The underlying saved/automated raw depth range remains 0-4, with Expo displayed as raw value times twelve.

Expo Center Off/On estimates the mean frequency ratio and reduces upward pitch bias. It is not a tuner that guarantees a fixed pitch during every transient. Try matched Sine oscillators, a muted modulator, moderate Expo amount and compare Center with the same note and output level.

**Extended PM** is a per-layer range setting for the twelve cross links. Legacy reaches 4 radians; Extended reaches 12 radians while keeping the low range through 1.5 radians unchanged. The existing raw domain and parameter IDs are preserved. Self-feedback still reaches 4 radians; Expo remains 48 semitones. Switching a nonzero high cross-link setting to Extended can change its sound, so compare before saving. Multiple incoming links remain bounded by the engine.

PM Feedback Timing selects Legacy / one generator sample or Fixed / 22.68 microseconds. Fixed is the newer-patch default. Legacy timing can be important to older feedback sounds. It is distinct from the effect-delay timing or the ring Echo character.

**PM/FM follows envelope** is a source property: the source oscillator ADSR shapes all its outgoing PM and Expo links, including self-feedback. It uses those times even if the source's audible Mono envelope is bypassed. Edit the times on OSCILLATOR ENV, not in the line editor.

## 3. Hard, Soft, Reverse and Scatter Sync

Each of Osc 1, 2, 3 and Sub can select a sync source or Off. Self-sync and circular sync chains are prevented. Sync is a directed generator interaction, not an effect applied to a mixed signal.

Hard resets the slave at the source wrap. Soft accepts a reset only in the configured phase window; Threshold is 0-100%, with zero closest to Hard and a high threshold rejecting most events. Its slider enables when Sync Type is Soft; a non-Off sync source is also needed to hear its effect. The endpoints are 0% and 100%; 50% is the middle, not the maximum. ACTIVE means you can edit it; INACTIVE and the dimmed track mean the current mode does not use it. Stored values remain for later reuse. Reverse flips the slave's traversal direction on the event. The **SYNC CORRECTION** dropdown sits above the Ring pair knobs, beside **PM / FM FEEDBACK TIMING**. Choose Legacy or Band-limited. Band-limited smooths the abrupt sync discontinuity to reduce aliasing; it is not a tone control. The difference may be subtle at low pitches or gentle settings.

Compare an audible synced Saw/Pulse slave on a higher note with all other settings fixed. It does not eliminate all modulation artifacts.

Scatter Sync is an experimental fourth type. Amount 0-100% varies the slave's phase-entry point rather than always starting at zero. Order chooses seeded Random or an eight-position Sequence. To edit it: choose a non-Off **1 SYNC SOURCE**, set **OSC 1 SYNC TYPE** to **Scatter**, then scroll down to **SYNC SCATTER 1 AMOUNT**. That round knob, not **OSC 1 SOFT THRESHOLD**, controls Scatter. Repeat for Osc 2, Osc 3 or Sub using the matching source/type/amount. It needs a selected source, Scatter type and an audible amount. To sweep it, hold or repeat the same note while changing Amount to 0%, 20%, 50% and 80%; compare each setting. This is unrelated to audible copy-gating on UNISON.

For an isolated comparison, use a Saw source and Pulse slave in Mono, keep the source muted in the mix, then sweep the slave pitch. Compare the types at the same source/slave relationship. The source level does not need to be audible for sync to operate.

In this control-location example, Osc 1 is Hard and its threshold is inactive. Osc 2/3 are Soft, so the sliders are editable; their sources are Off, so they will not produce sync until a source is selected.

## 4. PM depth scaling

Find **PM DEPTH MASTER** below the Ring pair blend knobs, beside **PM KEY TRACK** and **PM VELOCITY**. This knob spans 0-200%, default 100%, and scales PM/Expo depth. Key Track -100 to +100% changes depth with destination note pitch around MIDI 60, with bounded pitch scaling. Velocity 0-100% moves between unscaled depth and velocity-scaled depth.

Set one audible Sine carrier and a muted Sine modulator with a moderate PM amount. Play low/high registers before and after Key Track, then soft/hard velocities before and after Velocity. Keep the host velocity source consistent. These controls shape interaction depth, not the whole patch's volume. A zero route still sounds unmodulated even with Master at 200%.

## 5. Ring, AM and Diode

Six pairs connect 1 x 2, 1 x 3, 2 x 3, 1 x Sub, 2 x Sub and 3 x Sub. Dry > Product 0-100% blends each pair's raw product into its participating branches. Pairs are parallel, rather than a single chain. A zero-level modulator can still supply a raw operand; at least one endpoint needs an audible output path.

Ring gives the classic product and sum/difference components. AM preserves each endpoint's own carrier character. Diode adds a nonlinear bridge character with antiderivative antialiasing. Carrier Leak 0-100% adds dry input from both sides with gain compensation; Asymmetry 0-100% applies to Diode. These are different from increasing source distortion.

Use a Sine carrier and a modulator at a non-octave interval. Raise pair blend, compare Ring/AM/Diode, then raise Leak. Match later level when comparing the extra bass/fundamental. Keep other pairs dry initially.

## 6. Audio-rate Shape modulation

On SOUND, each main oscillator has Shape Source Off/Osc 1/Osc 2/Osc 3/Sub and Depth -100 to +100%. Self-links are blocked. It uses the source's previous generator-sample signal before its audible mixer and effects, with matched relative copy placement in unison.

Shape changes built-in Pulse width around the shared base width, or Custom Morph position around its base amount. The static Pulse width spans 5-95%; dynamic width is bounded to 2-98%. Dynamic Morph is bounded to 0-100%. With Wavetable, Shape moves table position; with Glottal it shapes Tension. It does not apply to unrelated built-in waves or Custom Dual A+B, so those controls are disabled there. Sample uses its dedicated region modulation instead.

Choose a Pulse carrier, set a middle width and use a muted Sine/Sub modulator. Compare Depth zero to a modest positive value, then reverse the sign. For Custom, draw clearly different frames and use Morph playback near the middle. The feature can add sidebands/animation; it is not merely a slow matrix LFO.

## 7. Cross-wave Fold

On HARMONIC CHARACTER, the three main Fold rows offer Source Off/Osc 1/Osc 2/Osc 3/Sub, Amount 0-100%, Depth 0-100% and Symmetry -100 to +100%. Self-fold source links are blocked. Sub can modulate a main folder but has no equivalent Fold processor of its own.

Amount is the base folding. It works with Source Off. Depth adds bipolar source-dependent motion to that amount, bounded to the same range. At Amount zero and positive Depth, the source's positive half-wave can still activate folding. Symmetry biases the contour. All seven built-in main waveforms and both Custom playback modes are supported.

Fold occurs before Character and the legacy source distortion stage. Its antiderivative antialiasing and DC removal reduce artifacts but do not make every extreme setting spectrally gentle. Start with a Sine and no source: increase Amount to hear folding alone. Then choose a silent modulator and add Depth. Return Depth to zero before judging the base Amount. Compare Symmetry separately. Higher oversampling can help but adds CPU cost.

The Folded Alloy bank provides performance sounds; Crossfold Studies gives focused comparisons. Extended cross-PM belongs to this upgrade step but remains a separate PM range control, not a Fold Amount extension.

## 8. Oscillator Logic

Two slots per layer each select Input A and Input B from Osc 1/2/3/Sub, a Mode, Threshold -100 to +100% and Level 0-100%. Level zero disables that audible contribution. Logic creates a new sound source and leaves the original oscillator paths available.

XOR, AND and OR compare each input against the threshold and combine the resulting states. Comparator compares raw A minus B against the threshold. Identical inputs can make XOR or Comparator quiet; this is not necessarily a broken routing slot. Muted source inputs remain available.

Input A anchors the Logic output's note, unison copies, pan, Scatter gates and envelope. In Mono it joins the original mix before the shared filter.

The new Logic source uses band-limited transitions, a short generator-sample delay and DC removal. Mode changes fade its contribution through zero; the original sound path is not delayed by that new source. Start with two different Pulse/Square inputs, mute their direct levels, make Logic Level audible and compare the four modes. Bring back some original carrier for a less stark sound.

## Experimental Routing Characters

These five characters reshape the selected oscillator interaction. Their neutral/zero settings preserve Standard behavior where applicable. They are available in the same workbench and save with routing/full presets.

| Character    | What changes / important condition                                                                                             |
|--------------|--------------------------------------------------------------------------------------------------------------------------------|
| Scatter Sync | Varied phase entry at sync events; source and Scatter type required.                                                           |
| Stepped PM   | Samples/holds cross-source PM in modulator phase subdivisions, from 64 toward 2 as Amount rises. Self-feedback stays Standard. |
| Mirror PM    | Alternates the cross-source PM polarity across modulator cycles. Amount blends this effect; self-feedback stays Standard.      |
| Echo Ring    | Blends a product with a one-cycle delayed tap referenced to the lower-indexed oscillator.                                      |
| Gate Ring    | Gates the lower-indexed carrier according to sign agreement of the pair inputs, with smoothing/DC removal.                     |

Ring Mode includes Echo and Gate. Their Extra 0-100% control applies only to these modes; at zero the result is Standard product behavior. Echo follows the cycle of the lower-indexed oscillator, not whichever note happens to be lower in pitch. The cycle buffer is bounded to 125 ms with an 8 Hz floor, and has no feedback tail. Gate is a source-sign interaction, not a MIDI gate or ordinary noise gate.

The Routing Characters bank has three presets per experiment, fifteen total. Compare character amount with the featured mode retained; selecting Standard can also remove the relevant extra control. Do not confuse Stepped PM with Sample Crush distortion or a step sequencer.

## Building combinations

Make each interaction audible alone, save the baseline, then combine them. Start with moderate values and matched later volume. A useful progression is Sine carrier plus PM, then a little Fold, then a modest filter cutoff and Filter FM. Alternatively, try Pulse Shape plus Soft Sync, or Logic with a little dry carrier and Diode Ring.

Add unison movement and effects last so their motion/ambience does not hide what the routing itself changes. Save a full preset for a complete recipe; a routing preset alone cannot reproduce its waveform, ADSR, matrix and effects.

## SOUND REFERENCE

# 14 / Route Damage



Oscillator Routing provides the entry to the routing workbench and its processing controls.

Route Damage changes the signal used by a routing interaction. It can make modulation coarse, saturated, folded or rhythmically chopped while keeping the direct oscillator available. There are sixteen independent slots in each layer. This is separate from the main oscillator Fold processor and from distortion in an effects rack.

## Find the controls

1. Select **LAYER A** or **LAYER B** at the top of the instrument.
2. Click **OSC ROUTING** in the bottom page row.
3. Scroll down inside the routing page to **ROUTE DAMAGE / SELECT A SLOT BELOW**.
4. Click one Source, Feedback or Pair button. The selected button is highlighted and its editor opens below the overview.
5. Choose **TYPE**, then adjust **AMOUNT** and **MIX**. Only controls used by that type appear. Type Off leaves the other controls inactive.
6. Read the status text below the editor. Make sure the matching routing depth or audible level is also above zero.

## Choose the correct signal stage

| Slot group                         | Signal path                                                                              | What must be audible                                                                              |
|------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Source: Osc 1, 2, 3, Sub           | Delayed raw source > Damage > existing PM character > outgoing cross-route depth.        | PM or Expo FM into another oscillator. Direct source audio, sync and self-feedback are unchanged. |
| Feedback: Osc 1, 2, 3, Sub         | Delayed self signal > Damage > DC safety and soft limiting > self-route depth.           | The matching diagonal PM/Expo route feeding that oscillator itself.                               |
| Pair: six Ring pairs and Logic 1/2 | Raw A/B > selected input damage > product or Logic comparison > existing Ring character. | Nonzero Ring blend or Logic Level with an audible output path.                                    |

Source Damage does not feed Pair Damage. They are independent stages. A muted modulator still supplies raw routing signals. For Pair slots, **TARGET** chooses **Input A**, **Input B** or **Both** according to that pair's input ordering. Changing one Source slot does not change all sixteen slots.

## Common controls and a clean comparison

**TYPE** selects Off, Fold, Hard Clip, Decimate or Chop. Pair slots provide Off, Fold, Hard Clip and Decimate only. **AMOUNT** and **MIX** each span 0-100%. Amount sets algorithm intensity; Mix blends the processed interaction signal with its unchanged signal.

**Off, Amount 0%, or Mix 0% is neutral.** Choosing a Type alone does not guarantee a sound change. Also confirm routing depth/level, layer and audible carrier. Start at moderate settings, then return Mix to zero to hear the same routing without Damage. Compare at a matched later output level.

## Fold and Hard Clip

**Fold** pushes the routing signal through a sine folder, creating extra bends and harmonics. Amount raises its internal drive from 1 to 12 nonlinearly. **Hard Clip** increases drive from 1 to 40 and clips the contour, often giving a harder, denser modulation signal. Neither is the same control as the main oscillator Fold or an effects-rack distortion.

Both use local antiderivative antialiasing and smooth parameter changes. Their complete routing result can still be bright, unstable or aliased at extremes. Feedback slots add DC safety and limiting, but high self-depth can still become chaotic. Begin with low self-depth and comfortable output volume.

## Decimate

Decimate holds and quantizes the interaction signal. Lower rates can create stepped or metallic motion; fewer bits add coarse amplitude levels.

| Control     | Range / operation       | Listening use                                                       |
|-------------|-------------------------|---------------------------------------------------------------------|
| RATE MODE   | Free or Pitch           | Free uses an absolute hold clock; Pitch follows the source pitch.   |
| HOLD RATE   | 50-22,000 Hz, Free mode | Lower it gradually to hear the held steps.                          |
| PITCH RATIO | 0.25-32x, Pitch mode    | Sets hold rate relative to the source pitch.                        |
| BITS        | 2-16, continuous        | Lower it to hear coarser levels; fractional settings are supported. |
| SOFTEN      | 0-100%                  | Smooths transitions; compare with the same rate and bits.           |

Hold Rate and Pitch Ratio are alternatives for the selected mode. A setting can remain saved when its control is hidden. Amount and Mix must still be above zero. Decimation intentionally creates coarse spectral character; oversampling does not remove its intentional coarse character.

## Chop

Chop gates the Source or Feedback interaction signal. It does not directly gate the oscillator's audible amplitude and is unrelated to Unison Scatter copy selection. If the dry carrier stays audible, you can hear a repeating change of timbre rather than silence between chops.

| Control   | Range / operation                                         | Listening use                              |
|-----------|-----------------------------------------------------------|--------------------------------------------|
| CLOCK     | Free or Tempo                                             | Select the clock before setting its rate.  |
| CHOP RATE | 0.1-60 Hz, Free clock                                     | Repetition speed independent of tempo.     |
| DIVISION  | 1/1 through 1/64 with dotted/triplet choices, Tempo clock | Subdivision of the current host tempo.     |
| DUTY      | 5-95%                                                     | Proportion of the cycle that is open.      |
| PATTERN   | Square or Random                                          | Regular gate or varied pattern.            |
| EDGE      | 1-20 ms                                                   | Raised-cosine smoothing of entry and exit. |

Amount controls chop depth. Slot timing is shared across unison copies and note-on resets the clocks. Increasing Edge softens transitions. Compare Square at a moderate tempo division before choosing Random. The editor shows Division for Tempo or Chop Rate for Free, not both.

## First listening exercise: the Mono showcase bank

1. Open **PRESETS**, clear filters, and find **Showcase Banks > Route Damage - Rift Carnival**. Use the preset browser's search if the category list is filtered.
2. Load **01 Crater King**. Its preset comment identifies Source Fold at 5x. Begin near MIDI note 36 with comfortable output volume, and hold a single note to hear its motion.
3. Move the **Damage** macro slowly while repeating the same note. The factory sound also includes a clean sub and filter movement, so listen for changing timbre rather than judging the algorithm by volume alone.
4. Compare **02 Demolition Velvet**, whose comment identifies Feedback Clip at 10x, and **03 Bit Tyrant**, which uses Logic Decimate at NUKE (20x). Read each comment for its starting register and macro roles before playing.
5. Open **OSC ROUTING**, scroll to Route Damage, and inspect the selected sound's Source, Feedback and Pair slots. Check Type, Amount, Mix and the expanded range. Each preset can feature a different slot and routing connection.
6. Macro assignments can own slot controls. Use the named macro for a factory comparison; use the fresh Init exercise below when you want direct, isolated control.
7. Save a personal copy before editing. Return to the original factory preset when you need the author's complete settings and performance assignments again.

This Mono bank demonstrates finished performance sounds rather than dry laboratory baselines. Use the following patch recipe to hear one process without the showcase sound's extra motion and processing.

## Isolated Source Fold exercise

Use a fresh **Mono Init** with Layer B down, Motion Off and effects bypassed. Remove any macro/matrix assignments that could alter the controls used below. Select Layer A. This isolates one layer while you learn the interaction.

1. On **SOUND** choose **Sine** for Osc 1 and Osc 2. Keep Osc 1 audible and set Osc 2 level to zero; its raw signal can still modulate. Keep other source levels down. Use the same pitch for both initially.
2. On **OSC ROUTING** choose **PM** in **OSC 1 MOD TYPE**. Set only **OSC 2 > OSC 1 / rad** to **1.00 rad**; keep other PM depths and Ring blends zero, Sync sources Off and Logic levels zero. Set **PM DEPTH MASTER** to **100%**, **PM KEY TRACK** and **PM VELOCITY** to zero.
3. Play one note. This is the baseline PM interaction. If it is not audible, check oscillator level, envelopes, filter cutoff and Layer/Master output before continuing.
4. Scroll to Route Damage and select **SOURCE / OSC 2**. Set **TYPE: Fold**, **AMOUNT: 30%**, **MIX: 100%**.

5. Play the same note. Move Amount to 60%, then 90%, returning to 30% between comparisons. Here a sweep means changing that named control slowly while holding or repeating the same note.
6. Set **MIX: 0%**. The original PM signal returns. Set Mix back to 100% to compare. The direct oscillator wave has not been replaced by a folder.
7. Keep the baseline and try **Hard Clip**, then **Decimate** with Free mode, Hold Rate 500 Hz, Bits 6 and Soften 0%. Reset Mix to zero between comparisons.
8. Try **Chop**, Clock Free, Chop Rate 4 Hz, Duty 50%, Pattern Square, Edge 5 ms, Amount 80% and Mix 100%. Listen for rhythmically changing PM timbre. The dry carrier need not disappear.

Save a personal full preset for the baseline and another for your favorite result. Init, source levels, effects and envelopes belong to the full sound, not just a routing preset.

## Diagram, saving and control ownership

Gold squares mark damaged existing links. Oscillator badges distinguish Source and Self damage, and the summary counts damage slots. The diagram shows stored base parameters; macro and host automation values can differ. Clean Compare can neutralize the effective signal while base markers remain visible.

Full presets and host state save both layers' Damage settings. Routing presets include them in the current format (v12); older routing presets and older supported sound states default Damage Off. **Clear Routing** resets Damage and **Undo Routing** can restore it. Existing macro ownership can prevent a directly owned setting from responding to Clear or loading; release the assignment when you need to edit its base setting. Save a copy before compatibility experiments with earlier builds.

Route Damage supports **host automation, macro assignment and MIDI Learn**. It adds no modulation-matrix destinations or extra matrix rows. In AUTOMATION, **Current Setup** hides Off slots; **All Parameters** retains the complete appended controls, including inactive mode alternatives. Do not assume a visible automation entry means the current type uses it.

## CPU and troubleshooting

Begin with one active stage and one or two unison copies. Factory performance sounds can combine several processors; maximum slot/copy/oversampling settings can exceed real-time headroom. See [Chapter 38](#) for current measured limits and practical adjustments.

If nothing changes, check Type, Amount, Mix, matching route/level, active layer, audible carrier and macro ownership in that order. If an interaction stays silent, inspect its source and carrier paths or Logic input anchors before blaming Damage. For a repeatable fault, retain version, preset, exact steps, note/pedal sequence and audio settings.

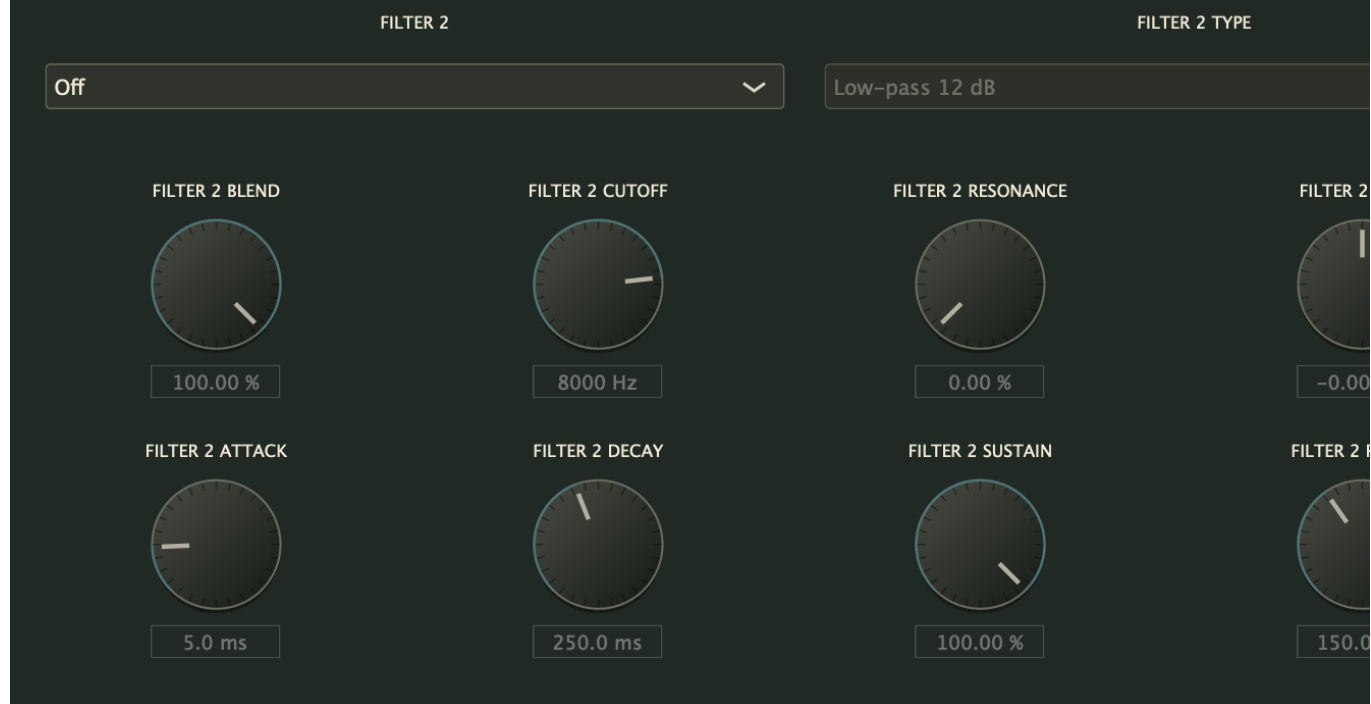
## Expanded ranges

Current Damage ranges offer 1x, 5x, 10x and NUKE (20x). The range scales the selected damage intensity; the slot Amount and Mix remain separate controls. PM WRECK and Ring WRECK also have expanded range choices. Follow the visible range label when copying a recipe, start with the ordinary range and compare at a comfortable level. A high range does not guarantee a louder output or multiply every setting equally.

## SOUND REFERENCE

# 15 / Filters, Filter 2 and Formant

Shape this layer with a second filter and its own envelope. Series: Filter 1 feeds Filter 2. Parallel: both receive the same signal; Blend moves resonance fade before bypassing. Right-click a control to assign modulation or MIDI Learn. Each layer has its own filter and envelope.



Filter 2 adds an independent response within the selected layer.

The Sound-page filter selector offers **Classic ladder**, **ZDF ladder** and **Formant**. ZDF ladder is the default for Init. Classic/ZDF selects the shared ladder engine; Formant enables the vowel filter for the selected layer. The selection is saved in the patch and applies to both layers; cutoff, resonance, filter type, envelope and drive remain per-layer controls.

## Modes and cutoff meaning

The filter-type menu contains Low-pass 24 dB, Low-pass 12 dB, High-pass 12 dB, High-pass 24 dB, Band-pass 12 dB, Band-pass 24 dB, SVF low-pass, SVF high-pass, SVF band-pass and Diode low-pass 24 dB. The engine selector changes the six ladder modes. The SVF and diode paths remain their own models.

Ladder high-pass and band-pass outputs are combinations of ladder taps. They are not separate cascades of high-pass components. ZDF also provides its low-pass tap selector and bass-compensation option; those options should not be interpreted as extra slopes for the SVF or diode paths.

The ladder cutoff label is calibrated to the **upper -3 dB corner relative to the response peak at 32% resonance**, using the full four-stage low-pass response. Other modes, taps, drive and resonance settings

change the response, so their measured -3 dB point can differ from the label. Raising resonance changes the peak; driving a nonlinear filter changes the conditions of the measurement.

The parameter's top label is 12,720 Hz. The effective cutoff is also rate-clamped: at 44.1 kHz the maximum is 11,686.5 Hz, while at 48 kHz it is 12,720 Hz. This is a processing-only clamp: the stored cutoff parameter is unchanged, including when the patch is saved again at 44.1 kHz. Returning to 48 kHz restores the higher available effective ceiling. Reaching the top stop does **not** bypass the filter.

| Control               | Range / choices                                                                                                                                                      | Default         |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Filter engine         | Classic ladder; ZDF ladder                                                                                                                                           | ZDF ladder      |
| Filter type           | Low-pass 24 dB; Low-pass 12 dB; High-pass 12 dB; High-pass 24 dB; Band-pass 12 dB; Band-pass 24 dB; SVF low-pass; SVF high-pass; SVF band-pass; Diode low-pass 24 dB | Low-pass 24 dB  |
| Cutoff                | 20 Hz to 12720 Hz                                                                                                                                                    | 12720 Hz        |
| Resonance             | 0.0 % to 100.0 %                                                                                                                                                     | 0.0 %           |
| Filter drive          | 1.00 x to 10.00 x                                                                                                                                                    | 1.00 x          |
| Mixer drive           | 0.0 % to 100.0 %                                                                                                                                                     | 0.0 %           |
| Key tracking          | -100.0 % to 100.0 %                                                                                                                                                  | 50.0 %          |
| Velocity to cutoff    | -5.00 oct to 5.00 oct                                                                                                                                                | 0 oct           |
| Sweep amount          | -5.00 oct to 5.00 oct                                                                                                                                                | 0 oct           |
| Env speed             | Fast; Slow                                                                                                                                                           | Fast            |
| ZDF LP24 tap          | 1 pole / 6 dB; 2 poles / 12 dB; 3 poles / 18 dB; 4 poles / 24 dB                                                                                                     | 4 poles / 24 dB |
| ZDF bass compensation | Bass comp off; Bass comp on                                                                                                                                          | Bass comp off   |

## Resonance and drive

Resonance uses its full 0-100% travel. Near the upper end, the ladder can sustain self-oscillation: feedback supplies a pitched component even with little source input. Use that response for ringing accents or a sine-like tone, with output level set conservatively. A higher resonance value is not merely an EQ boost of unchanged amplitude.

Filter drive feeds the nonlinear filter path. Mixer drive is earlier, at the combined source input. WRECK belongs to the individual source branches. These controls can all change harmonics, but they operate at different points; lowering Master output reduces listening level without undoing distortion already generated upstream.

The engines use different feedback calculations. Classic derives feedback from its calibrated stage response and drive-dependent feedback slope. ZDF solves the ladder's feedback loop without the Classic path's explicit

sample delay. ZDF bass compensation is output-only on its low-pass responses; it does not retune the loop or apply to high-pass/band-pass.

Compare the two engines at similar output levels and choose the response that suits the patch.

### Tracking and envelope sweep

Key tracking references **MIDI note 60 (C4 in this guide)**. Its range is -100% to +100%, with a new-patch default of 50%. Positive tracking raises cutoff as pitch rises; negative tracking reverses that relationship. Tracking follows the layer tuning and Oscillator 1's base tuning, which supplies the layer's reference. It is not the average pitch of all oscillators.

The filter envelope supplies a unipolar envelope to a bipolar Sweep amount. Positive amount opens the filter as the envelope rises; negative amount closes it. The amount is measured in octaves. Filter velocity tracking adds another octave offset. Key tracking, envelope sweep and matrix cutoff modulation combine before the final cutoff clamp, so a large positive total can reach the top stop early in the envelope.

FILTER SPEED cycles 1x / 5x / 10x to change filter-envelope timing. Keep the selected speed in view when copying attack or decay settings. The envelope family and timing multiplier are described in [Chapter 16](#). A sustained high cutoff can conceal envelope movement; lower the base cutoff before diagnosing a silent modulation route.

### Retained tap and bass-compensation settings

The ZDF LP24 tap and bass compensation are stored separately for each layer. Classic ignores them without erasing their saved settings. Classic LP24 uses its fixed fourth-stage output; changing a retained ZDF tap does not change that Classic slope. Returning to ZDF restores use of the retained choices where applicable.

The LP24 tap does not apply to ZDF high-pass, band-pass or non-ladder modes. Bass compensation applies only to ZDF low-pass modes. Inactive controls retain their settings; selecting a mode in which they apply makes them usable again.

### Add Filter 2

FILTER 2 provides an optional second filter with its own Enable, Type, routing, blend, cutoff, resonance, Sweep, tracking, velocity and ADSR. Its modes are LP12, HP12, BP12, Notch12, LP24 and HP24. The second filter is distinct from the Classic/ZDF engine selector for Filter 1.

In Series 1 > 2, Filter 2 receives the first filter's result. In Parallel, it receives the layer input and blends its response with the first path. Blend at zero leaves the first path. At full blend, the selected second path dominates. The effective result depends on routing, so compare modes at moderate levels and resonance.

| Control       | Range / choices                                                                                | Default        |
|---------------|------------------------------------------------------------------------------------------------|----------------|
| Filter 2      | Off; On                                                                                        | Off            |
| Filter 2 type | Low-pass 12 dB; High-pass 12 dB; Band-pass 12 dB; Notch 12 dB; Low-pass 24 dB; High-pass 24 dB | Low-pass 12 dB |

| Control               | Range / choices        | Default      |
|-----------------------|------------------------|--------------|
| Filter routing        | Series 1 > 2; Parallel | Series 1 > 2 |
| Filter 2 blend        | 0.00 % to 100.00 %     | 100.00 %     |
| Filter 2 cutoff       | 20 Hz to 20000 Hz      | 8000 Hz      |
| Filter 2 resonance    | 0.00 % to 100.00 %     | 0.00 %       |
| Filter 2 sweep        | -8.00 oct to 8.00 oct  | 0 oct        |
| Filter 2 key tracking | 0.00 % to 100.00 %     | 0.00 %       |
| Filter 2 velocity     | -5.00 oct to 5.00 oct  | 0 oct        |
| Filter 2 attack       | 0.0 ms to 8000.0 ms    | 5.0 ms       |
| Filter 2 decay        | 0.0 ms to 8000.0 ms    | 250.0 ms     |
| Filter 2 sustain      | 0.00 % to 100.00 %     | 100.00 %     |
| Filter 2 release      | 0.0 ms to 8000.0 ms    | 150.0 ms     |

Layer A controls; Layer B has its own independent settings.

## A moving band of tone

Use a saw with a sustained amp. Make Filter 1 a fairly open low-pass. Enable Filter 2 as a high-pass in Series, then raise its cutoff until the bass is trimmed. The two filters now define a band. Add positive Filter 2 Sweep with a short decay for a moving lower edge. Return Filter 2 Blend to zero to hear exactly what its contribution changed.

Filter 2's key tracking and velocity are independent of Filter 1. Its Sweep needs a nonzero amount. Bypass stops feeding the optional filter and allows its applicable transition/ringing state to settle before the dormant path. An unchanged stored cutoff does not mean the optional filter is active.

## The layer Formant filter

Enable Formant on the Sound page for the selected layer. Vowel moves through A/E/I/O/U. Voice selects Male/Female anchoring. Shift transposes formant positions, Sharpness changes their focus, and Mix controls the blend. Key Track determines how much the formants move with played pitch. These controls do not change the recorded text of a Voice oscillator.

| Control        | Range / choices       | Default |
|----------------|-----------------------|---------|
| Formant filter | Off; On               | Off     |
| Formant Vowel  | 0.00 % to 100.00 %    | 0.00 %  |
| Formant Voice  | Male; Female          | Male    |
| Formant Shift  | -12.00 st to 12.00 st | 0 st    |

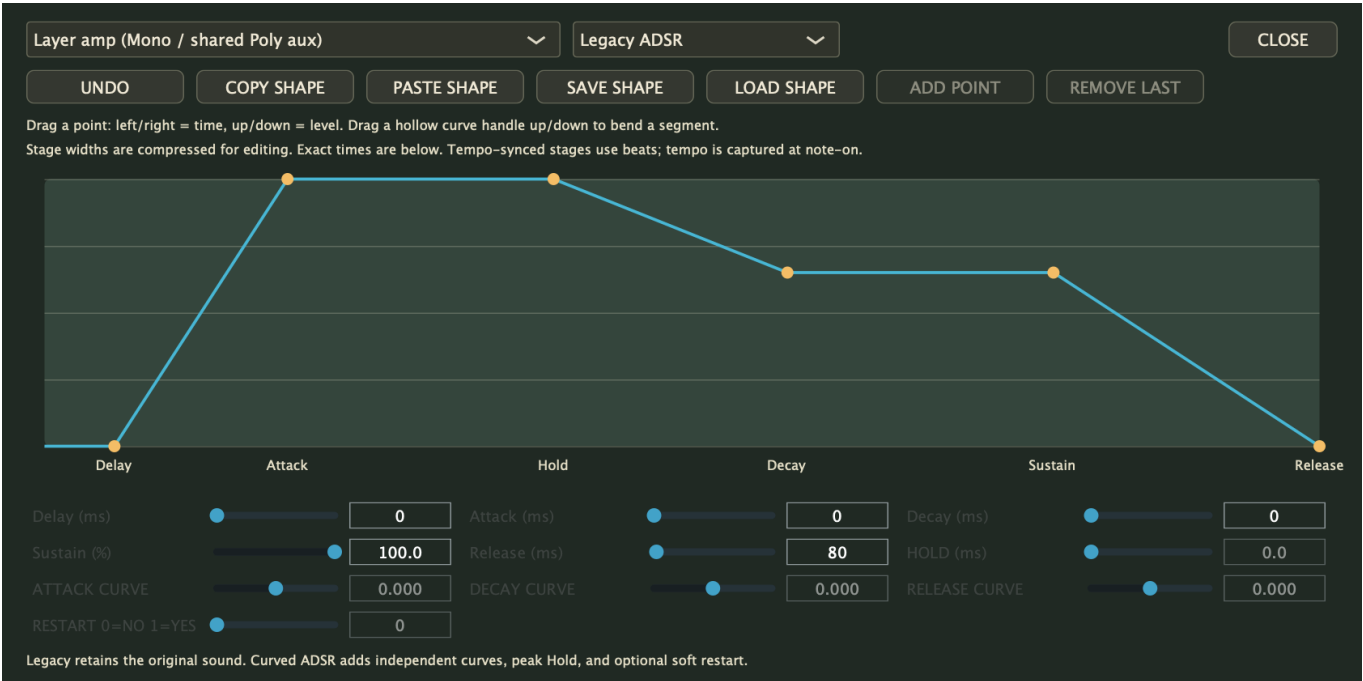
| Control           | Range / choices    | Default  |
|-------------------|--------------------|----------|
| Formant Sharpness | 0.00 % to 100.00 % | 50.00 %  |
| Formant Mix       | 0.00 % to 100.00 % | 100.00 % |
| Formant Key Track | 0.00 % to 100.00 % | 0.00 %   |

Layer A controls; Layer B has its own independent settings.

Start with an open saw, Mix fully wet and a slow vowel movement. Adjust Shift for a useful register, then reduce Mix to blend the effect. Modulate Vowel from an LFO or macro for talking motion. If an additional filter removes the formant region, increasing the vowel amount cannot restore harmonics that never reach it.

SOUND REFERENCE

# 16 / Envelopes and graphical editing



The graphical editor shows the chosen envelope and its exact stage values.



Source envelopes shape individual generators.

An envelope changes a value over the lifetime of a note. Mosasaur has separate amplitude, filter, source, modulation and effect envelopes; editing one does not change the others.

## Envelope families

| Family                 | Stages and destination                                                                                                                                   |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Layer amplifier        | Delay, Attack, Decay, Sustain, Release. Controls the filtered layer's amplitude; note velocity sets its peak.                                            |
| Filter                 | Attack, Decay, Sustain, Release. Feeds the filter's bipolar Sweep amount. FILTER SPEED cycles 1x / 5x / 10x.                                             |
| Oscillator 1-3 and Sub | Optional Attack, Decay, Sustain, Release per source. Shapes its contribution before source effects. Bypass leaves that source unshaped by this envelope. |
| Noise                  | Optional Attack, Decay, Sustain, Release for the noise branch.                                                                                           |
| Env 1 and Env 2        | Delay, Attack, Decay, Sustain, Release per layer. They do nothing to sound until assigned through the matrix.                                            |
| Each current FX slot   | Enable, Delay, Attack, Curve, Decay, Sustain, Release. Its target depends on the selected effect.                                                        |

| Control              | Range / choices    | Default  |
|----------------------|--------------------|----------|
| Amp delay            | 0 ms to 4.000 s    | 0 ms     |
| Amp attack           | 0 ms to 4.000 s    | 0 ms     |
| Amp decay            | 0 ms to 4.000 s    | 0 ms     |
| Amp sustain          | 0.0 % to 100.0 %   | 100.0 %  |
| Amp release          | 0 ms to 4.000 s    | 80 ms    |
| Amp attack smooth    | 0.0 % to 100.0 %   | 0.0 %    |
| Filter attack        | 0 ms to 4.000 s    | 0 ms     |
| Filter decay         | 0 ms to 4.000 s    | 0 ms     |
| Filter sustain       | 0.00 % to 100.00 % | 100.00 % |
| Filter release       | 0 ms to 4.000 s    | 80 ms    |
| Osc 1 source enable  | Bypass; On         | Bypass   |
| Osc 1 source attack  | 0 ms to 4.000 s    | 0 ms     |
| Osc 1 source decay   | 0 ms to 4.000 s    | 0 ms     |
| Osc 1 source sustain | 0 % to 100 %       | 100 %    |
| Osc 1 source release | 0 ms to 4.000 s    | 80 ms    |

| Control       | Range / choices | Default |
|---------------|-----------------|---------|
| Noise enable  | Bypass; On      | Bypass  |
| Noise attack  | 0 ms to 4.000 s | 0 ms    |
| Noise decay   | 0 ms to 4.000 s | 0 ms    |
| Noise sustain | 0 % to 100 %    | 100 %   |
| Noise release | 0 ms to 4.000 s | 80 ms   |
| Env 1 delay   | 0 ms to 4.000 s | 0 ms    |
| Env 1 attack  | 0 ms to 4.000 s | 0 ms    |
| Env 1 decay   | 0 ms to 4.000 s | 0 ms    |
| Env 1 sustain | 0 % to 100 %    | 100 %   |
| Env 1 release | 0 ms to 4.000 s | 80 ms   |

Attack smooth blends the ordinary envelope attack from a straight ramp toward a smooth S-shaped ramp. Legacy ADSR retains its original segments. For separate attack, decay and release curves, peak Hold, soft restart and multipoint shapes, use the graphical Envelope editor ([Chapter 16](#)). AMP SPEED and FILTER SPEED independently select 1x, 5x or 10x timing. Env 1 and Env 2 each have a separate 1x / 5x / 10x button. Sustain is unchanged. FX envelopes have their own Linear, Smooth and Fast attack choices and separate timing ranges.

The stored layer Delay value is also passed to the filter and source envelopes. AMP SPEED scales that delay for the amplifier only; the other envelopes still receive the unscaled base delay. FILTER SPEED scales its attack, decay and release, not that shared delay. Their individual panels do not provide separate delay knobs. Zero time requests the shortest segment rather than removing all internal sample transitions. An amp retrigger while already sounding includes a short fade from the current level before restarting. Do not infer a waveform phase reset from hearing a new attack.

## Using envelope speed controls

On SOUND, AMP SPEED is beside the layer amplitude envelope and FILTER SPEED is beside the sound/filter envelope. Each click cycles **1x -> 5x -> 10x -> 1x**. These are separate controls for the selected layer; Layer B has its own settings. No speed button changes every envelope globally.

| Envelope control             | Effective time limits and affected stages                                                                |
|------------------------------|----------------------------------------------------------------------------------------------------------|
| AMP SPEED: 1x / 5x / 10x     | Delay, Attack, Decay and Release each reach 4 / 20 / 40 seconds.                                         |
| FILTER SPEED: 1x / 5x / 10x  | Attack, Decay and Release each reach 4 / 20 / 40 seconds.                                                |
| Env 1 / Env 2: 1x / 5x / 10x | Each modulation envelope has its own button. Delay, Attack, Decay and Release reach 4 / 20 / 40 seconds. |

| Envelope control            | Effective time limits and affected stages                                                        |
|-----------------------------|--------------------------------------------------------------------------------------------------|
| Source and effect envelopes | Keep their existing ranges. The new Sound-page buttons do not multiply these separate envelopes. |

The fields show **actual time**, including the multiplier: milliseconds below one second, seconds from one second upward. A base setting of 1000 ms displays 5.000 s at 5x or 10.000 s at 10x. If you type 15000 ms with 5x selected, you request an actual 15 seconds; do not multiply that displayed value again. Sustain is a level, and Attack smooth is a curve blend, so neither is multiplied.

Choose 1x for ordinary short contours, 5x for slower movement, or 10x for very long swells and releases. The displayed times already include the chosen factor.

## Make Ladder Sweep descend when you release the key

A one-shot LFO does not automatically reverse when you release a key. For a rise while held and a return after release, drive the existing sweep macro with Env 1. The return begins at the envelope's current level, even if you release before the rise finishes.

1. Save a copy of Ladder Sweep if you already have that patch. To build the same teaching setup from Init, name Macro 1 "Ladder Sweep" and give it two Layer A routes: Filter Sweep amount from 0 to +4 octaves, and Resonance from 15% to 65%. Set the base Cutoff near 200 Hz. Keep a sustained filter envelope, then follow the steps below. Save this starting sound under a new name.
  2. On MODULATION MATRIX, find the row currently routing the swell LFO to Macro 1. Change its Source to **Env 1**, keep Destination **Macro 1**, set Amount to **+100%**, and Via to **None**. Replace the original route rather than leaving both active.
  3. Set the Macro 1 base knob to **0%**. Keep the macro's existing filter Sweep amount and resonance assignments.
  4. At Env 1, choose **10x**. Set Delay **0 ms**, Attack **10000 ms**, Decay **0 ms**, Sustain **100%**, and Release **8000 ms**. These are the displayed, actual times.
  5. On SOUND, choose AMP SPEED **10x** and set the main Release to **10000 ms**, so the voice remains audible during the eight-second return. A very short amp release would cut that return off.
  6. Choose FILTER SPEED **10x** and set filter Release to **40000 ms**. This patch's macro changes the filter envelope's Sweep amount, so the filter envelope also needs to remain active during the macro's return.
  7. Hold a note, then release it during or after the rise. Shorten Env 1 Release for a quicker descent, and keep main amp Release long enough to hear it. Use Retrigger when you want each overlapping note to restart the swell; Legato preserves continuity.
- This recipe makes Env 1 move the existing macro assignments back toward their starting values after release. Adjust the times to suit the phrase and keep the amp release long enough to hear the return.

## Trigger and velocity

The global **Legato / Retrigger** switch controls both layers' note-envelope policy. Legato keeps envelope continuity for overlapping notes; Retrigger starts another envelope articulation. The Motion tie and slide path also determines whether generated notes overlap. [Chapter 29](#) explains the shared policy and delayed B entry.

Amp Velocity controls how strongly note-on velocity changes the amplifier envelope's peak; zero removes that velocity-to-level response. Expression to Level is an additional response. The matrix also exposes Velocity, and Filter velocity can add a cutoff offset. These are separate uses of the same incoming expression, not a single global velocity-depth control.

Velocity transition (99%) controls the approach to a new peak on the Motion legato path. The new-patch default is 10 ms; its range is 0-200 ms. The number is time to 99% of the change, not the duration of a new attack stage. There is no separate user percentage knob attached to this label.

## Meter and gain structure

Source, layer and master meters measure different points. The floating Mixer and Master Output module provide the current metering controls, true peak and loudness displays. [Chapter 36](#) explains their scales and reset behavior. Balance A and B with Layer level while listening to their sum. Lower Master Output for comfortable listening; reducing a level after distortion cannot undo that distortion.

## Matching the two envelope pages

Env 1 and Env 2 on MODULATION MATRIX now cycle 1x, 5x, 10x, just like the Sound-page envelope speed controls. Each is independent in each layer. Larger factors lengthen the time stages; they do not raise Sustain. Enter an explicit unit such as 800 ms or 1.5 s. Bare numbers retain milliseconds meaning. Do not multiply a displayed actual time a second time.

## Choose the envelope that owns the movement

Open the graphical Envelope editor for the selected layer. Its group menu separates layer amp, layer filter, modulation envelopes and individual source amplitude envelopes. An amp envelope controls audibility; a filter envelope requires a nonzero Sweep amount to move cutoff; a modulation envelope requires a matrix assignment. Select the intended group before copying or loading a shape.

The graph compresses stage widths to keep long and short stages editable. Horizontal distance is not a linear stopwatch. Read the exact fields below it. Drag a point horizontally to change time and vertically where its level is editable. Drag a hollow curve handle to bend a segment. Numerical fields are useful when matching a recipe.

## Legacy ADSR

Legacy preserves the established envelope response. Delay waits before the rise; Attack reaches peak; Decay moves to Sustain; Sustain is held while the note is gated; Release returns from the current level after note-off. Source envelopes can be bypassed in the Mono audible path. A source envelope used to shape outgoing modulation can still matter separately.

Use the legacy mode when recalling older sounds or when an ordinary contour does the job. Choosing a new mode is a sound change. A zero or very short time still runs through the engine's articulation transitions; it does not request arbitrary discontinuities at every control update.

## Curved ADSR

Curved ADSR adds a peak Hold stage, separate Attack/Decay/Release curves and optional soft Restart. A rising segment bent one way spends more time near its starting level; bent the other way it reaches its target sooner. For a falling segment, listen to the corresponding decay shape rather than assuming the same curve number has the same audible timing impression.

Start from a short pluck. Increase Decay and compare its curve at several positions while keeping the exact time constant. Next lengthen Release and compare how the sound fades. A filter contour is easier to hear with a moderate base cutoff, positive Sweep and a sustained amp envelope.

Restart includes a short transition from a sounding value before another attack. This reduces abrupt retrigger discontinuities; it is separate from oscillator phase reset and from the global Legato/Retrigger policy.

## Multipoint mode

Multipoint uses two through eight points. Each segment has Time, target Level and Curve. The final level is always zero. The Sustain Point is the last point reached and held while the note remains gated, unless a held loop is enabled. On note release, playback continues through the release-side points after Sustain. Put the desired release shape there rather than extending only a pre-sustain segment.

ADD POINT extends the shape; REMOVE LAST reduces it while retaining a valid final zero. Set Sustain and Loop Start/End to legal points and inspect their labels in the graph. A held loop repeats only while the key is held; it is not a free-running transport sequencer after release. Keep an audible amp release when using a multipoint modulation envelope to move another process during the tail.

### Build a repeating brightness gesture

1. Select Modulation Envelope 1 and Multipoint.
2. Use several levels before Sustain: for example a rise, partial fall and second rise. Set useful segment times.
3. Enable Loop and place its start/end within the held portion.
4. Route Env 1 to cutoff through an unused matrix row. Start with a modest Amount and a base cutoff that leaves headroom.
5. Hold a note and listen to the repeated gesture. Release it and adjust the release-side contour.
6. If the sound ends before the movement can be heard, lengthen the amplitude release separately.

## Tempo and saved shapes

Tempo-synced multipoint stages use beats. Tempo is captured at note-on, so a tempo change does not imply that a running stage continuously recalculates its length. The editor identifies synced time fields. Source/layer speed multipliers and graph timing have their own ownership; copy exact displayed values deliberately.

COPY SHAPE/PASTE SHAPE transfer the selected envelope's contour. SAVE SHAPE writes a .mosaenv file; LOAD SHAPE validates it before applying. Save a full preset to retain assignments, sound generators and effects as well. A useful saved envelope with no destination is still only a contour.

## SOUND REFERENCE

# 17 / Equalization and stereo placement



EQ selects an individual source or the complete layer.



Direction and width place the selected signal in stereo.

An equalizer changes the balance between low, middle and high frequencies. Mosasaur gives each oscillator, the Sub oscillator and Noise its own EQ. Layer EQ shapes the combined layer later in the signal path. The separate Rack EQ effect has a different set of controls and is described in [Chapter 19](#).

## Choose the sound you want to inspect

Open **EQUALIZER**, then choose **OSC 1**, **OSC 2**, **OSC 3**, **SUB EQ**, **NOISE EQ** or **LAYER EQ**. The highlighted **LAYER A** or **LAYER B** button decides which layer you are editing. The knobs, gold response curve, numbered handles and live analyzer all follow that selection. Selecting a target does not solo it or mute the other sounds.

For example, OSC 1 shows that oscillator around its own EQ. It does not show the final sound after the layer filter. LAYER EQ is the useful choice for inspecting the combined layer after its filter and effects. Neither view is a measurement of the final master output after both layers have been combined and the master effects have run.

## The six EQ bands

Every source and layer EQ has a low shelf, four middle bell bands and a high shelf. A shelf raises or lowers a broad region toward one end of the spectrum. A bell raises or lowers a region around a chosen frequency. Frequency moves the region; Gain changes how much it is boosted or cut. Q controls the width of a middle bell: a higher Q makes it narrower. The shelves have fixed slopes and no adjustable Q.

| Control              | Range / choices     | Default |
|----------------------|---------------------|---------|
| EQ bypass / enable   | Bypass; On          | Bypass  |
| Low shelf frequency  | 20 Hz to 1000 Hz    | 100 Hz  |
| Low shelf gain       | -12.0 dB to 12.0 dB | 0.0 dB  |
| Mid 1 frequency      | 20 Hz to 20000 Hz   | 500 Hz  |
| Mid 1 gain           | -12.0 dB to 12.0 dB | 0.0 dB  |
| Mid 1 width (Q)      | 0.20 Q to 10.00 Q   | 1.00 Q  |
| Mid 2 frequency      | 20 Hz to 20000 Hz   | 2000 Hz |
| Mid 2 gain           | -12.0 dB to 12.0 dB | 0.0 dB  |
| Mid 2 width (Q)      | 0.20 Q to 10.00 Q   | 1.00 Q  |
| Mid 3 frequency      | 20 Hz to 20000 Hz   | 1000 Hz |
| Mid 3 gain           | -12.0 dB to 12.0 dB | 0.0 dB  |
| Mid 3 width (Q)      | 0.20 Q to 10.00 Q   | 1.00 Q  |
| Mid 4 frequency      | 20 Hz to 20000 Hz   | 4000 Hz |
| Mid 4 gain           | -12.0 dB to 12.0 dB | 0.0 dB  |
| Mid 4 width (Q)      | 0.20 Q to 10.00 Q   | 1.00 Q  |
| High shelf frequency | 1000 Hz to 20000 Hz | 8000 Hz |
| High shelf gain      | -12.0 dB to 12.0 dB | 0.0 dB  |

The EQ's **On / Bypass** selector determines whether its processing is active. A bypassed EQ displays a flat response. Moving a handle or resetting a band does not automatically turn it on. The stored knob settings remain available when you enable it again.

Source EQ comes before source effects and the layer filter, so a boost can also drive later nonlinear stages harder. Layer EQ comes after the layer effects and does not drive those earlier processors harder. The same curve in two different positions can therefore sound different.

## Read the line display

The frequency axis is fixed at **20 Hz to 20 kHz**, from bass on the left to treble on the right. It is logarithmic: an equal distance represents an equal frequency ratio rather than an equal number of hertz. Any region above the sample rate's Nyquist limit is blank because those frequencies cannot be represented at that rate.

The **gold curve** shows what the selected EQ is set to do. It remains useful in silence. Faint dashed gold curves show each band's contribution; the brighter curve combines all six. At 0 dB the EQ neither boosts nor cuts that frequency. This curve follows the effective settings, including macro-controlled values. During a quick edit, the audio's existing short smoothing can briefly lag the displayed target.

The **translucent blue-green area** is the signal before this EQ. The **bright green line** is the signal after it. Comparing them helps you see what this particular EQ changes. They share the same source level/envelope scaling, so they are a matched comparison around the selected stage. Source views also include the layer amp envelope as display scaling; this does not move the actual source EQ after that envelope in the audio path. A quiet source can have a low or absent spectrum even though its gold EQ curve is visible.

The live spectra use dBFS, a level relative to digital full scale. The gold EQ curve uses dB of boost or cut. They use independent scales: the left spectrum scale is dBFS, with a +6 dBFS ceiling and the selected floor; the right gold EQ scale is fixed at -12 to +12 dB. They answer different questions: the signal trace shows the sound's level; the gold curve shows the EQ's change to that sound. The signal peak does not need to sit on the gold curve.

## Change a band directly on the graph

The numbered circles identify **1: low shelf**, **2-5: four middle bell bands**, and **6: high shelf**. Each sits at its band's frequency on the combined response curve.

- Drag a circle left or right to change its frequency. Each band keeps the same frequency range as its knob.
- Drag up or down to boost or cut gain. Hold **Shift** for smaller adjustments.
- For any bell band (2-5), hold **Option (Alt)** and drag vertically to change Q. Scrolling over any middle-band handle also changes Q. These gestures do not add a Q control to either shelf.
- Double-click a circle to reset that band's frequency, gain and, where present, Q to their defaults. The other bands and EQ bypass selection are retained.
- Right-click a circle, choose **Frequency assignments...**, **Gain assignments...** or **Q assignments...**, then use the same parameter menu as the matching knob.

The knobs and handles edit the same sound parameters and stay synchronized. The independent EQ scale spans **-12 to +12 dB**, matching each band's gain range. Several bands together can exceed that scale; edge arrows mark an off-scale response and handles remain reachable. The spectrum's +6 dBFS ceiling is separate. Changing the spectrum Floor does not move the EQ response or gain handles. The bottom readout shows a handle's frequency, gain and Q while you point to or drag it.

These source and layer EQ controls do not have direct modulation-matrix destinations. Use their existing **Assign to Macro** menu for macro control; do not expect a direct Modulate destination that the knob itself does not provide. A macro-owned value follows its macro and is protected from ordinary manual editing. Disable/remove the route, or use that macro's Capture Mode, to edit it as described in [Chapter 25](#). Individual dimensions can have different ownership.

Dragging an EQ handle records the same Frequency, Gain and Q parameters as editing their knobs. Use the host's automation mode to record the gesture; each dimension remains an independent control.

## Steadiness, tilt and display range

**Average** controls how much the analyzer smooths changes over time. Its full 0-100% range corresponds to a 0-1000 ms averaging time constant; the default is **35%**, or 350 ms. A low setting responds quickly and moves more. A high setting makes trends easier to see but takes longer to settle. It does not smooth or change the sound itself.

**Tilt** changes the display's balance between bass and treble. Choose **Off, 3, 4.5 or 6 dB per octave**; the default is **3 dB/oct**. The reference is 1 kHz: with positive tilt, frequencies below that reference appear lower and frequencies above it appear higher. This can make a naturally falling musical spectrum easier to compare. Tilt affects the live, peak and frozen spectral displays and waterfall brightness. It never changes the sound or the gold EQ response. Use Tilt Off when you want to read the un-tilted spectral level.

**Floor** selects **-90, -100 or -120 dBFS**; the default is **-100**. A lower floor reveals quieter detail. The spectrum ceiling stays at **+6 dBFS**; the EQ scale remains -12 to +12 dB. Floor and tilt change how the same data is displayed, not the level sent to the host.

The analyzer uses two overlapping analyses so the bass does not collapse into just a few frequency bins: a 4096-point main FFT and a 16384-point low-frequency FFT, both with Hann windows and 75% overlap. Their results blend between 250 and 350 Hz. The low view has about 2.9 Hz bin spacing at 48 kHz and needs about 341 ms of samples for its first full window. Slower bass response is normal; the main analysis fills the display while that longer window becomes available. The GUI updates at 30 Hz. This is a bounded dual-resolution analyzer, not constant-Q analysis.

## Peaks, Freeze and the cursor

**Peaks** adds a quieter green outline that remembers recent high points. It is on by default. Each peak holds for **1.5 seconds**, then falls at **20 dB per second**. Enable **Infinite** to keep the outline until you press **Clear peaks**, change EQ target, leave the EQ page or change sample rate. Clear peaks starts a new peak capture; it does not clear or edit your sound.

**Freeze** captures the current post-EQ trace as a **lavender reference line**. Live analysis continues while you edit, making it useful for comparing before and after. Press the button again, now labelled **Clear freeze**, to

remove that reference. Freeze becomes available after valid analysis data arrives. Changing target, leaving the EQ page or changing sample rate clears it so you do not accidentally compare different signal sources. It is a temporary reference, not part of the saved preset. Floor and tilt continue to affect its display.

In Line view, point inside the graph for a crosshair and a readout of frequency, the nearest note name with cents offset, and the displayed dB coordinate. That dB value is the cursor's position, not a separate peak detector. With tilt enabled, remember that the signal display has been tilted. Pointing at a handle instead shows that band's native settings.

## Harmonic markers

Faint vertical markers show the fundamental, labelled **f0**, and up to its **16th harmonic**, limited by Nyquist and the display range. Harmonics are whole-number multiples of the fundamental. They help explain why a pitched sound can produce a row of peaks rather than one peak.

The reference is oscillator 1's played or gliding pitch after layer transpose and oscillator tuning, using the same rule as filter key tracking. It is published by the voice, not guessed from the spectrum. It excludes pitch bend, Analog Drift and matrix pitch offsets under that existing rule. Consequently, it is a tuning reference, not an audio pitch detector, and can remain meaningful when oscillator 1 is quiet. Markers fade over one second after note release; their disappearance does not imply that all effect tails have stopped.

## Waterfall: see how the sound changes over time

Choose **Waterfall** from the selector beside Freeze. Choose **Line** to return to the usual spectrum. Waterfall shows the selected **post-EQ** spectrum as a scrolling picture. Frequency still runs left to right, but vertical position now shows age: the newest row is at the top and the bottom is **six seconds old**. The right-hand labels show 0, 3 and 6 seconds.

Brighter areas mean stronger frequencies. Their brightness follows the selected floor and tilt, with the ceiling at +6 dB. Average still controls the underlying spectral smoothing. A sustained note leaves stable bands; changing its pitch makes them bend. A moving EQ band can alter their brightness. Source views are before the layer filter, so choose Layer EQ to see a filter sweep farther along the signal path.

The gold response and numbered handles remain overlaid, using the **left EQ dB scale**. A frozen reference is also a magnitude curve on that scale. They describe the current EQ or captured reference, not the age of a row. The live pre/post line and peak outlines belong to Line view, which makes the scrolling history easier to read. Freeze captures a reference; it does not pause the scrolling picture.

Hovering over waterfall history reports frequency, nearest note/cents and age. Hovering over a handle reports its settings. Changing target, leaving the EQ page, changing sample rate or switching display mode starts a fresh history. Changing tilt or floor redraws the stored levels with the new display choice. Missing updates or no fresh audio leave blank rows instead of stretching the six-second window.

## A practical EQ comparison

1. Choose the correct layer and **LAYER EQ**. Turn this EQ On and play a sustained note or a repeating phrase.

- 2. Use Line mode, Tilt Off and Average 35% for a steady first comparison. Look at the pre-EQ area and post-EQ line.
  - 3. Press Freeze. Drag middle-band handle 2 slightly down to make a cut, then left or right to find the region you want to reduce. Listen as well as watching.
  - 4. Option-drag the handle to compare a broad cut with a narrow cut. The lavender reference stays in place while the live post-EQ line changes.
  - 5. Compare On and Bypass at sensible listening levels. A boost often sounds more impressive simply because it is louder.
  - 6. Switch to Waterfall and move the band slowly while the phrase repeats. Watch the change travel down the display. Save a new preset when you want to keep the sound settings.
- If the graph is flat or empty, first distinguish the gold response from the signal trace. A flat gold curve can mean bypass or zero gains. An absent live spectrum can mean the chosen source is silent, the other layer is playing, or no fresh audio has reached that tap. Changing target clears old references. [Chapter 39](#) gives more troubleshooting checks.

Display preferences and saved sounds

Tilt, floor, Average, Peaks, Infinite and Line/Waterfall mode are **global UI preferences**, stored outside the patch in `~/Library/Application Support/Mosasaur Audio/Mosasaur Mono/Mosasaur Analyzer.xml`. Editors in the same host process share them; a later process loads the saved preferences. Reopen the display in another host process to load its most recently saved preferences. Freeze and waterfall history are temporary.

EQ frequency, gain, Q and bypass are saved with the sound. Average, Tilt, Peaks and the other display settings change the view without changing the audio. Closing the EQ page stops its analyzer capture; see the CPU chapter for managing inspection-window cost.

Placement and width

| Control         | Range / choices         | Default |
|-----------------|-------------------------|---------|
| Osc 1 direction | -180.0 deg to 180.0 deg | 0.0 deg |
| Osc 1 width     | 0.00 to 2.00            | 1.00    |
| Layer direction | -180.0 deg to 180.0 deg | 0.0 deg |
| Layer width     | 0.00 to 2.00            | 1.00    |
| Sub width       | 0.0 % to 100.0 %        | 0.0 %   |
| Sub direction   | -180.0 deg to 180.0 deg | 0.0 deg |

Direction is a cyclic stereo transform rather than a conventional left-to-right pan knob. At 0 degrees it preserves the image; at +/-90 degrees it places the mid component to one side; at +/-180 degrees it swaps left and right. Layer Pan is a separate balance placement applied before the layer direction/width transform.

Width works on the side component. Zero collapses it; one is the nominal image; two expands it. Expanding a mono source with identical left and right samples does not manufacture a side component. Sub widening and noise width use their dedicated source mechanisms, so they should not be confused with the general Width transform.

An expanded side signal can largely disappear when summed to mono. Check the result in mono when width is part of the patch's character. A source that sounds impressive in stereo may become much narrower or quieter in the mono sum without any parameter having failed.

## Stereoscope

The stereoscope offers layer and combined-signal views. A compact center-oriented trace indicates similar channel content; a wide or strongly sideways trace indicates more difference between channels. Treat a persistently side-dominant image as a reason to check mono compatibility, not as a numerical correlation measurement by itself. The separate layer views help distinguish a wide source from cancellation created when A and B combine.

## Added bells and older patches

The two added bells on every source and layer cover 20 Hz-20 kHz, +/-12 dB and Q 0.2-10. They default to 1 kHz and 4 kHz, 0 dB, Q 1. Older patches load with these gains at zero, preserving their original EQ response. Their stored Mid3/Mid4 IDs are appended for automation compatibility; the visual band numbers follow the six-band layout, not the historical ID order. Rack EQ remains its separate effect, with its own controls and routing.

The analyzer displays pre/post traces and individual band contributions. The six numbered handles correspond to the six bands described above.

## The detachable Analyzer

The EQ graph remains an EQ editing surface. The separate ANALYZER window adds Scope, Spectrum, Spectrogram, Modulation and Stereo views with selectable internal taps. Use [Chapter 37](#) for its complete controls, measurement meanings and worked comparisons. Opening either display does not replace the other feature.

## SOUND REFERENCE

# 18 / Resonance



Resonance gives the sound a tuned physical body.

## What this module adds

RESONANCE excites a bank of tuned resonant modes. Its result can suggest strings, tubes, bars, bells or less familiar bodies. It is a synthesis module, not a library of sampled acoustic instruments. Material changes mode relationships and decay weighting; the played note, tuning and tracking establish the pitch reference. Each layer has its own settings.

Begin with one layer, turn the monitoring level down and enable Resonance. A visible enabled module can still be quiet if no exciter feeds it or its Mix is dry. Raise Strike or another exciter deliberately. A regular oscillator can be an exciter, but its direct sound and the resonant body's sound are separate contributions.

## Tune and Material

Tune and Fine shift the body's base pitch; Key Track determines how much it follows the played note. At full tracking, keyboard changes move the body with the note. At low tracking, much of its pitch stays anchored while other oscillators move. Material travels through harmonic and inharmonic families. Inharmonic partials do not line up at simple integer multiples, which is why a bar-like or bell-like sound need not resemble a filtered saw.

Decay sets overall ringing time. Damping shortens higher modes relative to lower ones. Brightness changes modal emphasis. Key Decay changes ringing across the keyboard. These controls interact: a bright attack with strong damping can become dark quickly without having a short low-frequency tail.

## Exciters and position

Oscillator feeds ongoing generator energy. Strike is a note-on impulse-like excitation. Noise and Pluck add brief shaped excitation. Hardness changes the excitation spectrum, while Position changes which modes are strongly excited. Use one exciter at a time to hear its role. A steady oscillator can keep a resonator alive longer than a single strike would.

Drive adds nonlinear color. Mix blends the body with the source path. Quality changes the modal workload; it can affect detail and CPU. Ring mode determines how the body responds to note release. A natural ringing choice can carry past note-off; a damped choice is useful for tighter playing. The layer amp and subsequent effects can still limit what you hear.

| Control                         | Range / choices       | Default      |
|---------------------------------|-----------------------|--------------|
| Resonance                       | 0.0 % to 100.0 %      | 0.0 %        |
| Resonance Enabled               | Off; On               | Off          |
| Resonance Release behavior      | Natural Ring; Gated   | Natural Ring |
| Resonance Body tune             | -24.00 st to 24.00 st | 0 st         |
| Resonance Body fine             | -100.0 ct to 100.0 ct | 0.0 ct       |
| Resonance Body key tracking     | 0.0 % to 100.0 %      | 100.0 %      |
| Resonance Material morph        | 0.000 to 6.000        | 3.000        |
| Resonance Body decay            | 10 ms to 20.000 s     | 1.500 s      |
| Resonance High-mode damping     | 0.0 % to 100.0 %      | 40.0 %       |
| Resonance Body brightness       | -100.0 % to 100.0 %   | 0.0 %        |
| Resonance Decay key scaling     | 0.0 % to 100.0 %      | 25.0 %       |
| Resonance Oscillator excitation | 0.0 % to 100.0 %      | 0.0 %        |
| Resonance Strike excitation     | 0.0 % to 100.0 %      | 70.0 %       |
| Resonance Noise excitation      | 0.0 % to 100.0 %      | 0.0 %        |

| Control                    | Range / choices             | Default  |
|----------------------------|-----------------------------|----------|
| Resonance Pluck excitation | 0.0 % to 100.0 %            | 0.0 %    |
| Resonance Strike hardness  | 0.0 % to 100.0 %            | 60.0 %   |
| Resonance Pluck position   | 0.0 % to 100.0 %            | 30.0 %   |
| Resonance Body drive       | 0.0 % to 100.0 %            | 0.0 %    |
| Resonance Body mix         | 0.0 % to 100.0 %            | 50.0 %   |
| Resonance Body modes       | 8 modes; 16 modes; 24 modes | 16 modes |

Representative Layer A Resonance controls.

## Make a plucked body

1. Load Init, use one layer and open RESONANCE.
2. Enable the module, choose a string-like material region and set tracking high.
3. Start with a brief Pluck or Strike contribution and little continuous Oscillator excitation.
4. Increase Decay enough to hear the body, then adjust Damping to control the upper-mode tail.
5. Move Position slowly. Listen for changes in which partials speak rather than expecting a pan change.
6. Blend with a small amount of the original oscillator for attack definition. Save a variation before adding distortion.

## Make a bell or metallic accent

Choose an inharmonic material, increase Strike hardness, and use longer Decay. Move Tune/Fine to match the musical role by ear; strong inharmonic modes can obscure an obvious fundamental. A little brightness emphasizes the strike. Reduce ongoing oscillator excitation if the bell never settles. Use the Analyzer Spectrum to compare the mode spacing and Spectrogram to see different decay rates.

## Modulation and layering

A slow movement of Material, Brightness, Mix or pitch can animate a sustained sound. Start with a small range: rapidly changing a resonant geometry can be much more dramatic than moving an ordinary EQ band. Use a steady Sub or a simpler second layer when the body supplies unstable metallic color. Both layers still meet at the master, so check their summed peak.

Long ringing and many modes add work while they are audible. Save an editable original before resampling or Bake. A recorded body can be economical to replay, but transposition then changes its timing and harmonic relationships as it does with any sample.

## SOUND REFERENCE

## 19 / Effects racks and processors

Each rack has **three serial slots**, processed in slot order. Source racks exist for Oscillators 1-3, Sub and Noise on each layer. Each layer also has its own rack, and a shared master rack follows the sum of A and B.

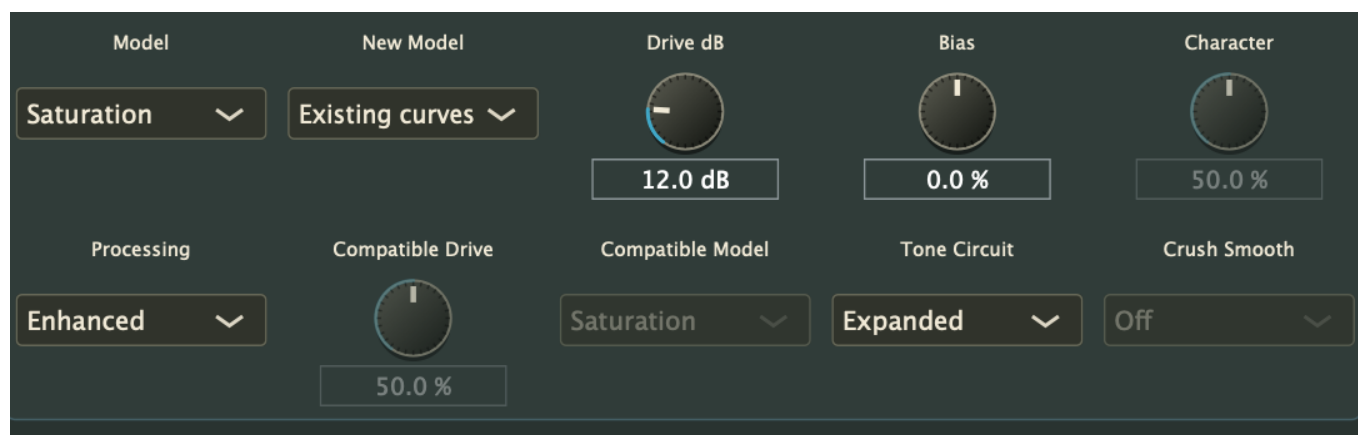
### Rack tiers and slot controls

There are thirty-nine slots: eighteen in each layer and three on Master. Each Oscillator 1-3, Sub, Noise and Complete Layer rack has three serial slots. The established effect families are: Distortion, Modulation, Phaser, Delay, Reverb, Rack EQ, Soft Clipper, Grain, MosaTap and Dynamics. Choose a Type, set Enable On, then set Mix. Each type retains its own settings and envelope when you switch types.

Source effects process only the selected oscillator, Sub or Noise before the shared layer filter and amplifier. The layer envelope can close over their tails. Complete Layer effects come after amplitude and stereo placement, before Layer EQ. Master effects process the combined layers. Use Complete Layer or Master for tails that continue after the layer envelope closes.

Effects with long histories prepare buffers outside the audio callback. A newly selected effect can pass dry audio briefly until its buffer is ready, then fade in. A selected but bypassed effect may retain its history. DSP Load is not a memory meter.

### Distortion



Distortion controls for the selected rack slot.

The Distortion effect is available in every oscillator, Sub, Noise, layer and master slot. The input/model, output, pre-tone, clean-bass, post-tone, dynamics and envelope sections are visually separated. Inactive controls remain visible; enable the relevant circuit to use them. Oscillator WRECK/NUKE is a separate feature.

## Start here

Choose Distortion, Enable On and raise Mix. New slots use Enhanced processing, Expanded tone and Measured Auto Calibration. Existing patches keep their saved Compatible/Original settings to preserve their sound. Selecting a new model in the interface enables Enhanced; automation should set Processing explicitly. New Model overrides Existing Model; select Existing Curves to return to Saturation, Hard Clip, original Wavefolder or original Rectify.

Drive covers 0-60 dB for most models. Bias introduces asymmetry. Character changes its label and function by model. Auto Level compensates against a reference signal. Perceived loudness still depends on the input, so adjust Output and Mix by ear. Set Output and Mix for the patch.

| Model               | Character and use                                                                                                                           |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Saturation          | Soft rounding; good for body, keys and pads.                                                                                                |
| Hard Clip           | Abrupt edges; useful for sharp sequences and percussion.                                                                                    |
| Original Wavefolder | The retained folding curve; aggressive extra harmonics.                                                                                     |
| Original Rectify    | The retained full-wave curve; octave-rich metallic color.                                                                                   |
| Tube                | Sag: asymmetric saturation with an input-dependent bias shift.                                                                              |
| Tape                | Age: magnetic-memory saturation and drive-dependent high-frequency loss. A bounded memory model, not a physical tape-machine simulation.    |
| Diode               | Asymmetry: unequal clipping thresholds for tearing leads and bass.                                                                          |
| Fuzz                | Gate: gated high-gain clipping for sputtering, broken textures.                                                                             |
| Fold                | Shape: sine-to-triangle folding. Drive controls the folding gain rather than literal 1,000x input gain.                                     |
| Rectify             | Blend: half-wave to full-wave rectified saturation.                                                                                         |
| Crush               | Bit Depth: 24-2 bits. Rate: host rate down to 500 Hz. Smooth adds low-pass smoothing. Intentional aliasing; local oversampling is inactive. |

Crush's Drive control displays bits; type a bit depth directly, such as **12 bits**. Frequency boxes accept either Hz or kHz, such as **1500** or **1.5 kHz**. Where supported, **Off** selects the exact disabled endpoint.

## Tone and clean bass

Expanded tone: Pre HP Off/20-2,000 Hz; Pre LP Off/1-20 kHz; Pre Tilt  $\pm 12$  dB; Pivot 100 Hz-5 kHz. Tone Link applies the inverse Pre Tilt in the post section, changing the frequencies that saturate without the same broad final tilt. It cannot undo generated harmonics. Post Tone must be On for the linked correction. The greyed Post Tilt shows the effective linked value and remembers the independent value for later.

Post LP is Off/100 Hz-20 kHz with 6/12/24 dB-per-octave slopes; Post HP is Off/20-1,000 Hz; Post Tilt is  $\pm 12$  dB. Original tone controls remain available when Original is selected. Changing circuits does not discard their stored settings.

Low Preserve is Off/20-500 Hz. It keeps the low crossover band clean while distorting the high band. Low Level adjusts that clean contribution from -24 to +6 dB. Auto Level and Output act on the processed high band. The crossover deliberately changes phase; the dry path follows the matching response. Mix reaching zero returns smoothly to exact raw bypass.

### Dynamics, Auto Level and modulation

Dynamics -100...+100% changes Drive with input level. Positive values add drive to loud notes; negative values reduce it. Range is 0-36 dB; Speed is 1-500 ms release, with attack one tenth as long. Drive is bounded to 0-60 dB. Dynamics and Range are smoothed over approximately 20 ms.

Measured Auto Calibration applies level compensation from reference measurements, bounded between -60 and +36 dB. Original retains the saved compensation behavior. Very quiet signals can disappear at extreme Crush settings because quantization removes them. At high Drive, Original Wavefolder can change loudness noticeably, particularly with oversampling Off or 2x; compare at matched output level and adjust Output for the material.

Envelope Target offers Wet Mix, Drive, Bias, Character, Post LP or Pre Tilt. Amount is bipolar. Wet Mix +100% retains the earlier envelope gate. Other targets offset their named parameter while leaving the wet path open. An Off Post LP stays Off. Disabled envelope controls remain visible.

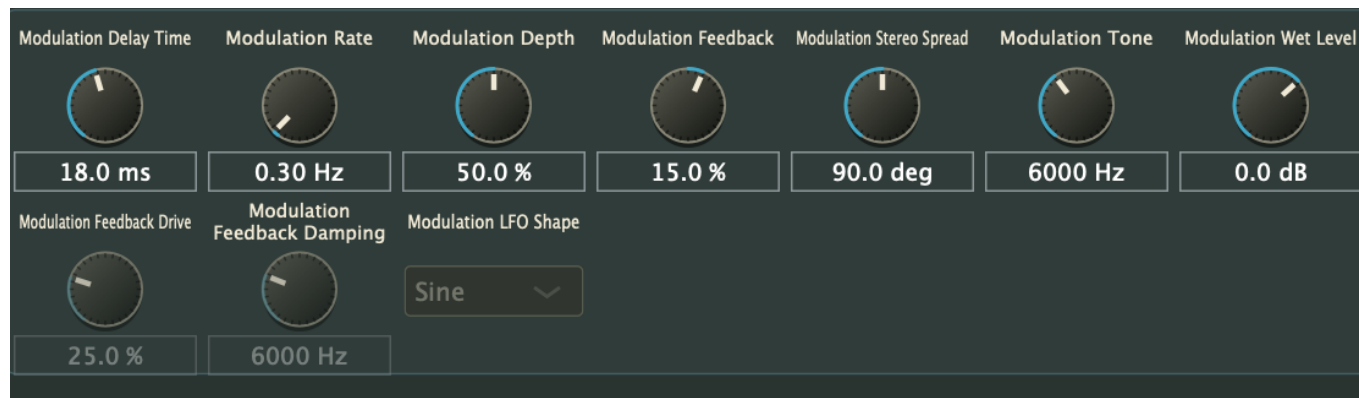
Use right-click Modulate or the matrix to move supported Distortion controls. Both layers can address Master destinations, and their offsets add. Copy, Undo and saved routes retain the settings.

### Quality and CPU

Local oversampling offers Off/2x/4x/8x. Use 8x for hard-edged, high-register sounds when CPU allows; 4x is a useful practical choice. Crush intentionally runs at host rate. Enhanced antialiasing includes a reconstruction filter whose top transition band rolls off near Nyquist; Compatible retains its earlier response. Existing host-reported latency is unchanged.

The controls and meters describe the selected model. Tape memory, Tube sag and gated Fuzz respond to incoming audio over time.

## Modulation: Chorus and Flanger



Chorus and flanger controls in the Modulation effect.

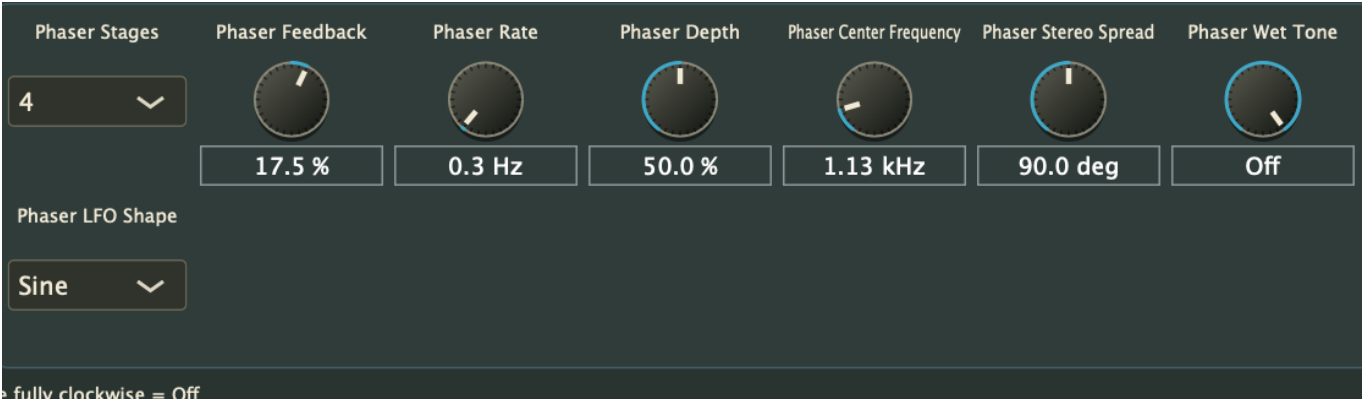
Modulation selects a modulated-delay Chorus or a feedback Flanger. Rate sets the sweep speed; Depth sets excursion; Stereo Spread offsets the channels' modulation. Chorus Delay Time determines its center delay and Feedback recirculates part of the delayed signal. Tone filters the wet path and Wet Level adjusts its gain.

Flanger uses its own short Delay and signed Feedback controls. Feedback Drive and Feedback Damping shape the recirculating signal. LFO Shape selects Triangle, Sine, Ramp Up or Ramp Down for the flanger path. Chorus and flanger-specific controls should be read in the context of the selected Mode.

| Control          | Range / choices                    | Default  |
|------------------|------------------------------------|----------|
| Delay Time       | 0.5 ms to 40.0 ms                  | 18.0 ms  |
| Rate             | 0.02 Hz to 10.00 Hz                | 0.30 Hz  |
| Depth            | 0.0 % to 100.0 %                   | 50.0 %   |
| Feedback         | -90.0 % to 90.0 %                  | 15.0 %   |
| Stereo Spread    | 0.0 deg to 180.0 deg               | 90.0 deg |
| Tone             | 100 Hz to 16000 Hz                 | 6000 Hz  |
| Wet Level        | -24.0 dB to 12.0 dB                | 0.0 dB   |
| Mode             | Chorus; Flanger                    | Chorus   |
| Flanger Delay    | 0.10 ms to 10.00 ms                | 2.00 ms  |
| Flanger Feedback | -100.0 % to 100.0 %                | 0.0 %    |
| Feedback Drive   | 0.0 % to 100.0 %                   | 25.0 %   |
| Feedback Damping | 1000 Hz to 20000 Hz                | 6000 Hz  |
| LFO Shape        | Triangle; Sine; Ramp Up; Ramp Down | Sine     |

Try: for a widened chorus, choose Chorus with slow Rate, moderate Depth and separated Stereo Spread; for a narrow moving comb, choose Flanger with short Delay and modest Feedback, then sweep Depth; for a sharper sweep, try Ramp Up in Flanger and compare positive with negative Feedback. Use Mix to retain the desired dry component.

## Phaser



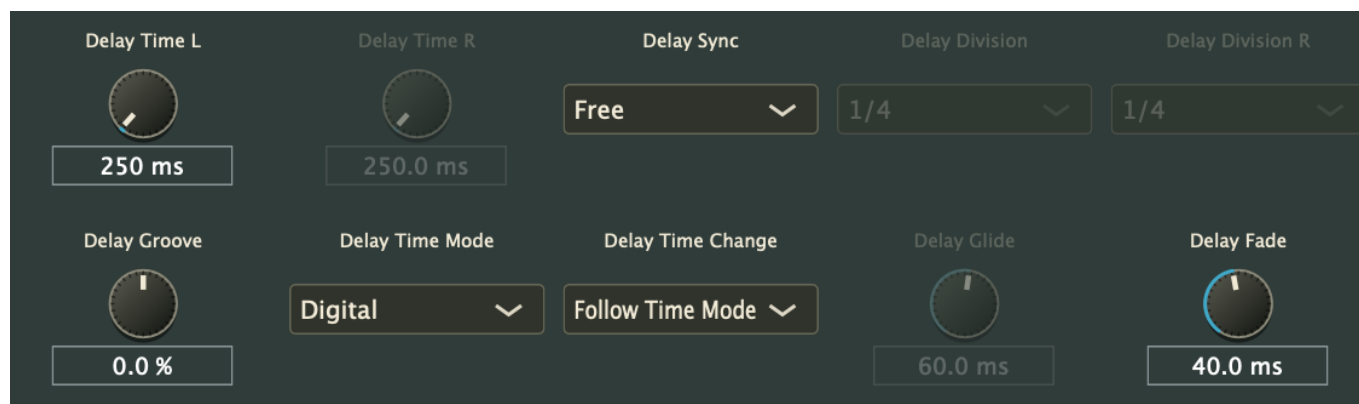
Phaser stages, motion and feedback controls.

Phaser uses a moving all-pass cascade with a resonant feedback path. Stages selects 2, 4, 6, 8, 12 or 16 all-pass stages. Ten and fourteen stages are not offered. Center Frequency and Depth define the sweep region, while Rate and LFO Shape set its motion. Signed Feedback emphasizes the moving notches/peaks. Feedback Drive and Damping act in that loop. Stereo Spread offsets channel motion; Wet Tone and Wet Level shape the returned signal.

| Control          | Range / choices                    | Default  |
|------------------|------------------------------------|----------|
| Stages           | 2; 4; 6; 8; 12; 16                 | 4        |
| Feedback         | -100.0 % to 100.0 %                | 17.5 %   |
| Rate             | 0.0 Hz to 20.0 Hz                  | 0.3 Hz   |
| Depth            | 0.0 % to 100.0 %                   | 50.0 %   |
| Center Frequency | 100 Hz to 8.00 kHz                 | 1.13 kHz |
| Stereo Spread    | 0.0 deg to 180.0 deg               | 90.0 deg |
| Wet Tone         | 100 Hz to Off                      | Off      |
| Wet Level        | -24.0 dB to 12.0 dB                | 0.0 dB   |
| Feedback Drive   | 0.0 % to 100.0 %                   | 25.0 %   |
| Feedback Damping | 1000 Hz to 20000 Hz                | 6000 Hz  |
| LFO Shape        | Triangle; Sine; Ramp Up; Ramp Down | Sine     |

Try: use four stages, slow sine motion and low Feedback for a broad movement; use more stages and moderate Feedback for a denser pattern of notches; use a ramp shape and a narrower Depth around the desired Center Frequency for a repeating sweep. Feedback can substantially change peaks, so compare with conservative output levels.

## Delay



Delay time, synchronization and transition controls.

Delay is available in all racks. It has independent timing, feedback, coloration and wet-output sections. Existing patches use the upgraded engine with their saved values; earlier delay timbres can change.

### Getting started

Choose Delay in any effect slot. Time Change adds Repitch, Fade and Jump. Repitch bends pitch as time changes; Glide sets its response (1-2000 ms). Fade moves between read positions over 5-500 ms. Jump uses a short 1 ms crossfade. Follow Time Mode preserves control by the existing Tape/Digital selector: Tape = Repitch, Digital = Fade.

### Timing and stereo

Stereo Timing offers Offset (-50 to +50%) and nine Musical Ratios (1/4 to 2). The original Ratio still reaches 4x. Time L/R Override uses the existing time at zero; positive values cover 0.5-12000 ms. Sync overrides span 1/64 to 8 bars, with straight, dotted and triplet values. Synced base times clamp at 12 seconds; derived right-channel ratios can reach 48 seconds. Groove alternates longer and shorter intervals; +25% at 400 ms produces repeats at 400, 900, 1200 and 1700 ms.

### Routing

Routing adds Stereo, Ping-pong and Cross. Ping-pong starts a mono signal on the chosen Left or Right side, then alternates. Cross Feed blends the channel exchange; 0% behaves as Stereo and 100% sends a first hard-left repeat right. Follow Ping-pong keeps the existing On/Off control in charge. Controls overridden by these choices appear inactive.

### Loop shaping

Feedback Extension adds up to 10 percentage points to the existing Feedback dial: 110 + 10 = 120%. Feedback Resonance increases the loop-filter resonance. Low/High Cut Override covers 20 Hz-20 kHz; zero uses the original cut control. Loop Drive adds 0-24 dB of saturation with makeup outside the loop. Internal feedback is bounded, but Wet Level and effects after Delay still affect final output volume.

## Three sound models

**Digital** is transparent at Character 0. Character progressively reduces resolution from 24 to 6 bits and sample rate to 4 kHz at 100%. The aliasing and increasingly damaged repeats are intentional. **Tape** adds asymmetric saturation, a gentle 60 Hz head bump and time-dependent head loss. **BBD** adds anti-alias/reconstruction filtering and compander-style saturation. Longer times darken Tape and BBD even at Character 0. Their model bandwidth stacks with your feedback filters.

## Time Mode is a separate function

The existing Time Mode selector controls how time moves: Tape means Repitch and Digital means Fade. It does not select the new sound model. Use the separate Model control for Digital, Tape or BBD coloration. Explicit Time Change choices still override Time Mode.

## Wobble and flutter

Wobble spans 0-100%, reaching approximately +/-50 cents. Rate is 0.05-10 Hz; Shape selects Sine or smooth Random. Flutter adds a smaller, seeded 6-9 Hz component; its depth follows the Wobble amount. Stereo Wobble goes from identical modulation to quadrature/decorrelated motion. Depth is limited below half the delay time at very short settings. Modulation affects the audible read, including Reverse, while the forward feedback path stays stable.

When you select Tape or BBD in an Init-based patch, neutral Wobble/Flutter controls receive light model defaults. Saved patches load with their stored values; migration does not switch wobble on. Wobble, Rate, Flutter, Stereo Wobble, Character, Diffusion and Freeze have new matrix destinations in each layer slot. All new controls support automation and the existing macro system.

## Reverse and Freeze

Direction Reverse plays two overlapping Hann-windowed reads backward. Each window lasts the delay time, rounded to one sample. Feedback still comes from the forward read, so repeats do not alternate between forward and reverse. Time changes start a new window pair at a boundary and crossfade. Repitch/Fade describe forward time changes.

Freeze fades input and loop coloration out over 20 ms, then recirculates at unity gain. The held loop is rounded to the nearest whole sample to avoid cumulative interpolation loss. Wobble stays outside that loop. You can reverse a frozen loop. Releasing Freeze restores live input and processing over 20 ms. Assign the Freeze matrix destination to the wheel or a macro; it switches on above 50%.

## Duck: echoes bloom between notes

Duck reduces only the wet output. Repeats continue circulating at their normal feedback level. The detector listens to the louder of the two channels at the slot input, before the send envelope. Duck 0% bypasses ducking exactly; 100% applies up to 36 dB attenuation. Threshold ranges from -60 to 0 dBFS, with a 6 dB soft knee centered on the threshold. Full reduction occurs above the top of that knee.

Attack is 0.1-100 ms; Release is 10-4000 ms, both exponential. Defaults are 5 ms and 250 ms, with Threshold -24 dBFS. They describe the peak follower's 63.2% response time, not the time until a threshold crossing. Try Duck 80%, dotted-quarter sync, Tape, Feedback 40% and Release 400 ms for a lead that leaves space while you play.

## Width and Wet Tilt

Width affects the wet stereo image: +100% keeps it unchanged, 0% makes it mono, and -100% swaps left and right. Intermediate values narrow the image or progressively reverse its sides. The dry signal is untouched.

Wet Tilt ranges from -6 to +6 dB around a 1 kHz pivot. Positive values brighten the repeats; negative values warm them. It follows the existing Wet Tone filter and precedes Width, Duck and Wet Level. Tilt 0 dB bypasses its filter exactly. These output controls do not change the feedback loop.

## Modulation and envelope

The new continuous output controls and Direction appear in both layers' matrices, right-click Modulate and macro destinations. Envelope Target defaults to Input Send, preserving the established release-tail behavior. Choose a named target to shape that control instead; the send stays open. Envelope Depth sets the signed amount. Positive depth lowers the chosen value as the envelope falls. Duck, for example, follows the envelope without turning down Mix.

## Read the echo map

The panel groups Time, Feedback, Character and Output. Inapplicable controls stay visible and dim, with their stored values shown. The compact echo map predicts about eight repeats: left above the center line, right below. Heights reflect feedback and routing; Duck shades them down. Reverse uses rising ramps. Groove shifts alternating repeats. The map is a timing/gain illustration, not an audio waveform or spectrum.

Audio publishes readouts at about 30 Hz only while the map is visible. The L/R times reflect sync, modulation, Offset and Ratio; frozen timing stays held. FROZEN identifies a held loop. RUNAWAY indicates a pre-saturator loop level above 0 dBFS; the existing safety path remains active. Before audio starts, the map uses the selected settings.

## Buffers prepare outside the audio callback

Only slots selected as Delay hold the large main delay histories. They are prepared during non-render setup or by the message-thread service when you change effect type. If a new Delay is still preparing, that slot passes dry audio until its history is ready, then uses its normal fade-in. Allow this short preparation period before recording a live type change. Saving a patch with Delay already selected ensures the histories prepare before playback starts.

Switching away fades the effect out before handing its histories back for off-thread disposal. Release is asynchronous, so a retired allocation may remain briefly until the service runs. Other effects' existing buffers are separate. The generous 12-second left time, 4:1 ratio and Reverse history remain: about 23.04 MB per selected Delay at 48 kHz and 92.16 MB at 192 kHz. Six selected Delays use about 138.24 MB or 552.97 MB respectively. A bypassed slot still selected as Delay retains its history.

## Preset loads and compatibility

Loading a preset clears Delay history behind a 10 ms wet fade-out and fades the new history back in over 10 ms. Ordinary transport stop/start does not clear the lines. Freeze saves its switch state, not captured audio. Earlier patches receive Duck 0%, Width +100%, Tilt 0 dB, the default duck timings, Input Send envelope targeting and no new modulation assignments.

## Reverb



Reverb size, decay and spectral shaping.

All racks use the same HQ reverb tank. Choose Reverb, enable the slot and raise Mix. There is no selectable legacy tank.

### Controls

Size spans 0-200%, Decay 0.2-60 seconds. Low Decay and High Decay span 0.25-4x the main time, allowing a band's target to reach 240 seconds. At 1x / 1x the target is flat across frequency. Low Crossover spans 50-2,000 Hz; High Crossover 500-16,000 Hz. The effective High crossover is at least 1.1x Low; the interface explains any clamp. Shelving transitions are gradual.

Build 0-100% lengthens six input diffuser stages for a slower onset. Start at 0 for fast density, or increase it for swelling tails. Diffusion controls scattering strength. Mod Depth retains approximately  $\pm 1$  ms maximum delay excursion. Mod Rate sets the base random-transition rate, with independent per-line rates. Random trajectories are smoothly joined, deterministically seeded and decorrelated across lines and slots.

Pre-delay, Low Cut, Early/Late, Width, optional Wet Tone, Wet Trim, Mix and the input-send envelope remain available. Early/Late blends distinct early reflections and the tank. Wet Tone colours the output; High Decay controls how long upper frequencies persist.

Reverb uses one continuous tank rather than a Room/Hall/Plate menu. Size changes its dimensions and Build controls how gradually the tail fills in. Size is smoothed, so moving it while a tail sounds can bend pitch. The tail can take roughly a tenth of a second to become dense even with a fast Build setting.

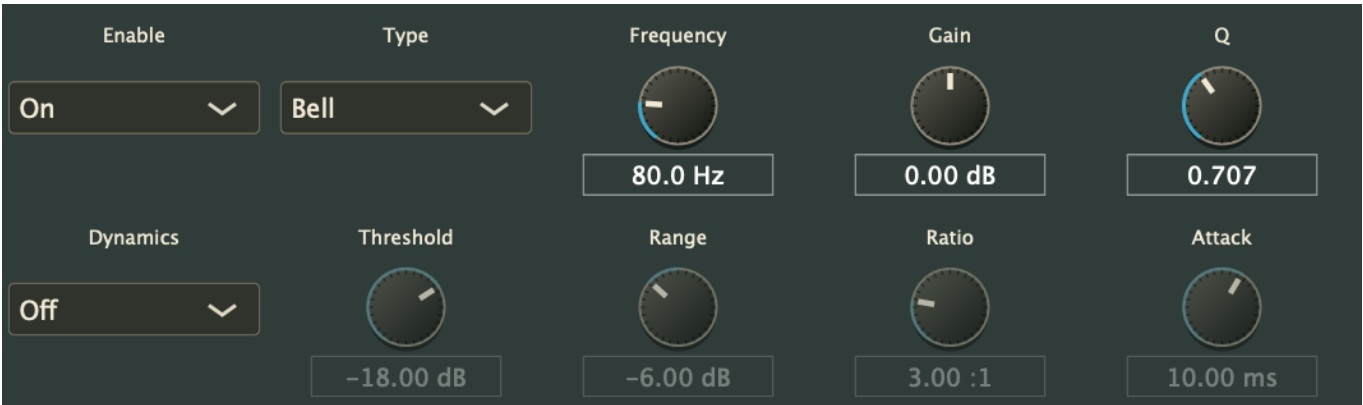
### Recalling older sounds

Older reverbs load into the current tank. If a recalled tail feels different, adjust Mix, Decay and High Decay while keeping an original copy of the sound. [Appendix B](#) explains the conversion.

Settings to audition

- **Dense, clear:** Size 50%, Decay 3 s, Low/High 1x, Diffusion 67%, Build 0%, Mod Depth 8%, Rate 0.15 Hz, Early/Late 85%, Mix 20-30%.
- **Dark aggressive space:** Size 70%, Decay 6 s, Low 1.2x, High 0.35x, crossovers 250/3,500 Hz, Diffusion 85%, Build 10%, Low Cut 120 Hz, Mix 15-25%.
- **Long swelling wash:** Size 150%, Decay 20-40 s, Low 0.8x, High 0.65x, Diffusion 100%, Build 70%, Mod Depth 20%, Rate 0.25 Hz, Mix 30-50%.

Rack EQ



Rack EQ edits an independently selected band.

Rack EQ has six bands. Each has Enable and Bypass, a Type, Frequency, Gain, Q, Slope and Channel selection. Types are Bell, Low shelf, High shelf, Low cut, High cut, Notch, Band pass and All pass. Gain and slope applicability depend on type. Channel selection is Stereo, Mid, Side, Left or Right; Side has little material to process when the input is mono.

Dynamic mode adds level-dependent gain action for Bell, Low shelf and High shelf. Threshold sets the detector threshold, Range bounds the gain change, Ratio sets its strength, Attack/Release set movement times and Detector selects Peak or RMS. Positive and negative Range produce different gain directions. Do not interpret a detector or dynamics control as a second audio input.

Output controls the EQ's output gain; Mix blends the rack EQ result. Phase invert flips polarity. Analyzer selects Off, Pre, Post or Both, with Fast, Slow or Hold decay. Analyzer controls affect the display, not the frequency response. Envelope band, destination and depth direct the slot envelope to one band's Frequency, Gain or Q.

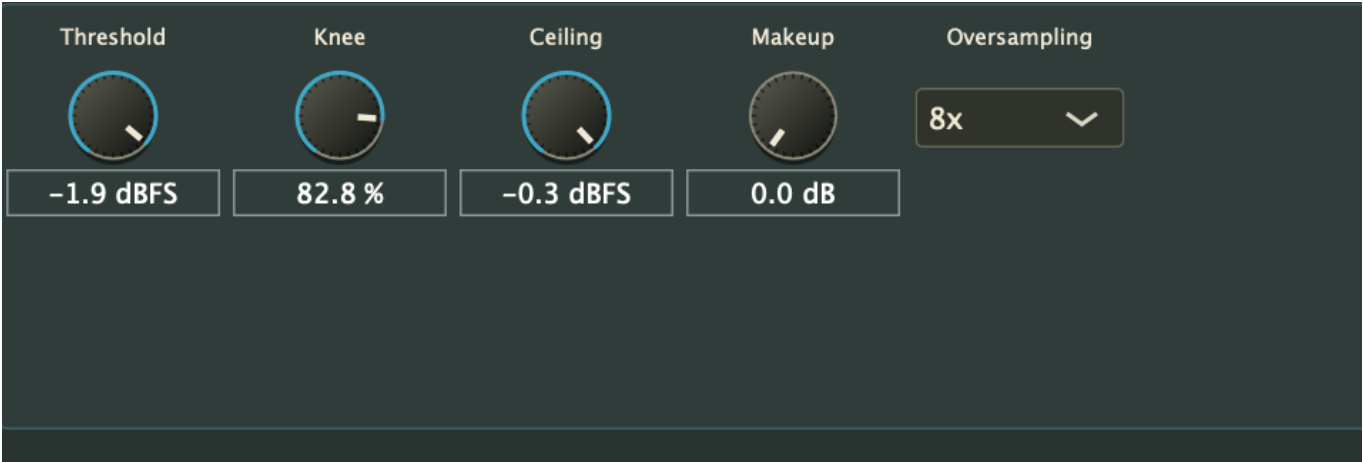
| Control        | Range / choices       | Default  |
|----------------|-----------------------|----------|
| Output         | -24.00 dB to 24.00 dB | 0.00 dB  |
| Mix            | 0.00 % to 100.00 %    | 100.00 % |
| Analyzer       | Off; Pre; Post; Both  | Post     |
| Analyzer decay | Fast; Slow; Hold      | Slow     |

| Control              | Range / choices                                                            | Default   |
|----------------------|----------------------------------------------------------------------------|-----------|
| Phase invert         | Off; On                                                                    | Off       |
| Envelope band        | 1; 2; 3; 4; 5; 6                                                           | 1         |
| Envelope destination | Frequency; Gain; Q                                                         | Frequency |
| Envelope depth       | -100.00 % to 100.00 %                                                      | 0.00 %    |
| Enable               | Off; On                                                                    | On        |
| Type                 | Bell; Low shelf; High shelf; Low cut; High cut; Notch; Band pass; All pass | Bell      |
| Frequency            | 20.0 Hz to 20.00 kHz                                                       | 80.0 Hz   |
| Gain                 | -18.00 dB to 18.00 dB                                                      | 0.00 dB   |
| Q                    | 0.100 to 18.000                                                            | 0.707     |
| Slope                | 6 dB/oct; 12 dB/oct; 24 dB/oct; 48 dB/oct                                  | 12 dB/oct |
| Channel              | Stereo; Mid; Side; Left; Right                                             | Stereo    |
| Bypass               | Off; On                                                                    | Off       |
| Dynamics             | Off; On                                                                    | Off       |
| Threshold            | -60.00 dB to 0.00 dB                                                       | -18.00 dB |
| Range                | -18.00 dB to 18.00 dB                                                      | -6.00 dB  |
| Ratio                | 1.00 :1 to 10.00 :1                                                        | 3.00 :1   |
| Attack               | 0.10 ms to 200.00 ms                                                       | 10.00 ms  |
| Release              | 5.00 ms to 2000.00 ms                                                      | 150.00 ms |
| Detector             | Peak; RMS                                                                  | RMS       |

The Band 1 rows describe the controls available independently on each of the six bands. Their initial frequencies are 80, 200, 600, 1,800, 5,000 and 12,000 Hz; only Band 1 starts enabled. Select a band to edit its controls or drag its graph handle.

Try: use a broad low shelf for overall weight; use a narrow Bell cut to reduce a persistent resonant band; use a dynamic Bell with negative Range to reduce an emphasized region only when its detector crosses Threshold. Compare bypassed and enabled states at similar output level.

## Soft Clipper and the master rack



Soft Clipper threshold, knee, ceiling and quality controls.

Soft Clipper is available in every rack. It bends peaks above Threshold, with Knee controlling the transition and Ceiling setting the saturation ceiling. Makeup adds drive/gain within the processor. Its own Oversampling offers Off, 2x, 4x and 8x. A clipping indicator reports over-threshold activity; it is not a substitute for the host's output meter.

| Control      | Range / choices        | Default   |
|--------------|------------------------|-----------|
| Makeup       | 0.0 dB to 24.0 dB      | 0.0 dB    |
| Ceiling      | -12.0 dBFS to 0.0 dBFS | -0.3 dBFS |
| Knee         | 0.0 % to 100.0 %       | 82.8 %    |
| Threshold    | -40.0 dBFS to 0.0 dBFS | -1.9 dBFS |
| Oversampling | Off; 2x; 4x; 8x        | 8x        |

Try: place it after master Reverb/EQ to shape their combined peaks; for restrained peak rounding, keep Makeup low and choose a soft Knee; for a deliberately driven sound, raise Makeup while lowering the later Master output to keep listening level comparable. If the result is unintentionally flattened, reduce drive into the clipper or adjust Threshold rather than assuming the host is clipping.

Init does not establish a mandatory, always-enabled clipping stage. Enable and configure the slot when you intend to use it. A later master EQ boost can raise level after a clipper placed earlier in the rack.

## Processing cost

Active racks add work. Reverb carries a multi-line tail, Rack EQ can run six dynamic bands, and more Phaser stages increase its cascade. Local effect oversampling adds further work in nonlinear processors. If playback strains, simplify active racks, unison or Play quality, then compare the sound. The CPU chapter provides a practical order for making these choices.

## Restore the master rack

On the Master rack, **RESTORE MASTER DEFAULTS** resets the master effect parameters to Init values. It has no plugin-local Undo entry; the layer Copy/Clear Undo does not restore this action. Save a variation first if you need to keep the current rack. Host automation Undo is host-dependent.

## Phaser wet level and Wet Tone Off

The phaser compensates for feedback-dependent attenuation in its wet path. Extreme Feedback can still change loudness, so compare it with Wet Tone Off and Wet Level at 0 dB before deciding whether to adjust the output.

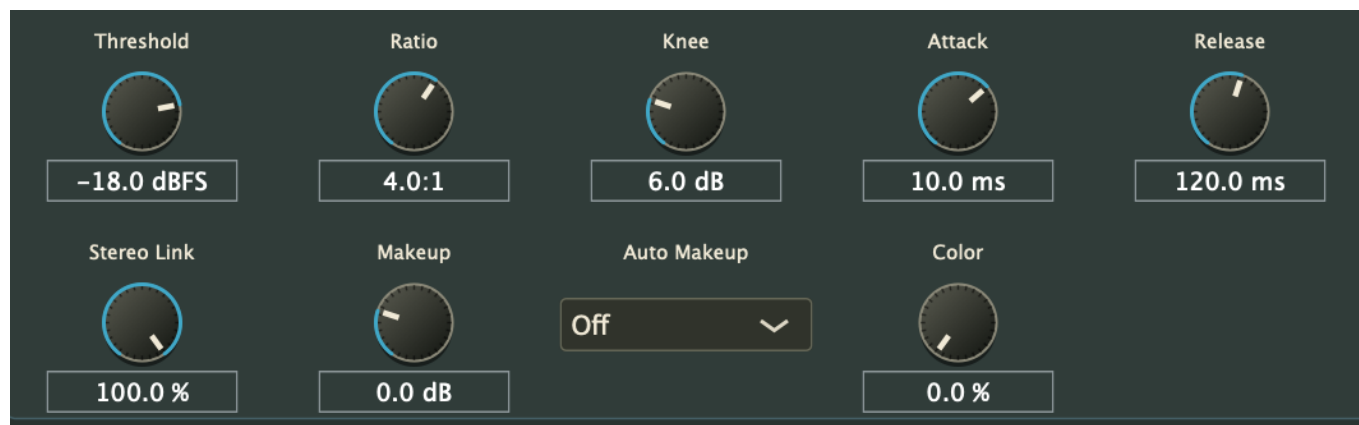
**Wet Tone** now ends at **Off**, stored at the existing 16000 Hz endpoint. Off bypasses wet-tone filtering; it is the default for fresh slots. Older saved settings, such as 6000 Hz, are preserved and can still remove high-frequency energy. For a full-band comparison, choose Off and leave Wet Level at 0 dB, then compare with bypass. At intermediate Mix, cancellation between dry and shifted wet signal is part of the phaser sound. Two serial phasers can compound filtering and phase interaction.

Adjust Wet Level or later output gain when serial phasers produce a large level change. Wet-level compensation preserves the feedback setting and its resonant character.

## Grain

Grain captures audio history for grains, reverse fragments, smear and frozen sustain. It is available in all racks. [Chapter 20](#) provides its control reference and audition recipes. Captured audio is never saved with a patch.

## Dynamics



Dynamics compressor controls; gate and limiter sections follow in the same editor.

Choose Dynamics in any slot, enable it, and choose which sections to use: Gate, Compressor and Limiter. Start with unity Input/Output and moderate Mix.

## How timing and blending work

Attack and Release are one-pole time constants: a step moves gain reduction 63.2% toward its new target in the stated time. At the shortest Attack settings, that time can be less than one sample. Auto Release blends fast and slow recovery according to how long compression has been active; sustained sounds recover more slowly.

Peak reads instantaneous sample magnitude. RMS averages power over RMS Window and is calibrated by +3.01 dB to the peak amplitude of a steady sine. Their moving detector signals are different, so the same settings need not produce identical gain reduction. Stereo Link 100% applies matching gain to both channels; lower values allow more independent movement.

Mix blends the compressed signal with the dry signal after Input. It is a linear, time-aligned blend. The slot envelope scales this parallel Mix. Mix 0% is transparent only with Input/Output at 0 dB. Compressor Off bypasses compression and Makeup; with Input/Output at 0 dB it is bit-identical. Continuous changes ramp over 20 ms; Compressor On/Off uses a 15 ms fade.

## Three settings to audition

**Punchy bass:** Complete Layer Dynamics, Peak, Ratio 4:1, Knee 3 dB, Attack 25 ms, Release 100 ms, Mix 100%. Adjust Threshold for 4-6 dB reduction. The slower attack preserves the start of each note.

**Parallel aggression:** Complete Layer, Ratio 10:1, Knee 0, Attack 0.3 ms, Release 60 ms, Mix 40%, Makeup +6 dB. Lower Threshold for strong reduction, then compare with Compressor Off. Watch output level when adding makeup.

**Pad leveling:** RMS, Window 50 ms, Ratio 2:1, Knee 12 dB, Attack 60 ms, Release 400 ms, Auto Release On, Link 100%. Aim for 2-4 dB reduction to retain movement while easing sustained peaks.

The Dynamics - Living Pressure showcase bank contains twenty examples.

## Four compressor personalities

**Clean** is the transparent reference. It smooths gain reduction in decibels after measuring the input. With Color at zero it uses the clean compressor path. Gate and Limiter have their own switches and can remain active when Compressor is Off.

**Glue** smooths input level before calculating reduction. Transients and recovery feel different even with the same knob settings. Its Color curve adds gentle asymmetric saturation.

**Opto** detects the previous compressor output, before Color and Makeup. Its initial attack is three times the Attack setting and becomes faster as charge builds. Auto Release is always active; the control displays On and is disabled without changing its saved value. Switching away restores the saved choice. Color adds even-harmonic warmth.

**FET** also detects the previous compressor output and offers fast, aggressive compression. Its symmetric Color curve is the strongest. Infinity is bounded to 50:1 in both feedback styles. Changing Style preserves all other parameter values and fades over 20 ms.

## Smash: compression pushed beyond limiting

Available only in FET, Smash overrides Ratio with a 20:1 curve plus additional reduction that rises with input and stops at 12 dB. Over part of this range, louder input produces a quieter sustained output. Ratio stays stored but its knob is disabled. Attack has a 0.1 ms minimum while Smash is active. Color receives an extra 6 dB of drive; Color zero still bypasses saturation exactly.

Try FET, Smash On, Attack 1 ms, Release 80 ms, Color 70%, Mix 40%, and lower Threshold until the gain-reduction meter moves strongly. Add Makeup carefully. Smash creates aggressive compression; use the Limiter section when you need a sample-peak ceiling.

## Color without an added host delay

Color runs at local 4x oversampling at every tier, regardless of the synthesizer Play quality. Dry and wet use matching minimum-phase filters while Color is engaged. Reported plug-in latency does not change, but the filtered result has phase shift relative to other oscillators or layers. That can change cancellation when parallel signals are combined. Color zero removes this filtering after its short transition.

Color ranges from 0 to 100%. It changes both drive and the saturation blend. Compensation is calibrated with a -12 dBFS sine, not an automatic loudness follower; real material can still change loudness. Matched 2 Hz DC filtering removes the offset from asymmetric saturation. Mix zero and Compressor Off are exact bypasses at unity Input/Output once transitions settle.

## Settings to audition

**Bus punch:** Glue, Ratio 4:1, Attack 25 ms, Release 120 ms, Color 20%, Mix 100%. Aim for 3-5 dB reduction on peaks.

**Pad leveling:** Opto, Ratio 2:1, Knee 12 dB, Attack 40 ms, Release 350 ms, Color 25%. Aim for 2-4 dB reduction and listen to the slower first attack and release.

**Crushed parallel bass:** FET with Smash, Attack 1 ms, Release 80 ms, Color 70%, Mix 40%. Adjust Threshold for strong reduction and Makeup for the desired blend. Compare with Compressor Off at similar loudness.

## Gate and expander

Gate On enables downward expansion before the compressor on the wet path. Its self-key reads the signal after Input gain, using the Peak/RMS detector settings. The gate links both channels to preserve the stereo image; Stereo Link continues to control the compressor. The dry side of Mix remains ungated. Mix 100% gives fully gated output; lower Mix blends the original signal back in.

The gate opens above Gate Threshold. It starts its Hold countdown below Threshold minus Hysteresis, then closes with Gate Release. Between those thresholds, hysteresis prevents chatter. Gate Attack controls opening. Attack and Release are log-domain one-pole time constants, not a fixed time to complete the transition.

Gate Ratio starts at 1.5:1 for gentle expansion and reaches Gate (inf) for full gating. Range limits attenuation. At -100 dB, the display reads -inf dB and the fully closed gate reaches exact silence. Lesser Range values reduce level without muting completely. Gate On/Off fades over 15 ms.

## Ranges and defaults

Gate Threshold: -100 to 0 dBFS, default -50. Gate Ratio: 1.5:1 to infinity, default gate. Range: -100 to 0 dB, default -80. Gate Attack: 0.01-100 ms, default 0.5. Hold: 0-2000 ms, default 20. Gate Release: 1-5000 ms, default 150. Hysteresis: 0-12 dB, default 3.

## Catch peaks at any tier

Limiter On enables a stereo-linked sample-peak limiter after parallel Mix and Output gain. Ceiling ranges from -24 to 0 dBFS, default -0.3. Limiter Release ranges from 1 to 1000 ms, default 50. Limiter Auto Release is on by default and uses the same changing-charge recovery principle as the compressor.

At zero lookahead the limiter reacts on the peak sample. This can reshape sharp transients. Once fully enabled, its final safety clamp guarantees the Dynamics slot output does not exceed the current Ceiling. Bypass and the bypass portion of an On/Off fade deliberately permit unbounded input. Later slots and global output gain can still raise the final synthesizer output above this slot's ceiling.

## Master-only lookahead

Lookahead is available only in master Dynamics slots, from 0 to 5 ms, default 1 ms. Oscillator and layer slots display a disabled 0 ms. When Limiter is enabled, positive Lookahead delays the slot output so gain can fall before a peak arrives. This delay is not included in the latency reported to the host. Use 0 ms when exact track alignment is needed, or account for the chosen delay in the host.

Changing Lookahead crossfades between delay configurations over 20 ms. During rapid repeated changes, the current crossfade finishes before the newest requested delay begins. Limiter On/Off uses a 15 ms transition. The limiter always measures its actual input; it does not follow the gate/compressor key source.

## Sample peaks and reconstructed peaks

The limiter controls sample peaks. Reconstructed peaks between samples can still exceed Ceiling, especially with bright high-frequency material. Leave headroom and watch Master Output true peak when setting the final output level.

## Settings to audition

**Tight noise bursts:** Gate On, Gate Ratio at Gate (inf), Range -inf, Gate Attack 0.5 ms, Hold 15 ms, Gate Release 30 ms, Hysteresis 3 dB. Set Threshold just below the intended hits and use Mix 100%. This uses the audio itself as the key.

**Gentle cleanup:** Gate Ratio 2:1, Range -18 dB, Attack 2 ms, Hold 60 ms, Release 250 ms. Start Threshold low and raise it until quiet gaps soften without cutting off the wanted tail.

**Master peak control:** Limiter On, Ceiling -1 dBFS, Lookahead 2 ms, Release 100 ms, Auto Release On. Keep Input and Output at 0 dB initially. Compare to 0 ms lookahead on sharp percussion, adjusting playback level for a fair audition.

## One key for gate and compressor

**Self** reads this Dynamics instance's audio after Input gain. **Other Layer** reads the other layer at its rack input, after stereo placement and before its effects. It is available only in the two complete-layer racks. Both layers can key from one another; neither waits for the other rack to finish. This adds no latency. Other Layer values received outside the layer racks fall back to Self.

**Tempo Pulse** creates an exponential key burst at each selected beat division, with Pulse Length setting its decay time constant from 5 to 500 ms (default 60). Pulse Rate has all 18 straight, dotted and triplet divisions from 1/1 through 1/32, default 1/4. It follows the shared host clock while playing, and the internal free-running clock when stopped. It is available at oscillator, layer and master tiers.

The gate and compressor share this filtered key, including Peak/RMS detection. Opto and FET retain feedback-style behavior with an external key by applying the previous compressor gain to that key. The limiter always measures its actual audio input, regardless of Key Source or key filters.

## Filter the detector, not the sound

SC High-pass covers 20-1000 Hz. SC Low-pass covers 1000-20000 Hz. Both are 12 dB/octave Butterworth filters. High-pass at exactly 20 Hz and Low-pass at exactly 20000 Hz are bypassed. Existing patches default to those bypass endpoints. Source and filter changes use short smoothing/fades.

Raising SC High-pass can prevent sub-bass from driving the compressor while retaining higher-frequency hits in the key. Lowering SC Low-pass can keep bright clicks from dominating detection. These controls change the detector signal; they do not directly filter the audible wet path.

## Hold to hear the key

Hold the LISTEN button to replace this slot's output with its filtered key. The display shows a conspicuous LISTEN ACTIVE warning and red border. Release the button to restore processing. Listen fades over 5 ms, is not a patch parameter, and is not automatable or saved. Closing or hiding its panel clears it. Later effects and output gain still process the audition signal.

## Displays and controls

Four segmented buttons select Clean, Glue, Opto and FET; Smash sits beside FET. Gate, compressor and limiter retain their individual switches. Inactive section controls remain visible with muted styling; enable the section to edit its controls. Controls that do not apply to the chosen style or rack remain disabled, such as master-only Lookahead and Opto's fixed automatic release.

The transfer display shows the static gate/expander, compressor knee and ratio, parallel Mix, gain and limiter ceiling against a unity line. The dot follows input/output levels. It is a static pre-Color reference, not a prediction of transient envelope behavior or the nonlinear Color waveform; external keying can move the live dot away from the self-key reference curve.

The history holds four seconds: compressor gain reduction in amber, limiter gain reduction in cyan, and a faint input-level trace. Audio publishes maximum values in 5 ms bins to a fixed queue; the interface redraws around 30 times per second. Input and output peak meters span -60 to +6 dBFS with peak hold; the gain-reduction meter spans 0-30 dB. Gate Open and Limiter Active indicators accompany the history.

## Settings to audition

**Tempo-pumped pad:** Complete Layer Dynamics, Glue, Key Source Tempo Pulse, Rate 1/4, Length 60-120 ms, Threshold -24 dBFS, Ratio 4:1, Attack 1-5 ms, Release 150-300 ms, Mix 100%. Try dotted eighths or quarter-note triplets for different movement. Leave the key filters bypassed initially.

**Rhythmic slicing:** Tempo Pulse, Gate On, Range -inf, Gate Threshold -12 dBFS, Attack 0.5 ms, Hold 0-10 ms, Release 20-50 ms, Pulse Length 30 ms, Rate 1/16. Compressor Off and Mix 100% make the gate movement easiest to hear.

**Cross-layer ducking:** Put the sustained sound on Layer B and the rhythmic sound on A. In B's complete-layer rack choose Other Layer, Glue, Threshold -24 dBFS, Ratio 4:1, Attack 2 ms and Release 180 ms. Raise SC High-pass toward 150 Hz if low notes dominate the ducking. Use Listen briefly to inspect A's rack-input signal.

## Move the sound with the matrix

Right-click a supported Dynamics control and choose Modulate..., or choose its named destination in the modulation matrix. Destinations are available for Input, Output, Mix, Threshold, Ratio, Attack, Release, Makeup, Color, Gate Threshold, Range, Ceiling, SC High-pass and Pulse Length in all 39 slots. Either layer may modulate Master Dynamics; their offsets add before the parameter is clamped.

Amount scales the destination's full range. Time and high-pass controls move exponentially; gain and percentage controls move linearly. Ratio moves through its existing ratio taper. Values stay within the advertised ranges. The matrix uses its existing 10 ms smoothing. Newly modulated Dynamics controls also receive three 1 ms smoothing stages before the existing 20 ms control ramps, to suppress artifacts from the matrix update steps. Unmodulated existing patches retain their prior processing.

## Two new sources per layer

**Dyn Env** is the compressor detector level: -60 dBFS or below gives 0, and 0 dBFS or above gives 1. It follows the selected Peak/RMS detector and sidechain. **Dyn GR** maps compressor gain reduction from 0-24 dB to 0-1. Gate and limiter reduction do not contribute. Both may also be chosen as Via sources.

These sources come from the first enabled Dynamics slot in that layer's Complete Layer rack, in slot order. Oscillator, Noise, Sub and Master Dynamics do not replace that source. With no enabled instance, both sources are zero. The matrix reads the preceding rack result at its next 16-sample control tick: at 48 kHz, the update interval is approximately 0.33 ms, before destination smoothing.

The transfer curve follows modulated controls. Its horizontal axis and moving dot use detector level; the input and output meters continue to show the actual audio levels. The curve remains a static pre-Color reference, so transients, feedback styles, external keys and limiter history can place the dot away from the curve.

## Newer specialized rack processors

TalkBox adds vowel filtering and optional external-sidechain analysis ([Chapter 22](#)). Master Multiband provides three-band compression, drive, gain and width ([Chapter 23](#)). These processors use their dedicated editors; the ordinary rack Enable, Mix, placement and preset workflows still apply. Multiband is available at the master tier only.

SOUND REFERENCE

# 20 / Grain



Grain reads recent audio to make short overlapping fragments.

Grain captures up to four seconds of its input and rearranges it into windowed fragments. Choose Grain in any source, Complete Layer or Master slot. Placement changes what it records and whether the layer amplifier closes over its tail. Earlier effects in that rack continue feeding its buffer.

## Controls

| Control  | Range / default       | Behavior                                                               |
|----------|-----------------------|------------------------------------------------------------------------|
| Size     | 1-500 ms / 60         | Exponential; sampled at grain creation. Unsafe durations shorten.      |
| Density  | 0.5-200 grains/s / 20 | Exponential; schedules grain starts.                                   |
| Position | 0-4000 ms / 0         | Exponential with exact zero; zero uses a safe minimum history offset.  |
| Spray    | 0-100% / 0            | Random offset up to ±four seconds; clamps to available history.        |
| Jitter   | 0-100% / 0            | Random interval ±nominal interval; minimum 0.1 ms.                     |
| Shape    | Smooth-Hard / 30%     | Hann through trapezoid to near-rectangle; even Hard has rounded edges. |

| Control                  | Range / default      | Behavior                                                                                              |
|--------------------------|----------------------|-------------------------------------------------------------------------------------------------------|
| Pitch                    | -24-24 semitones / 0 | Whole-semitone steps; Pitch Fine adds $\pm 100$ cents. Combined base pitch clamps to $\pm 24$ .       |
| Pitch Random             | 0-12 semitones / 0   | Independent bipolar random pitch at creation; combined random rate can reach $\pm 36$ semitones.      |
| Reverse                  | 0-100% / 0           | Probability of reverse playback per grain.                                                            |
| Stereo Spread            | 0-100% / 30          | Independent random stereo balance; preserves stereo input.                                            |
| Freeze                   | Off / On             | Holds buffer writes after a short wet transition fade. Only switch state is saved.                    |
| Mix                      | 0-100% / 50          | Equal-power blend, 20 ms smoothing, exact dry endpoint.                                               |
| Density Sync / Division  | Free / Sync; 1/16    | Host BPM divisions from 1/64 to one bar, including dotted/triplet. Density still clamps to 0.5-200/s. |
| Position Sync / Division | Free / Sync; 1/4     | Tempo-derived history offset, capped at four seconds.                                                 |
| Fallback BPM             | 20-300 / 120         | Stored per slot; used whenever host BPM is unavailable.                                               |

Free values remain stored when Sync is selected. Density/Position modulation is inactive while its corresponding Sync switch is on. Sync follows BPM; the scheduler is not a transport-grid sequencer or transport-phase reset feature.

## Modulation and envelope

The matrix destination picker has a Grain category for each layer FX slot: Size, Density, Position, Spray, Shape, Pitch, Reverse and Mix. Right-click an applicable control to assign an existing modulation source. Each layer has its own 16 rows. Macro, MIDI-learn and standard automation support apply to the new parameters.

At 100% route Amount with a +1 source/Via, Size or free Density spans its full logarithmic range; Position adds 4000 ms, Pitch adds 48 semitones, and percentage destinations add 100 percentage points.

Contributions sum, smooth and clamp to the destination range. Grain properties are sampled at birth, so existing grains do not jump when those controls change. The existing per-effect envelope targets Mix. Note-off does not erase history; its release fades the wet blend when enabled. Bypass fades to dry while the selected Grain keeps its history/clock running, including Freeze. Choosing another effect clears the Grain instance after its wet fade.

## Sound and safety boundaries

Selected Grain instances prepare independent stereo float buffers outside the audio callback. Each holds exactly four seconds at the host sample rate. Storage is about 1.54 MB per slot at 48 kHz or 3.07 MB at 96 kHz, plus small fixed state. Grain does not add reported plugin latency; the synthesizer's existing fixed latency is unchanged. Its nominal minimum wet history offset is 5 ms, potentially shorter during initial buffer fill.

Cubic readers must stay within recorded and unoverwritten history. Position/Spray clamp; pitched-up/reverse grains shorten near either boundary; impossible tiny grains skip. At extreme settings the requested Size may therefore be longer than the grain actually played. Synced Position caps at the buffer length minus the interpolation guard.

There are 16 active grains plus four retiring voices. The oldest voice steals with a 0.5 ms raised-cosine fade. If all retire voices are busy, a spawn skips. Windows use a 0.1 ms edge floor. Freeze changes fade the wet signal down over 5 ms, clear the active readers, change the write-head clock, then fade up over 5 ms. A slight dip is intentional; repeated rapid changes follow the latest requested state. Freeze is history capture, not a sample asset: loading a frozen patch never restores its previous captured sound. Unfreeze to record fresh sound.

Actual window energy is normalized with a gain cap of 2 and a conservative coherent-overlap cap. With nonnegative windows the coherent cap dominates. Sparse gaps remain sparse; dense decorrelated grains can sound quieter. A 5 Hz wet DC blocker reduces low-frequency buildup; its tail follows the grain window so empty gaps stay silent. A soft wet ceiling begins above 0.9 and approaches 0.999 to catch interpolation/DC overshoot. Equal-power mixing of correlated dry/wet signals can still increase level; leave headroom and use the existing output/master controls. Grain is a texture effect: large pitch shifts can change the apparent fundamental and add aliasing.

## Compatibility and host automation

Grain is selected in the slot's Type menu. For direct host automation of its selection, use the named Grain Selected control; choosing another Type in the interface clears it. Grain has its own Mix control. Captured history is temporary and is not saved with a patch.

## Starting settings

- Jagged swarm: Size 14 ms, Density 90/s, Shape 96%, Position 130 ms, Spray 3%, Jitter 5%, Spread 35%, Mix 50-100%.
- Broken tearing: Size 8 ms, Density 45/s, Shape 96%, Position 130 ms, Spray 1%, Jitter 15%, Mix to taste.
- Reverse shredding: Size 18 ms, Density 120/s, Shape 96%, Pitch -7, Reverse 80%, Position 130 ms.

- Smear: Size 200 ms, Density 30/s, Shape 0%, Position 300 ms, Spray 8%, Mix 40%. Play a filter sweep, then Freeze.

Grain is available in source, layer and master racks. The controls describe how to read its recent input history; the editor does not show a separate waveform of that history.

## SOUND REFERENCE

## 21 / MosaTap



MosaTap distributes a set of echoes over a selected length.

MosaTap is the effect previously named MultiTap. Choose MosaTap in any source, Complete Layer or Master slot and set Enable On. Its six control groups are Time, Level, Feedback, Texture, Chop and Stereo. The live map is below the stereo controls. Complete Layer or Master placement allows tails after the amplifier closes.

### Time, level and stereo

**Length Mode** chooses Free (1-8000 ms, logarithmic) or Sync (straight, dotted or triplet values from 1/64 to four bars). Sync uses host tempo, or the transport's internal/retained tempo; the initial fallback is 120 BPM.

**Pre-delay** shifts the pattern by 0-1000 ms.

**Taps** spans 1-64. **Spread** runs from -100 to +100%: negative bunches taps near the start, positive near the end. **Grid** quantizes spacing to quarter, eighth, eighth-triplet, sixteenth, sixteenth-triplet or thirty-second notes. Coincident taps sum; they can create strong accents.

**Key-track** spans -100 to +100%. At +100%, an octave above C4 halves Length; an octave below doubles it. It follows the filter's Osc 1 pitch reference, including transpose, tuning and glide. Effective Length is clamped to 0.25-8000 ms; each tap has a four-sample minimum.

**Tape** moves read positions through the 1-2000 ms Glide control (80 ms default), producing pitch movement.

**Jump** crossfades stationary heads over 30 ms; targets received during a fade wait for it to finish. The last target wins.

**Taper** spans a 48 dB level ramp: negative fades out and positive swells in. **Normalize** divides gains by their root-sum-square; correlated or coincident taps can still add loudly. **Mix** uses the rack's existing Grain equal-power law, with exact settled dry and wet endpoints. **Output** trims wet level from -24 to +12 dB.

**Input** pan mode preserves stereo through mid/side Width. **Alternate** switches left/right each tap, **Sweep** travels across the group, and **Random** uses a saved seed. Width spans -100 to +100%; zero centers non-Input modes and negative reverses their stereo pattern. **Reroll Seed** picks a different value from 0-9999.

Key tracking on source racks follows the layer pitch reference; on Master it uses Layer A. Hard sync and oscillator PM do not directly retime captured audio.

## Feedback and tone

Feedback spans 0-100%, with 20% on fresh settings. Last Tap recirculates the last delay at unit gain before pan; All Taps recirculates an amplitude-normalized sum. Pre-delay remains outside the loop. Low Cut spans 20-2000 Hz and High Cut 500-20000 Hz. Their extreme settings bypass them exactly. They filter the write path, so repeats become progressively darker or thinner.

Loop Drive adds up to 24 dB of drive inside a unity-small-signal saturator. Bounded compensation is applied to the wet output only. A 5 Hz DC blocker and a soft-knee loop limiter protect the recirculating signal. Normalize Off can still make the summed wet output very loud.

## Freeze

Freeze fades incoming audio out over 20 ms and changes to unity Last Tap feedback. It bypasses loop drive, filtering, diffusion and the loop DC blocker during the hold; the safety limiter remains. A single-pass 5 Hz DC blocker on the frozen output removes the captured mean without progressively filtering the held loop. Release restores those processes over 20 ms. Only the switch is saved, not captured audio. Output tap settings, pan, Drift and Smear can reshape the held recording.

For an enduring hold, the captured period is rounded to the nearest sample, with an eight-sample minimum. That avoids repeatedly interpolating frozen audio. Capture can differ from the requested period by up to half a sample. Output taps are limited to the frozen period; the wet tail continues after note release.

## Smear and Drift

Smear is the production label for the diffusion control. It spans 0-100%, using six allpass stages per channel on both the output and loop. Zero is an exact bypass. Timings use 0.093, 0.129, 0.171, 0.213, 0.249 and 3.88 times mean spacing; right-channel times are 1.07 times longer. Five short stages build density and one longer stage disperses the tail. The coefficient reaches 0.65, with decorrelated timing motion up to 20%. Internal Jump fades sum to unity to prevent feedback gain buildup.

Drift spans 0-100%, reaching a nominal +/-15 ms offset with a squared depth taper. Drift Rate spans 0.02-10 Hz. Independent seeded random trajectories move output taps only, preserving feedback tuning. Offsets shrink near the minimum delay to avoid reading ahead of recorded audio. The amount of pitch movement depends on the random trajectory and delay timing; use a sustained note when judging Drift.

## Chop: rhythmic motion for individual taps

Shape: Off, Sine, Triangle, Square, Ramp Up, Ramp Down, Random, Env Follow or Env Duck. Depth blends between unchanged tap gains at 0% and the full unipolar shape at 100%. Off and settled Depth 0 bypass Chop exactly. Changes into bypass fade smoothly. Chop changes the output taps; it never chops the feedback signal.

Free Speed spans 0.05-40 Hz. Sync offers 1/64 through 4 bars, including dotted and triplet divisions, using the current host or fallback tempo. Phase Spread offsets consecutive taps across a cycle; 100% with eight taps places them one eighth of a cycle apart. Random holds a deterministic, independent value for each tap and cycle.

Edge is always active, from 0.5-50 ms. It specifies the 10-90% transition time. Short values give sharp gating; long values soften transitions. Rounded Square, Random and ramp resets necessarily differ from their ideal hard edges during the transition. Rate, depth and phase-spread edits are smoothed as well.

## Retrigger and envelope-following shapes

Free runs continuously while the effect is processed. Note resets phase on note-ons that retrigger the amplifier under the global Legato/Retrigger policy. Legato overlap and releasing a note to restore a held note do not reset Chop. Host locks synced Chop to song position while transport runs; without valid running transport, or in Free rate mode, it falls back to Note. Gain transitions retain Edge smoothing after a reset or host jump.

Env Follow opens the taps as the slot input rises, mapping -48 to 0 dBFS onto 0-100%. Env Duck closes them as input rises, with a mapping from -48 to -6 dBFS. Its remaining gain is squared for deeper ducking near the top of that range. At full Depth, a steady detector level of -6 dBFS fully ducks the taps; the smoothed detector can leave a small residual on a waveform. Reduce Depth for gentler ducking. The detector follows the larger absolute stereo input sample, with Rise 0.1-2000 ms and Release 1-5000 ms (63% time constants). Rate, retrigger and phase spread do not affect envelope shapes.

## Modulation and audition

### Matrix, right-click and effect envelopes

Each layer has 72 MultiTap destinations: 24 fields for each of its three slots. Right-click a supported control and choose Modulate to prefill an available matrix row. Existing source, via, macro, MIDI-learn and automation workflows remain available.

Targets: Length, Pre-delay, Taps, Spread, Key-track, Glide, Taper, Mix, Output, Feedback, Low Cut, High Cut, Loop Drive, Freeze, Smear, Drift, Drift Rate, Chop Depth, Chop Speed, Chop Phase Spread, Chop Edge, Env Rise, Env Release and Width. Chop Speed modulation applies to Free mode; in Sync, the chosen musical division controls the rate.

Full matrix travel changes Length by up to two octaves in either direction (one quarter to four times), in both Free and Sync, before the eight-second limit. Other continuous targets use their linear or logarithmic control range. Taps round to whole taps; Freeze switches above 50%. Multiple routes add before clamping.

The existing per-slot ADSR now has Envelope Target and bipolar Envelope Depth. Positive depth reduces the target as the envelope falls; negative depth increases it. Mix and Feedback scale their existing amounts, reaching zero at full positive depth and zero envelope. Other targets use the matrix travel range. Disable the envelope or set depth to zero for no envelope modulation. Default target Mix and depth +100% preserve existing patches.

## Settings to audition at 120 BPM

Stutter Grid (9): 16 taps, Length Sync 1 bar, Grid 1/16, Square Chop Sync 1/16, Depth 100%, Phase Spread 50%, Edge 1 ms, Retrigger Note. Try staccato notes and overlapping legato notes.

Scanner (10): 24 taps, Length 600 ms, Sine Chop Free 1 Hz, Phase Spread 100%, Pan Sweep, Width 100%. Hold a note and increase Edge for gentler motion.

Swell Engine (8): 32 taps, Length 1200 ms, Taper +100%, Env Duck, Rise 300 ms, Release 900 ms, Smear 40%. Play a phrase and leave space for the echoes to bloom.

Tuned Comb (11): 1 tap, Length 3.822 ms, Key-track 100%, Feedback 95%, Loop Drive 30%, High Cut 6 kHz, Mix 50%. Wrecked Repeats (13): 4 taps, Length Sync dotted 1/4, Feedback 75%, Loop Drive 80%, High Cut 3 kHz; enable WRECK on Osc 1.

## Reading the live tap map

Open Effects and select a rack and its MosaTap slot. Scroll below the Stereo controls to find its time map. Each vertical line shows a tap at its current delay time. Height represents the normalized tap gain multiplied by live Chop, from 0 to -48 dB. Lines below -48 dB disappear; they have not been deleted. This is an effect-gain display, not an audio level meter.

Blue indicates left pan, cream the centre and amber the right. The first pass ends at Pre-delay + Length. When Feedback is nonzero, the map extends to show two fainter repeats, each one loop period later and scaled by Feedback. The repeats are a timing/gain preview; filtering, drive, diffusion and All Taps feedback can make the actual recirculating sound more complex. Smear widens the soft halo around each tap.

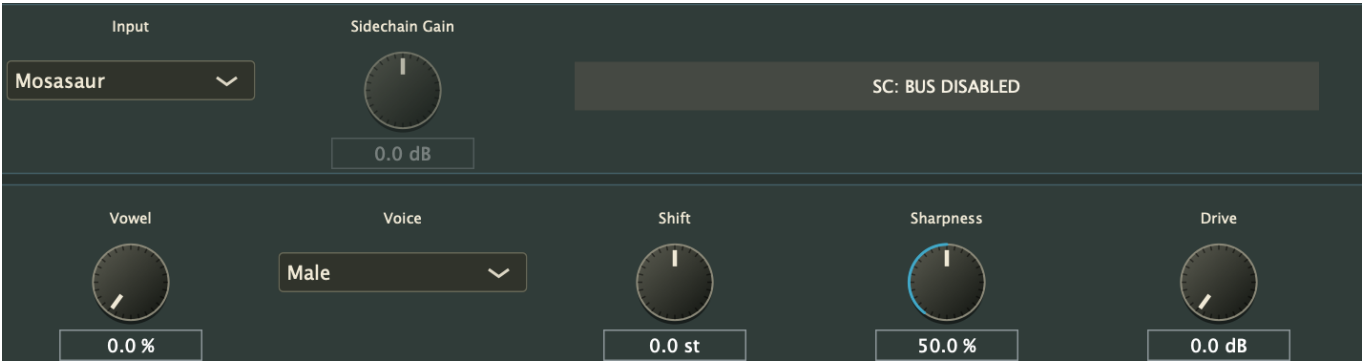
Freeze tints the background and marks the locked period in milliseconds. Its preview uses the held loop period and the effective feedback gain. Frozen audio is not saved with a patch. The map updates about 30 times per second while visible and audio is processing. It is read-only: edit the controls or their modulation routes to move the taps.

## Save and recall

A preset saves controls, routes and seed, but not captured audio. Freeze after reloading cannot recover the previous recording; unfreeze to record fresh sound. Normalize does not guarantee constant perceived loudness when taps coincide or are strongly correlated. Keep output headroom when increasing Feedback or turning Normalize off.

SOUND REFERENCE

22 / TalkBox



TalkBox shapes the incoming signal with a moving vowel response.

Three ways to make vowel color

Voice generates a vocal source. The layer Formant filter imposes vowel resonances on another source. TalkBox is a rack processor with its own mouth, motion, drive and optional master sidechain input. Choose the method according to whether you want a new generator, a layer color, or a processor placed later in a chain. A filter needs useful input energy near its resonances. A saw or harmonically rich sample makes a clearer first test than a single low sine. Open unrelated filters and reduce extreme distortion until you can hear what the vowel processor adds.

Place TalkBox in a rack

Select an eligible layer or master slot and choose TalkBox. Enable the slot and set an audible Mix. A layer instance processes that complete layer; a master instance processes the combined instrument and can use the supported external input choices. Output level controls the complete dry/wet blend. Drive colors the source before the mouth response; at zero it is the transparent source setting for that stage. Use Vowel for the mouth position and Glide to smooth changes. Compare a slow manual sweep before enabling its motion features. The mouth sequence is a timbral movement; it is not the lyric engine and does not transcribe speech from a microphone.

| Control        | Range / choices           | Default  |
|----------------|---------------------------|----------|
| Input          | Mosasaur; Sidechain; Both | Mosasaur |
| Sidechain Gain | -24.0 dB to 24.0 dB       | 0.0 dB   |
| Vowel          | 0.0 % to 100.0 %          | 0.0 %    |
| Voice          | Male; Female              | Male     |

| Control        | Range / choices                                                                                                                                                                                                                                                                                                                                      | Default  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Shift          | -24.0 st to 24.0 st                                                                                                                                                                                                                                                                                                                                  | 0.0 st   |
| Sharpness      | 0.0 % to 100.0 %                                                                                                                                                                                                                                                                                                                                     | 50.0 %   |
| Drive          | 0.0 dB to 36.0 dB                                                                                                                                                                                                                                                                                                                                    | 0.0 dB   |
| Glide          | 0.0 ms to 2000.0 ms                                                                                                                                                                                                                                                                                                                                  | 40.0 ms  |
| Mix            | 0.0 % to 100.0 %                                                                                                                                                                                                                                                                                                                                     | 100.0 %  |
| Output         | -24.0 dB to 24.0 dB                                                                                                                                                                                                                                                                                                                                  | 0.0 dB   |
| LFO Rate       | 0.0 Hz to 40.0 Hz                                                                                                                                                                                                                                                                                                                                    | 1.0 Hz   |
| LFO Mode       | Free; Sync                                                                                                                                                                                                                                                                                                                                           | Free     |
| LFO Division   | 8 bars; 8 bars dotted; 8 bars triplet; 4 bars; 4 bars dotted; 4 bars triplet; 2 bars; 2 bars dotted; 2 bars triplet; 1 bar; 1 bar dotted; 1 bar triplet; 1/2; 1/2 dotted; 1/2 triplet; 1/4; 1/4 dotted; 1/4 triplet; 1/8; 1/8 dotted; 1/8 triplet; 1/16; 1/16 dotted; 1/16 triplet; 1/32; 1/32 dotted; 1/32 triplet; 1/64; 1/64 dotted; 1/64 triplet | 1/4      |
| LFO Shape      | Sine; Triangle; Saw Up; Saw Down; Square; S&H                                                                                                                                                                                                                                                                                                        | Sine     |
| LFO Depth      | -100.0 % to 100.0 %                                                                                                                                                                                                                                                                                                                                  | 0.0 %    |
| Follow Amount  | -100.0 % to 100.0 %                                                                                                                                                                                                                                                                                                                                  | 0.0 %    |
| Follow Attack  | 0.1 ms to 500.0 ms                                                                                                                                                                                                                                                                                                                                   | 10.0 ms  |
| Follow Release | 5.0 ms to 5000.0 ms                                                                                                                                                                                                                                                                                                                                  | 200.0 ms |

Representative master TalkBox controls. The external input choices apply to master slots.

## Motion and envelope control

Use the processor's motion controls for repeated vowel movement and its envelope options for note-shaped changes. Rate, division and synchronization determine timing where shown. A matrix or macro can also move supported TalkBox destinations. Avoid simultaneously running several full-range vowel controllers until you understand which base and modulation values they combine.

A practical talking bass starts with a rich oscillator, a restrained low end and a clear amp gate. Sweep the mouth slowly, add modest Drive, then automate a shorter vowel span. Add delay only after the vowel articulation is clear. Very fast transitions become a different synthetic texture rather than clearer speech.

## External sidechain in the master rack

Choose the external input for the master TalkBox only after routing a sidechain to the instrument in the host. In Logic the plugin header's Side Chain selector supplies that routing. Internal uses the instrument path; External uses the routed signal; Both adds sidechain before Drive at each selected slot. Sidechain Gain sets its contribution. Several selected slots can process that input in sequence, so gain and rack order matter.

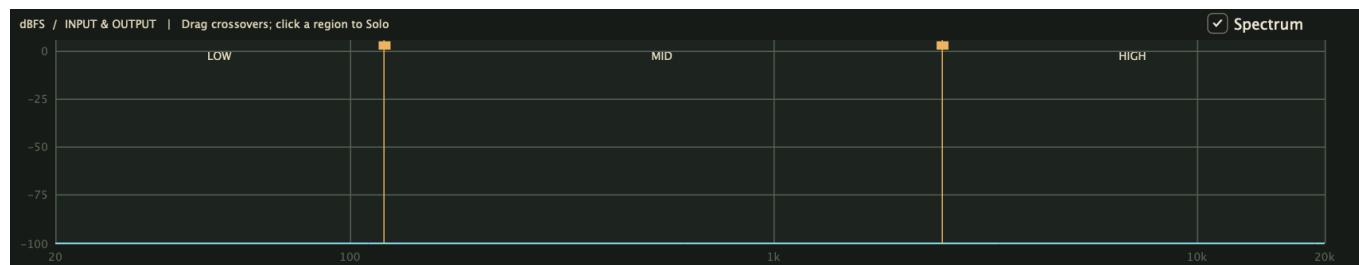
If external input is silent, first verify host routing and the source track/bus. Do not turn up Drive to diagnose a missing bus. Test Internal to prove the slot itself works, then return to External/Both and compare. A portable sound preset cannot create the host's sidechain routing for its recipient.

## Level and placement checks

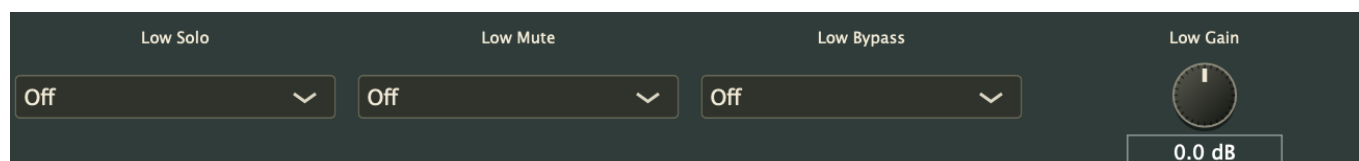
Vowel resonances can raise peaks and emphasize a narrow region. Match output level before comparing brightness. If the low end disappears, reduce wet Mix or combine with a simpler layer. A later master SoftClipper can alter the vowels again. Use Analyzer pre/post or layer/master comparisons to see which stage produces a change.

## SOUND REFERENCE

## 23 / Master Multiband



Two crossover points divide the master signal into three bands.



Each band has its own gain, listening and stereo controls.

### Choose Multiband for a frequency-dependent change

Multiband splits the master signal into Low, Mid and High bands, processes each, then recombines them. It is useful when a bright distorted texture needs a steadier clean bass, when a pad's upper detail needs compression, or when stereo treatment should differ by frequency. This version provides Multiband in the master rack only, processing the combined Layer A and Layer B signal.

Open MASTER EFFECTS, select a slot and choose Multiband. Enable the slot and set an audible Mix. Start with neutral band gain/width, compression ratios at unity and Drive off. Select one of the provided starting points if you want a working example, then inspect what it changed rather than treating it as a hidden fixed algorithm.

### Set the crossovers

Low/Mid spans 40-1000 Hz; Mid/High spans 500-12000 Hz. The high crossover is kept at least twice the low crossover. Drag crossover markers in the spectrum or type values. GUI editing can move the other control to preserve a valid relationship; automated values are constrained in the effective processing without rewriting the host's automation lane.

Choose crossovers around the material. A bass fundamental and body may belong mostly in Low; its articulation can sit in Mid/High. A single fixed split is not a universal vocal or bass preset. Listen to the soloed bands to understand the division before applying large compression/drive.

The crossover network has phase behavior. Neutral processing uses the established neutral/dormant path. Once band processing participates, recombination is not equivalent to three ideal brick-wall frequency files.

Compare active and bypassed at a useful level rather than assuming the spectrum alone describes the complete waveform.

## Input, Output and Mix

Input changes the level entering the band processors. It therefore changes how strongly compression and drive act. Output sets the later result. Mix blends dry and processed output. Lower Mix can preserve some attack and original balance. Set Output for a fair comparison before deciding whether more Drive sounds better.

Bass Mono collapses the Low band's side content. Each band also has Width from 0 to 200%, where 100% retains the ordinary width relationship and zero removes side content. Use a mono compatibility check after widening; cancellation and downstream processing can change what survives.

## Band Gain, Solo, Mute and Bypass

Band Gain trims by -24 to +24 dB. Solo can be enabled on more than one band; hear Low+Mid together if useful. Mute removes a band. Band Bypass preserves that band without its added processing settings rather than muting it. Clear all solos/mutes before judging the full output or saving an intentional complete sound.

These Multiband listening parameters belong to its saved effect state. They differ from the floating Mixer's temporary Mute/Solo controls. A preset with a saved band solo is intentionally a restricted spectrum until that solo is cleared.

## Downward compression

Enable Compression for the chosen band. Down Threshold determines where high-level material begins reducing gain; Down Ratio controls how strongly it is reduced above threshold. A ratio of 1:1 is neutral. Attack determines how quickly gain reduction responds; Release determines recovery. A slower attack can preserve more transient, while an excessively fast or deep setting can change texture.

Watch the per-band down meter while playing the loud part. A high threshold with quiet input may show no reduction. Lower the threshold or raise input only after checking the band's actual level. Downward compression is not a fixed limiter ceiling, and later Drive/Gain/Output can still raise peaks.

## Upward compression

Up Threshold and Up Ratio raise quieter material below their operating threshold, with bounded gain and a low-level guard. This can reveal texture and ambience in a sustained synth band. It can also expose noise and tails you did not want. A ratio at its neutral setting does not add upward movement.

Compare short phrases with rests. If a tail blooms too much, reduce upward amount, lower its threshold, change release or disable it for that band. Upward and downward processing can both act in a patch, so assess their combined envelope rather than looking at only one meter.

Depth scales compression strength for the complete Multiband. Time scales band attack/release timing from 10 to 1000% of their entered values; 100% uses the entered times. Turning Depth to zero does not

necessarily bypass Drive, Gain or Width. Use the proper module/slot bypass when you need a complete comparison.

## Band Drive

Enable Drive separately from Compression. Amount is 0-100%; Type chooses Saturation, Hard Clip, Wavefolder, Rectify, Tube, Tape, Diode, Fuzz, Fold, Rectify 2 or Crush. These nonlinear responses create different harmonics rather than simply boosting volume. Auto Gain compensates the prepared drive response as a comparison aid; it is not a limiter or guaranteed perceptual loudness match.

Quality controls the drive processing's cost/alias behavior where applicable. Extreme high-band drive or high notes can still sound deliberately rough. Choose the lowest setting that sounds satisfactory for playing, and compare rendered quality using the global workflow as needed. A zero Drive amount with neutral other controls should not be mistaken for audible full-band saturation.

| Control            | Range / choices                                                                             | Default    |
|--------------------|---------------------------------------------------------------------------------------------|------------|
| Low / Mid          | 40.0 Hz to 1000.0 Hz                                                                        | 120.0 Hz   |
| Mid / High         | 500.0 Hz to 12000.0 Hz                                                                      | 2500.0 Hz  |
| Input              | -24.0 dB to 24.0 dB                                                                         | 0.0 dB     |
| Output             | -24.0 dB to 24.0 dB                                                                         | 0.0 dB     |
| Mix                | 0.0 % to 100.0 %                                                                            | 100.0 %    |
| Bass Mono          | Off; On                                                                                     | Off        |
| Depth              | 0.0 % to 100.0 %                                                                            | 100.0 %    |
| Time               | 10.0 % to 1000.0 %                                                                          | 100.0 %    |
| Low Solo           | Off; On                                                                                     | Off        |
| Low Mute           | Off; On                                                                                     | Off        |
| Low Bypass         | Off; On                                                                                     | Off        |
| Low Gain           | -24.0 dB to 24.0 dB                                                                         | 0.0 dB     |
| Low Width          | 0.0 % to 200.0 %                                                                            | 100.0 %    |
| Low Drive On       | Off; On                                                                                     | Off        |
| Low Drive          | 0.0 % to 100.0 %                                                                            | 0.0 %      |
| Low Drive Type     | Saturation; Hard clip; Wavefolder; Rectify; Tube; Tape; Diode; Fuzz; Fold; Rectify 2; Crush | Saturation |
| Low Auto Gain      | Off; On                                                                                     | Off        |
| Low Compression On | Off; On                                                                                     | Off        |
| Low Down Threshold | -60.0 dB to 0.0 dB                                                                          | -18.0 dB   |

| Control          | Range / choices     | Default  |
|------------------|---------------------|----------|
| Low Down Ratio   | 1.00:1 to 20.00:1   | 1.00:1   |
| Low Up Threshold | -60.0 dB to 0.0 dB  | -36.0 dB |
| Low Up Ratio     | 1:1.00 to 1:4.00    | 1:1.00   |
| Low Attack       | 0.1 ms to 100.0 ms  | 10.0 ms  |
| Low Release      | 5.0 ms to 1000.0 ms | 100.0 ms |

Representative master slot 1 controls. Multiband Low band rows also apply independently to Mid and High.

### Keep the bass clean while the top breaks up

1. Choose a patch with enough upper harmonics to hear a difference. Lower monitoring level.
2. Enable Multiband and set the low crossover above the region you want stable.
3. Leave Low Drive off, Gain neutral and Width restrained or Bass Mono on.
4. Solo Mid/High and add a modest drive type/amount. Match its output by ear.
5. Clear solos and balance the complete result.
6. Bypass any unrelated later master distortion/clipper when evaluating whether Low itself remains clean. A final whole-signal nonlinear stage can distort the recombined bass again.

### Glue a shifting texture

Use gentle downward ratios on bands whose levels jump unpredictably, with attack/release suited to the phrase. Add only enough upward processing to retain quiet detail. Compare the input/output spectrum and gain meters, then listen in context at matched level. Save a neutral and processed version. A visually flatter spectrum is not necessarily a better patch.

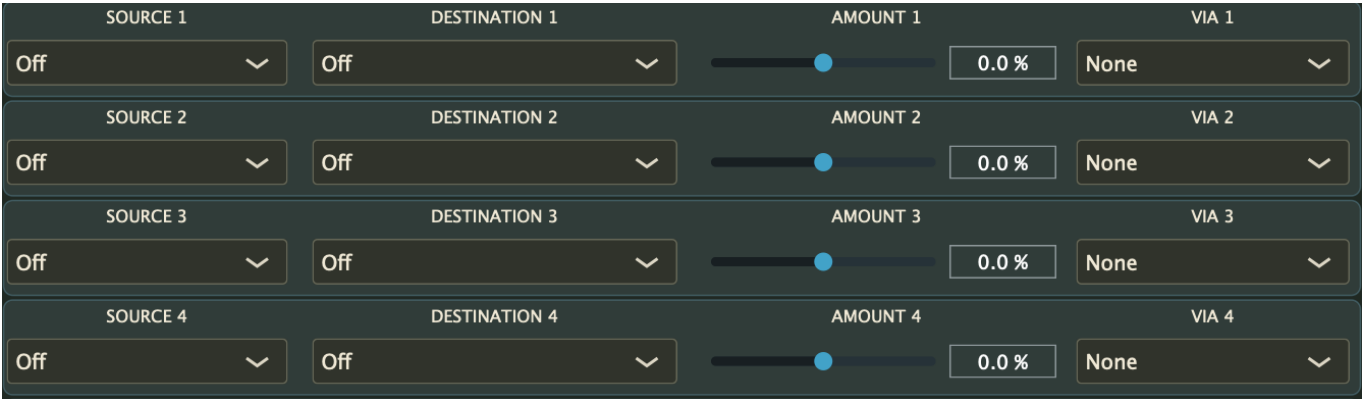
### Modulation and CPU

Supported Multiband destinations integrate with matrix, macro, XY, MIDI Learn and host automation. Useful gestures include modest Depth, Input, Mix or band Drive/Gain spans. Avoid large crossover and gain moves all at once until each behaves as intended.

The shared master location avoids replicating Multiband across voices. Used compression/drive still costs CPU; hidden analysis has its own visibility demand. Disable unwanted slots and let transition/tail behavior settle. See [Chapter 38](#) for a repeatable performance comparison rather than assuming a fixed per-effect percentage.

MODULATION AND PERFORMANCE

# 24 / Modulation Matrix and LFOs



Each matrix row connects Source, Destination, Amount and Via.



LFO shape, rate and Curve controls.



LFO timing controls and waveform previews.

Each layer has **sixteen matrix rows**. A row selects a Source, Destination, Amount and optional Via. Amount is bipolar: a negative amount reverses the source's contribution. Via multiplies it, so a unipolar Via can act as a depth control while a bipolar Via can also reverse polarity. None leaves the Via multiplier at one.

Sources and their polarity

Off contributes no modulation. Each named source has the behavior described below. The eight macros can also be used as Source or Via controls.

| Source family                          | Meaning                                                                |
|----------------------------------------|------------------------------------------------------------------------|
| LFO 1-3                                | Independent periodic/random curves. Their previews show base settings. |
| Env 1/2                                | Assigned modulation contours; unipolar.                                |
| Velocity / Release velocity            | Incoming note-on/note-off expression.                                  |
| Wheel / pressure / key / random / bend | Performance and note-dependent values with their labelled polarity.    |
| Expression / Breath / Foot / Slide     | CC11 / CC2 / CC4 / CC74.                                               |
| Pedal sources                          | Soft and sustain pedal states.                                         |
| Source/layer envelopes                 | Relevant envelope activity where offered.                              |
| Motion lanes and note sources          | Four lanes, accent, step velocity/index/random, gate and position.     |
| Macros 1-8                             | Previous-block values avoid an instantaneous feedback loop.            |

| Source family                 | Meaning                                      |
|-------------------------------|----------------------------------------------|
| Dynamics envelope / reduction | The selected layer dynamics control sources. |

LFOs, Note random, Key track and Pitch bend are bipolar. Envelopes, Velocity, Mod wheel, Aftertouch and macro values are unipolar. A bipolar LFO moves above and below the base setting, whereas a unipolar envelope starts from its lower endpoint. Motion lane polarity is selectable; [Chapter 27](#) distinguishes its stored and displayed values.

## Destinations and depth

The destination menu groups pitch, filter, source levels, stereo placement, oscillator shaping, PM/ring routes, supported effect controls and Rack EQ band controls. The searchable picker is more useful than assuming every visible knob is a matrix target. MIDI Learn and macros can address parameters outside the matrix destination set.

| Destination              | Meaning at full source and full Amount                                                |
|--------------------------|---------------------------------------------------------------------------------------|
| Layer Pitch              | Nominal twelve-semitone contribution per row, subject to the destination path limits. |
| Cutoff                   | An octave-domain offset before effective cutoff limiting.                             |
| Oscillator Coarse / Fine | Native semitone/cents offsets within the destination limits.                          |
| Frequency / time / gain  | Uses the engine's defined scale and clamps, not one universal unit.                   |
| Macro value              | Relative contribution evaluated with block-boundary ownership.                        |

Routes add their contributions before destination clamping, so two opposite routes can cancel. Ordinary destinations are smoothed; changing row order does not create a serial chain of modulators. Direction wraps around its cyclic range. Cutoff offsets are exponential octave changes, not linear hertz additions.

A base value near an endpoint can make half of a bipolar modulation cycle hit the limit. Reduce the base or Amount before assuming the LFO is one-sided. A zero Amount, Off source or Off destination makes a row inaudible even if it remains occupied for assignment purposes.

There is no general row Offset or Curve control in this matrix. Macro routes have their own curves; these are not matrix row curves. Legacy and extension selectors retain their stable IDs, while the editor combines them into a single visible Source/Destination choice.

## LFOs

There are three LFOs per layer. Shapes are Sine, Triangle, Ramp up, Square, Sample hold, Ramp down, Step Up, Step Down and Custom. Free rate is measured in hertz. Sync chooses a musical division using host tempo/playhead information. Phase offsets the waveform position; Free / Note retrigger determines whether a free-running loop restarts its phase on a note.

| Control        | Range / choices                                                                                                        | Default  |
|----------------|------------------------------------------------------------------------------------------------------------------------|----------|
| LFO 1 rate     | 0.010 Hz to 20.000 Hz                                                                                                  | 1.000 Hz |
| LFO 1 shape    | Sine; Triangle; Ramp up; Square; Sample hold; Ramp down; Step Up; Step Down; Custom                                    | Sine     |
| LFO 1 phase    | 0.0 deg to 360.0 deg                                                                                                   | 0.0 deg  |
| LFO 1 trigger  | Free; Note retrigger                                                                                                   | Free     |
| LFO 1 playback | Loop; One Shot                                                                                                         | Loop     |
| LFO 1 timing   | Free; Sync                                                                                                             | Free     |
| LFO 1 division | 1/1; 1/1 D; 1/1 T; 1/2; 1/2 D; 1/2 T; 1/4; 1/4 D; 1/4 T; 1/8; 1/8 D; 1/8 T; 1/16; 1/16 D; 1/16 T; 1/32; 1/32 D; 1/32 T | 1/4      |

### LFO speed: 1x, 1/5 and 1/10

With Timing set to **Free**, a small button sits directly beneath each LFO Rate knob. It starts at **1x**. Click once for **1/5**, again for **1/10**, and again to return to **1x**. Each LFO in each layer is independent. Larger factors mean slower motion: frequency is divided by the factor.

| LFO speed | Actual frequency range and slowest complete cycle     |
|-----------|-------------------------------------------------------|
| 1x        | 0.010 to 20 Hz; up to 1 minute 40 seconds per cycle.  |
| 1/5       | 0.002 to 4 Hz; up to 8 minutes 20 seconds per cycle.  |
| 1/10      | 0.001 to 2 Hz; up to 16 minutes 40 seconds per cycle. |

The Rate field displays and accepts actual Hz. At minimum, 1/5 reads **0.002 Hz**; 1/10 reads **0.001 Hz**. The cyan Cycle line shows the complete cycle duration. These settings apply in both Loop and One Shot modes. Tempo Sync uses its musical division instead and hides the speed button. Switching back to Free restores use of the saved speed setting.

The LFO buttons remain in MODULATION MATRIX. The separate speed buttons on SOUND belong to the amp and filter envelopes. A speed button changes its generator's timing, but an LFO still needs a destination through modulation or macro routing to affect the sound.

For a one-shot Ramp up, the full rise lasts one cycle: 100 seconds at 0.010 Hz or 1,000 seconds at 0.001 Hz. A Triangle rises and falls within its cycle; not every shape spends the entire cycle rising. For a key-release descent, see the Env 1 recipe in [Chapter 16](#).

Loop repeats. One Shot starts on a note and reaches a shape-dependent endpoint: Sine ends at zero; Ramp up at +1; Triangle, Square and Ramp down at -1; Sample hold retains its selected value. One Shot is not a unipolar envelope merely because it runs once. Synced looping LFOs follow the host beat position, so seeking or looping the host can change their phase.

## Right-click Modulate

1. Right-click a supported destination control on its page.
2. Open **Modulate** and choose the desired source from the submenu.
3. Mosasaur writes the first completely empty matrix row for the destination's layer, with that source, that destination and **+10% Amount**.
4. Open that layer's matrix to adjust Amount and Via.

The source is selected in the submenu before the row is created. This is not a command that creates a destination-only row and waits for you to choose a source afterward. It consumes one of the sixteen rows. If no completely empty row is available, the assignment cannot be added; clear an unwanted row or edit an existing one. A row with Amount at zero is not necessarily empty.

Master Rack EQ destinations use the selected/preferred layer's matrix. Verify the layer indicator before adding a route to a shared destination. MIDI Learn, macro assignment and matrix modulation offer different sets of destinations; use the menu available on the chosen control.

## Four starting assignments

- **LFO to cutoff:** Source LFO 1, Destination Cutoff, Amount +10%, Via None. Set cutoff away from either endpoint. A full-scale LFO then targets approximately +/-0.5 octave before other offsets and clamps.
- **Envelope to PM:** Source Env 1, Destination PM 2 > 1, positive Amount. Shape Env 1 with a short attack/decay and lower sustain to make PM strongest around the onset. Keep the base PM depth low enough to leave room for movement.
- **Velocity to filter:** Source Velocity, Destination Cutoff, positive Amount. Higher note velocities add more positive octave offset. Negative Amount reverses that response; this route is separate from the hard-wired Filter velocity control.
- **Lane to resonance:** choose Seq Lane 1, Resonance, modest positive Amount. Run a sequence with different lane values on successive steps. Each routed lane uses a matrix row.

Use these as starting settings and adjust Amount to the sound.

## Current destination access

Use the matrix's searchable destination picker for the current supported targets. Enhanced Distortion and Dynamics add named destinations across rack tiers; either layer can address their shared Master destinations, and offsets add. [Chapter 19](#) describes their ranges and sources. Source/layer EQ parameters that do not have a matrix destination can still use macro assignment.

Dyn Env and Dyn GR are additional source/Via choices. They come from the first enabled Dynamics slot in that layer's Complete Layer rack; see [Chapter 19](#). Choose the destination by its visible name in the searchable picker.

## Pitch destination numbering

Each main oscillator has separate Coarse and Fine modulation offsets: up to +/-24 semitones or +/-100 cents. They add to effective pitch independently of the base Transpose and Fine Tune knobs. The base knob can stay still while a matrix route changes the heard pitch. [Appendix B](#) explains older destination numbering.

## Step shapes and assignment shortcuts

The LFO shape menu includes **Step Up** and **Step Down** as well as Sine, Triangle, Ramp up, Square, Sample hold and Ramp down. The step shapes move through discrete levels. Route them to cutoff for stepped brightness, or pitch for pitch steps; they do not automatically quantize musical notes.

Right-click a macro knob and choose **Modulate... (Layer A/B)**, then select a source. Mosasaur opens the assigned matrix row. Check the displayed layer, destination, Amount and Via, and set the amount to suit the patch. Macros use the currently selected layer for this shortcut. If the matrix is full, clear an unused row first. Macro values can still be selected as Source, Via or Destination in the matrix.

A cyan ~ badge indicates an active assignment, not instantaneous movement. Hover for its route summary. Amber M1-M8 badges identify macro ownership of base controls. An idle envelope can have an assigned route even when no sound or movement is occurring.

## Continuous LFO Curve control

Each of the three LFOs in each layer now has a **Curve** knob. It bends the selected waveform's output values while keeping the cycle rate, phase and output extremes. Its range is **-100% to +100%**, and its default is **0% (Original)**. At 0%, Triangle is the unchanged straight-sided triangle; every other waveform also retains its original behavior. No additional shapes are added to the shape menu.

### Exact mapping and useful positions

The five landmarks are equally spaced at 25% intervals of the knob's total travel. These describe the rising portion of a triangle or ramp; a falling portion traverses the same curve in reverse.

| Curve value | Result                 | Movement on a rising ramp                                |
|-------------|------------------------|----------------------------------------------------------|
| -100%       | Full upward parabola   | Slow at the bottom, progressively faster toward the top. |
| -50%        | Full downward parabola | Fast at the bottom, slowing toward the top.              |
| 0%          | Original waveform      | Triangle and ramp segments remain linear.                |
| +50%        | Full S curve           | Slow at both ends, faster through the middle.            |

| Curve value | Result        | Movement on a rising ramp                                     |
|-------------|---------------|---------------------------------------------------------------|
| +100%       | Steep S curve | Longer near the extremes, faster movement through the middle. |

Values between adjacent landmarks blend continuously. This is a tour through useful curves, not a steadily increasing amount of one deformation. In particular, blending the two opposite parabolas at **-75%** also produces the original straight ramp/triangle. The dedicated 0% position is the neutral default. Double-click to enter an exact percentage; use the control's Reset action to return to 0%.

A full S curve is not an exact sine wave. The +100% shape is steep but remains continuous on a triangle; it is not a literal square. A ramp still jumps back at the cycle boundary. Curve never removes that reset.

### What changes for each shape

**Triangle and Ramp Up/Down:** bends their rising and falling slopes. Rate, sync division, phase and one-shot duration remain unchanged. Triangle still travels up and down; ramps still reset on looping playback.

**Sine:** reshapes its existing smooth motion. The parabolic settings are asymmetric and can shift the average modulation level. They do not turn a sine into an exact parabola over time.

**Square:** remains unchanged. Its only output levels are the two endpoints, which Curve preserves.

**Step Up/Down:** keeps eight equal-duration steps but changes the spacing between their levels. The highest and lowest levels remain unchanged. This does not smooth the step transitions or quantize pitch to a musical scale.

**Sample Hold:** bends the random levels and changes their distribution. It retains the update timing and the held-level behavior. Modulating Curve while a random level is held can move that level smoothly; the next random update can still jump. The preview is an illustrative sequence, not a prediction of the random values.

The preview shows the selected waveform with its **base Curve, Symmetry and Rise/Fall settings**. It does not animate the instantaneous contribution of matrix modulation. Parabolic bending can change the average value, so a cutoff or level modulation may sit higher or lower even with unchanged Amount.

### Modulating Curve

In a matrix row, choose **LFO 1 Curve**, **LFO 2 Curve** or **LFO 3 Curve** from the **LFO curves** destination category. Select a source and start with a modest Amount. These destinations operate on the selected layer. The right-click **Modulate...** shortcut on the Curve knob also creates a route. Macro assignment, host automation, saving and preset recall are supported.

Example: use LFO 1 Triangle to modulate filter cutoff. Set Curve to 0%. In another row, choose Mod wheel as Source, LFO 1 Curve as Destination and +25% Amount. With no Via scaling, the wheel adds up to **50 Curve percentage points**, taking the base setting from Original to the full S curve. Amount spans the entire 200-point Curve range; +100% Amount corresponds to a possible +200-point offset before clamping. Multiple routes add together, then the result is limited to -100% through +100%.

You can use a second LFO to change the first LFO's Curve. Self-modulation is also bounded and uses the previous control update; there is no instantaneous recursive evaluation.

### Smoothing and compatibility

Base/automation targets are read with the processor's block snapshots. The matrix updates at its existing fixed 16-sample control cadence. The combined Curve target is smoothed **every audio sample**, with state carried across blocks: a one-pole smoother has a **10 ms time constant** (about 46 ms to reach 99% of a step). Matrix offsets also retain the existing 10 ms control smoothing, so matrix-driven movement passes through both stages. Rapid Curve movement is intentionally softened. This smooths the Curve control, not the intentional edges of Square, ramps, steps or random updates.

An LFO begins from its saved Curve setting. A Sine one-shot ends at the curved value of zero; negative parabolic Curve settings can shift this held value. [Appendix B](#) covers older LFO data.

## LFO timing controls

The three LFO rows now use the full width of the Modulation page. After Curve, each row has **Symmetry**, **Rise**, **Fall** and a larger preview. All six LFOs have independent settings.

### Symmetry and Square pulse width

**50%** preserves the original timing. At **25%**, Triangle reaches its peak one quarter of the way through its cycle, then takes the remaining three quarters to fall. At **75%**, it rises slowly and falls quickly. The range is **1% to 99%**.

For **Square**, this is pulse width: 25% means high for one quarter and low for three quarters; 50% gives equal high/low times; 75% stays high for three quarters. Curve still cannot bend Square's two endpoint levels, but Symmetry can move the transition between them.

For Sine, Symmetry sets the positive half's share of the cycle. Ramps acquire two different slopes either side of their midpoint and retain their cycle reset. Step Up/Down put their first four steps into the selected portion of the cycle. Sample Hold is unaffected by Symmetry. Phase offsets are applied before this timing warp, and one-shot endpoint values remain unchanged.

### Separate Rise and Fall smoothing

Each control ranges from **0 ms (off) to 5 s**; its knob midpoint is **100 ms**. Rise smooths upward movement and Fall smooths downward movement, after Symmetry and Curve. A setting is the time to cover **99% of the distance to a held target**. It is an exponential approach, not a fixed-speed ramp. A moving LFO may reverse before reaching that target; long times reduce the depth of fast modulation.

Try Square with Symmetry 25%, Rise 100 ms and Fall 0 ms: the upward movement softens while the downward movement stays sharp. Swap Rise and Fall to reverse the effect. This also softens ramp resets, step changes and random jumps. At 0/0 ms, the smoothing stage is bypassed exactly.

The first initialized value starts at its target. Subsequent retriggers retain the current smoothed output; a one-shot continues settling toward its final held target after its cycle finishes. Display fields show seconds at 1 s and above. You can type units such as 250 ms or 1.5 s; bare numbers mean milliseconds. Envelope speed factors do not affect these times.

## Modulating LFO Rate

Choose **LFO 1 Rate (Free)**, **LFO 2 Rate (Free)** or **LFO 3 Rate (Free)** in the **LFO rates (Free)** destination category. The Rate knob's right-click Modulate shortcut can create the route too. These destinations apply within the selected layer.

With a source at +1 and no Via scaling, **Amount +25% doubles the rate**, **-25% halves it**, and **+100% multiplies it by 16**. Routes add in octaves, limited to four octaves in either direction. The result is clamped to the existing 0.01-20 Hz base-rate range, then divided by the selected 1x, 5x or 10x speed factor. The Rate knob displays its base value, not the momentary modulated value.

This affects both repeating and one-shot LFOs in **Free** timing. **Tempo Sync ignores Rate modulation** and follows its selected beat division, including one-shot playback. Self-modulation uses the previous control update and remains bounded. Symmetry, Rise and Fall support automation and macro assignment; they do not add matrix destinations in this release.

## Timing smoothing and preview

Symmetry, Rate multiplier and Rise/Fall coefficients are smoothed every audio sample with a 10 ms time constant, retaining state across host blocks. This is about 46 ms to reach 99% of a control change. Matrix rate offsets also pass through the existing matrix smoothing. Target control values are read from block snapshots. The output Rise/Fall filter advances once per sample, independently of transport refresh calls.

The preview illustrates base settings at the base rate, including directional smoothing. It excludes live matrix offsets. Repeating previews show a settled cycle; one-shot previews show the initial traversal and do not draw the later settling tail. Sample Hold previews remain illustrative. These are shape guides, not an oscilloscope.

Layer Copy, Clear and Undo include LFO timing controls and rate routes. For older project automation, see [Appendix B](#).

## Splice modulation destinations

Each of Oscillators 1-3 has five dedicated destinations in each layer: **Splice Amount**, **Splice Rate**, **Splice Jitter**, **Splice Jump** and **Splice Time**. Select Splice Character first to hear them. The original Character Amount destination still belongs to the original contour controls; use Splice Amount for the spliced blend.

Rate follows the selected Free or Key-track mode and is modulated exponentially within that mode's range. It changes grain timing, not oscillator transpose. Amount, Jitter, Jump and Time change their corresponding percentages. Right-click assignment, destination search, route hints and patch/layer recall include these controls. Rate Mode and Clock can be saved/automated but are not additional Splice matrix destinations.

Try an LFO into Splice Jump for continuously changing roughness, a motion lane into Rate for stepped texture changes, and Mod wheel into Amount for performance control. Bypassing a coupling connection in OSC ROUTING also silences matrix modulation on that connection; clearing routing leaves matrix assignments in place.

## Grain destinations

The matrix offers Size, Density, Position, Spray, Shape, Pitch, Reverse and Mix for each of the three Grain layer slots. Each layer routes independently. Sync disables free Density/Position modulation; free values remain stored. See [Chapter 20](#) for depth scales.

## Matrix route view

Scroll past the LFO and envelope section to reach all sixteen routes. A route combines Source, Destination, signed Amount and optional Via. Off is an unassigned route; Via None does not require another controller. Begin with one modest-depth route and add more once its contribution is clear.

## Slow modulation envelopes

ENV 1 SPEED and ENV 2 SPEED lengthen their own envelope times. Attack Smooth changes the attack contour for the layer envelopes; the graph previews the curve, from linear at 0% toward a soft S-curve at 100%.

## Drawable custom LFOs

Choose Custom in an LFO Shape menu to open the drawing editor. EDIT LFO below the preview reopens it. All three LFOs in each layer have independent drawings: six in one preset. Drawing a shape does not create a matrix route; assign the LFO to a destination to hear it.

Start from Sine, Triangle, Ramp up/down, Square, Pulse, Step up/down, Random steps or Blank. Random steps makes a repeating pattern; built-in Sample hold keeps generating new values. Freehand paints the shape, Move points moves one point vertically, and Steps holds cells on a 4, 8, 16 or 32-division grid. In continuous modes, Snap constrains horizontal editing positions to those divisions.

LFO values run from -1 to +1. Flat and offset drawings are valid modulation: no DC removal or normalization applies. Use an all-positive drawing for positive-only movement. Loop joins the end back to the start; unequal endpoints intentionally jump. Once starts on a note trigger, traverses the drawing and holds its final value or final step. Loop phase offset does not apply to Once.

The green playhead shows cycle phase. The large drawing is the raw shape; Curve, Symmetry and Rise/Fall act afterward and appear in the small preview. Rise and Fall at zero preserve held steps. Drawing changes have short transitions of about 20 ms. Rate, speed divisors, tempo sync, phase and retrigger remain available.

Smooth, Mirror and Invert transform the drawing. Undo or Command-Z restores up to 32 gestures while the editor has focus; Escape closes it. Presets, exports and DAW state save the drawings. Layer Copy/Clear/Undo includes them; clearing restores the default sine drawing with Custom disabled. Continuous drawings store endpoint-inclusive values, unlike oscillator cycles whose last point wraps to the first.

## Modulating custom-wave morph

Select Osc 1, 2 or 3 Wave Morph as a matrix destination in the correct layer. Set its base Morph to 50% and Amount to +50% for a full bipolar sweep. A slow drawn LFO can pause, jump or reverse the blend; an envelope can make the transition follow a note. Identical A/B frames produce no timbral change regardless of the route.

## New modulation destinations

The matrix includes continuous destinations for custom-wave Dual A/B fields, unison movement and Scatter, Filter FM, PM scaling, Shape, Fold, Logic and Routing Character amounts. Use the searchable AUTOMATION browser for the complete current list and permanent IDs. Discrete mode choices are not interchangeable with continuous amount destinations.

The routing diagram shows stored base settings. An asterisk identifies a matrix-driven connection; the drawn line is not a live oscilloscope or animated amount meter. Clear Routing preserves matrix rows. Bypass on eligible PM, Ring and Sync links also suppresses matrix contributions to that connection. Clear, Copy and Undo include Routing Character destinations.

MODULATION AND PERFORMANCE

# 25 / Macros

MACRO 1 / Macro 1

SMOOTHING / ms TO 99%

Macro 1

20.00

COPY

PASTE

CLEAR MACRO

CL

| ON                                  | SCOPE   | DESTINATION           | START / NATIVE | END / NATIVE |
|-------------------------------------|---------|-----------------------|----------------|--------------|
| <input checked="" type="checkbox"/> | Layer A | A Cutoff              | 12720          | 20           |
| <input checked="" type="checkbox"/> | Layer A | A Resonance           | 0              | 100          |
| <input type="checkbox"/>            | Layer A | Choose destination... | 0              | 0            |
| <input type="checkbox"/>            | Layer A | Choose destination... | 0              | 0            |
| <input type="checkbox"/>            | Layer A | Choose destination... | 0              | 0            |
| <input type="checkbox"/>            | Layer A | Choose destination... | 0              | 0            |
| <input type="checkbox"/>            | Layer A | Choose destination... | 0              | 0            |
| <input type="checkbox"/>            | Layer A | Choose destination... | 0              | 0            |

Endpoints use native units. Right-click any control to assign it.

A macro has up to eight assignments with independent endpoints.

A macro lets one control move several parameters between chosen endpoints. Mosasaur has **eight macros**, each with **eight routes**. Routes can address Layer A, Layer B or Global parameters. They do not consume modulation-matrix rows.

## Assigning and editing

Use a parameter's macro assignment menu or a macro's **EDIT** panel to choose a destination. Each route has ON, SCOPE, DESTINATION, START / NATIVE, END / NATIVE, CURVE and AMOUNT / STEPS. Enable the route to make it own its destination. Remove it with the row's x control.

Start is the destination value at macro 0%; End is its value at macro 100%. Enter the destination's **native units**. These fields are not generic depth percentages: a cutoff endpoint is in hertz, while some percentage-looking panel controls have a different stored range. For example, rack Distortion Drive stores 1-25 even though its panel displays 0-100%.

End may be lower than Start to reverse the direction. Discrete destinations use legal choice values and snap; they do not continuously blend algorithms. Choosing another scope clears that row's old destination. A macro cannot directly assign another macro as a route destination.

## Curves, smoothing and ownership

| Curve       | Relationship between endpoints                                      |
|-------------|---------------------------------------------------------------------|
| Linear      | Equal macro-position increments give equal native-value increments. |
| Exponential | More change toward the end, controlled by Amount.                   |
| Logarithmic | More change toward the start.                                       |
| S-Curve     | Softens the ends relative to a straight ramp.                       |
| Inverse S   | Changes the inverse of that S-shaped deviation.                     |
| Stepped     | Uses 2-32 positions between the endpoints.                          |

Amount is 0-100% for continuous curves; Stepped uses a step count. Smoothing is **0-10,000 ms to 99%**, default **20 ms**, evaluated at block boundaries. Zero or a setting shorter than a processing block is immediate in that path. Discrete destinations snap rather than glide between choices.

Only one enabled macro route may own a destination, even across different macros. Conflicting assignments or re-enabling a conflicting route are rejected. While a macro owns a destination, its effective value comes from the route. The matrix then adds its relative modulation to that base. A macro-owned knob that does not behave like an independent base control is not necessarily ignoring host automation.

When a route releases a destination, the last effective value is held until a fresh external write takes over. Removing ownership therefore need not make the sound jump immediately back to an old hidden base value.

## Capture, names and saved state

CAPTURE MODE suspends the selected macro's destination writes so you can adjust its destinations on other pages. CAPTURE START or CAPTURE END records the enabled routes' current values as those endpoints, as one Undo operation. Exit Capture Mode to resume macro control. Leaving it active explains why an assigned macro can appear inactive.

A macro label can use up to sixteen printable ASCII characters. The label is shown on the macro strip and used as host-facing metadata; its stable value ID remains `macro_1Value` through `macro_8Value`. Host automation addresses that value even after renaming. COPY/PASTE includes the macro value, label, smoothing and routes; conflicts are still validated. CLEAR MACRO and CLEAR ALL remove assignments, and the macro editor supplies its own Undo history.

Macro labels, route definitions, endpoints, curves and smoothing are saved per patch. Only the macro values and the matrix's macro selectors are host parameters; the editor's route rows are saved structured data. Saving effective destination values helps the patch retain the sound produced by its assignments.

Macros can be matrix Source, Via or Destination choices. As matrix inputs they use the previous audio block's macro values. A route feeding a macro back into itself therefore evolves with block-boundary updates rather than an instantaneous audio-rate loop.

## Two starting designs

**Brightness:** name Macro 1 Brightness. Add a Layer A cutoff route with Start 400 Hz and End 4,000 Hz. Choose Linear initially, then compare an exponential curve if the low end of travel needs more space. Add a Layer B cutoff route only if B is intended to be audible. This assignment changes absolute cutoff base values; it is not a +100% matrix depth.

**Intensity:** name Macro 2 Intensity. Route Layer A Filter drive from 1x to 3x, and Layer A Oscillator 1 Saturation from 0% to 40%. Add a Layer A level route from 80% down to 60% to counter some of the level rise. Reverse endpoints on that last route intentionally. Compensation is an audition decision, not a measured loudness guarantee.

Save a browser patch and reload it to check that labels and assignments return. Test host automation of the macro separately from editing route endpoints. Use these designs as starting points and adjust their ranges to your patch.

## Remove an assignment at the original control

Right-click the assigned control, such as Resonance, and choose **Remove from Macro N (name)**. This removes that control's assignment from the named macro; it does not clear the macro's other destinations. The X in the MACROS route row remains another way to remove an assignment. Save the preset if you want the edited routing recalled later.

## Modulate a macro directly

Right-click the macro knob, choose **Modulate... (Layer A/B)**, and select an LFO, envelope, expression source or Motion source. Review the matrix row that opens. A macro can move several assigned destinations together, so start with a modest depth and check output level. The shortcut uses the selected layer's available matrix row. The menu reports when that matrix is full.

## MODULATION AND PERFORMANCE

## 26 / XY Pad

**XY / PERFORMANCE**

Drag sets the base; motion moves around it. Dot: moving point. Crosshair: base. Arrows/Home adjust the base (pop-out: XY Edit). Automate XY Pad X/Y in Logic.

X 50.0% Y 50.0%

☐ X MOTION **Sine** ☐ SYNC  
 RATE / Hz: 0.20 DEPTH / %: 50.0 PHASE / deg: 0.0

☐ Y MOTION **Sine** ☐ SYNC  
 RATE / Hz: 0.13 DEPTH / %: 50.0 PHASE / deg: 90.0

**X ASSIGNMENTS** **Y ASSIGNMENTS**

| ON                       | SCOPE   | DESTINATION           |
|--------------------------|---------|-----------------------|
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |
| <input type="checkbox"/> | Layer A | Choose destination... |

The XY Pad combines two sets of performance assignments.

### Two axes, sixteen assignments

XY PAD gives X and Y independent positions and up to eight routes each. A route addresses Layer A, Layer B or Global, with endpoints in the destination's native units. It does not consume a modulation-matrix row. Use the pad to coordinate a performance gesture rather than moving unrelated knobs separately.

Select X ASSIGNMENTS or Y ASSIGNMENTS before editing. Enable a row, choose Scope and Destination, then set At 0% and At 100%. Reversed endpoints reverse the movement. Linear, Exponential, Logarithmic, S-Curve, Inverse S and Stepped change how the axis travels between endpoints. Continuous Amount shapes the curve; Stepped uses a count from 2 to 32.

Destinations use the same ownership rules as macros. A destination already assigned to another controller cannot be assigned again until that assignment is removed. Changing scope clears/disables the old destination rather than quietly repointing it. Removing or clearing a route holds the last heard value until a new explicit edit takes over; it need not restore a hidden earlier base automatically.

## Set a useful range

1. Start with a sustained patch you know. Choose X and route the audible layer's Cutoff from a restrained low value to a useful upper value.
2. Move X alone and listen. Reduce the range if most of its travel is too dark or too bright.
3. Assign Y to a second parameter, such as a layer effect Mix or a small Drive span.
4. Visit all four corners. Check peak level, clarity and CPU at the strongest corner.
5. Add another route only when its purpose is clear. Reversed output-level endpoints can counter a rise in intensity, but are not automatic loudness compensation.
6. Save the preset and reload to confirm the complete mapping.

## Base point and moving point

Dragging sets the base position, shown by the crosshair. The moving dot shows the effective position after axis motion. X and Y position fields provide exact values. CENTRE returns the base to the middle; it does not clear assignments or turn motion off.

Each axis has smoothing from 0 to 10,000 ms to 99%. It softens changes to the assigned values. Large smoothing can intentionally lag a gesture; reduce it before diagnosing delayed pad response. A discrete destination still selects valid choices rather than blending two algorithms.

## Automatic X and Y motion

X MOTION and Y MOTION are independent LFOs around their saved base positions. Shape, free Rate or synced Division, Depth and Phase define each movement. At 100% depth the excursion is plus/minus half the pad size, clipped at the edges. Moving the base shifts the center; it does not erase the motion.

For an orbit, use equal sine rates with X at 0 degrees and Y at 90 degrees. For a diagonal, use equal phases. Different rates create evolving paths. Depth less than full scale can keep the gesture inside a useful region. At an edge, clipping can hold a value temporarily; it is not an extra envelope stage.

Sync follows host beat during playback and continues at the last tempo while stopped. Dotted and triplet divisions have their displayed meanings. Free Rate is cycles per second. The pad's motion is separate from the four Motion lanes and the layer's three LFOs.

## Automate or detach the pad

XY Pad X/Y are host parameters. Automate those for a reproducible base performance; the enabled axis motion can still run around that base. Routes, smoothing and motion choices are saved with the sound. Ordinary pad movements can be captured by the host's own automation workflow.

POP OUT opens a separate XY window while leaving other editing pages available. RETURN TO TAB returns the same instance's pad. KEYS: HOST preserves host performance typing while dragging; XY EDIT enables text, pad arrows/Home and window editing shortcuts. Switch back when you want laptop keys to play the host again.

## Diagnosing an unresponsive gesture

Check the selected axis, enabled route, legal endpoints, destination's active feature and ownership. A zero-to-zero range cannot move a parameter. A filter at its effective limit can conceal another cutoff increase. Motion plus automation plus a matrix route can combine into a different result than the base crosshair suggests. Disable the additional movement temporarily and rebuild one contribution at a time.

MODULATION AND PERFORMANCE

# 27 / Motion modulation lanes

The sequencer has **four lanes** of values aligned to its steps. A lane supplies control data; it does not contain notes and does not alter the sound until routed. The same four lanes are available to both layers' matrices.

## Editing a lane

Open the sequence grid, choose the pattern and step page, and adjust the lane bars or their value fields. The editor shows sixteen steps at a time within a pattern of up to 64 steps. Selecting a step chooses what you edit; it does not solo that step or change the pattern length. Values outside the active length remain stored but are not visited by the current playback length.

Lane values are stored from zero to one. In unipolar mode they are presented as 0-1; in bipolar mode the displayed/source range is -1 to +1. Changing polarity changes how that stored value is interpreted, rather than creating a second set of step data.

## Smoothing and routing

Click a lane's label to open its smoothing/polarity settings. Smoothing ranges from **0 to 10,000 ms**, with a default of **5 ms**, and specifies the approach time to 99% of the new source value. **Zero means immediate source steps, not no output**. Existing matrix destination smoothing still applies, so zero lane smoothing does not promise a discontinuous audible cutoff jump at the exact step sample.

Assign Seq Lane 1-4 as Source or Via in a matrix row. Four lanes routed once each consume four rows, leaving twelve on that layer if no other rows are used. Routing a lane to two destinations uses two rows. Macro assignments have their own route capacity and do not refund these matrix rows.

Lane values update with the visited step, including a rest or a step rejected by its note condition. They follow the sequence cursor rather than only successful note-ons. The lane sources are cleared when the Motion source state is cleared; they are not free-running LFOs when the sequencer is inactive.

## Other Motion sources

| Source        | Output and update                                                                                                                                  |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Arp Accent    | Unipolar accent state from the arpeggiator's rhythm generation.                                                                                    |
| Step Velocity | Unipolar velocity of the generated note, updated on note-on. It is not a separate note-off velocity.                                               |
| Step Index    | Unipolar position of the visited step, from 0 at the first index to 1 at the last index for lengths greater than one. A one-step pattern yields 0. |
| Step Random   | A bipolar step-associated random value supplied by Motion.                                                                                         |
| Note Gate     | 1 while the generated note gate is on, 0 when it is off.                                                                                           |

| Source           | Output and update                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Pattern Position | Unipolar chain position: 0 through 1 across a multi-entry chain, or 0 without a multi-entry chain. It is not progress through the current pattern. |

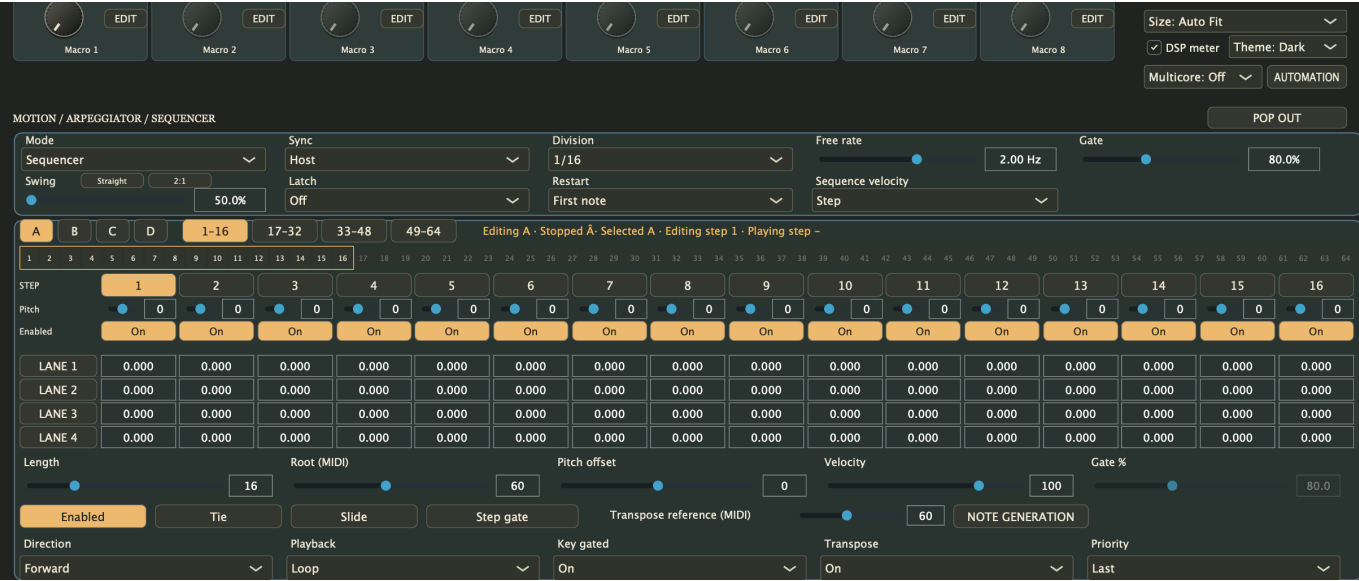
## Saving and a worked example

Pattern step values and lane smoothing/polarity are saved in patch state. Save the sound after editing them. They are not separate files next to a preset, and not individual host-automation parameters for every bar. A host project captures the instance state as well; the MIDI Learn map has its own host-state rule described in [Chapter 30](#).

For a cutoff sequence, use a four-step pattern and set Lane 1 to 0, 0.3, 0.6 and 1. Route Seq Lane 1 to Cutoff at a small positive Amount and lower the base cutoff to leave room above it. Compare 0 ms with 100 ms lane smoothing. Expect stepped versus rounded source movement while the same notes continue.

MODULATION AND PERFORMANCE

28 / Arpeggiator and sequencer



The Motion page includes note timing, arpeggiator and sequencer editing.

Motion selects **Off**, **Arp** or **Sequencer**. Arp and Sequencer are mutually exclusive. Off returns to direct incoming-note handling. Arp and Sequencer generate a note stream into that same two-layer engine; Motion is not a separate instrument.

Clock, gate and held notes

Host sync uses host beat position and tempo when valid playing-position information is available. Free uses a rate in hertz. With no valid playing host clock, Motion can run from a played note on its free-time path; host transport is not a prerequisite for every live phrase.

| Control   | Range / choices                                                                                                                                                                                 | Default |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Mode      | Off; Arp; Sequencer                                                                                                                                                                             | Off     |
| Sync      | Host; Free                                                                                                                                                                                      | Host    |
| Division  | 1/1; 1/2; 1/4; 1/8; 1/16; 1/32; 1/64; 1/1 dotted; 1/2 dotted; 1/4 dotted; 1/8 dotted; 1/16 dotted; 1/32 dotted; 1/2 triplet; 1/4 triplet; 1/8 triplet; 1/16 triplet; 1/32 triplet; 1/64 triplet | 1/16    |
| Free rate | 0.01 to 50 Hz                                                                                                                                                                                   | 2 Hz    |
| Gate      | 1 to 200 %                                                                                                                                                                                      | 80 %    |
| Swing     | 50 to 75 %                                                                                                                                                                                      | 50 %    |

| Control        | Range / choices                          | Default    |
|----------------|------------------------------------------|------------|
| Latch          | Off; On                                  | Off        |
| Restart        | First note; Every note; Transport; Never | First note |
| Velocity       | As played; Fixed; Pattern; Played x Step | As played  |
| Fixed velocity | 1 to 127                                 | 100        |
| Priority       | Last; Low; High                          | Last       |

Gate controls note length relative to a step: 100% is one step, while values above 100% overlap into the next step. Swing delays alternate positions within the pair. Straight sets 50%; the 2:1 button sets the exact triplet ratio displayed as 66.7%. Dragging can capture that detent; Shift bypasses it, while typing 66.7% keeps the literal typed value. Restart offers First note, Every note, Transport and Never. Those choices affect restart position rather than changing the musical division itself.

Latch keeps the held-note set after keys are released. Once all keys are released, a new key replaces that latched set; keys added while another remains held join it. RELEASE NOTES clears held-note memory. With Sequencer Key gated on, an eligible held or latched note is required. With Key gated off, the sequencer does not require that held-note gate. Last is the default note priority; Low and High choose the corresponding held pitch when a single pitch is needed, including key transposition. Arp still follows its selected ordering mode.

## Arpeggiator

Arp orders the held notes, then applies octave behavior and the rhythm lane. Directions include Up, Down, the inclusive/exclusive up/down and down/up variants, As played, Reverse as played, Random, Random no-repeat, Shuffle and Chord (mono priority). Inclusive turning points repeat endpoints; exclusive variants avoid that repeated endpoint. Chord still emits the mono-priority result, not simultaneous polyphonic notes.

Octaves ranges from one through four. Octave mode is Up, Down, Up/down, Alternate or Random. Octave order selects Within octave or Each note. Together these determine whether the held-note ordering is completed in a register before moving registers, or whether octave movement is grouped with each note.

The rhythm lane has up to sixteen steps. Its editing controls specify whether a step sounds and its performance attributes; Arp Accent is available to modulation. Velocity can follow As played, Fixed or Pattern. Fixed velocity uses its scalar control; Pattern starts from velocity 100 before the step offset. The step velocity offset is added to the selected base and clamped to MIDI 1-127. A rhythm rest still takes time.

Select a rhythm step to edit Play, Rest or Tie, Ratchet (1-8), Accent, Octave offset (-2 to +2), Velocity offset (-64 to +63) and Probability (0-100%). RESET STEP restores that step's defaults. A Tie extends a preceding note; its pitch/ratchet controls do not create a separate new attack. The amber border marks the playing step, independently of the selected editing step.

| Control       | Range / choices                                                                                                                                                              | Default       |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Direction     | Up; Down; Up/down inclusive; Up/down exclusive; Down/up inclusive; Down/up exclusive; As played; Reverse as played; Random; Random no-repeat; Shuffle; Chord (mono priority) | Up            |
| Octaves       | 1 to 4                                                                                                                                                                       | 1             |
| Octave mode   | Up; Down; Up/down; Alternate; Random                                                                                                                                         | Up            |
| Octave order  | Within octave; Each note                                                                                                                                                     | Within octave |
| Rhythm length | 1 to 16                                                                                                                                                                      | 1             |

## Sequencer grid and pitch

There are four patterns, **A-D**, each holding up to **64 steps**. The grid presents sixteen steps per page. Length is the number visited, not the currently selected edit cell. A dim cell outside Length retains its data. The display distinguishes Editing pattern/step from Playing pattern/step and chain position.

A step has Enabled, Pitch offset, Velocity, optional Step gate, Tie, Slide and lane values. Pitch offset is -36 to +36 semitones around the pattern's Root (MIDI). With Key transpose on, the priority held note minus Transpose reference is added. Default reference is MIDI 60. This is an offset pattern, not a stored absolute pitch that ignores the keyboard.

Loop repeats traversals; One-shot ends after one traversal. Step gate overrides the global gate only when enabled. Tie continues a preceding successful note; it cannot create a first note from a rest. Slide depends on a preceding fired step and the sound engine's glide behavior. Tied-step pitch/velocity controls are not a new independent attack. Ratchet repeats an untied step one through eight times within its period.

| Control                    | Range / choices                                                              | Default |
|----------------------------|------------------------------------------------------------------------------|---------|
| Pattern                    | A; B; C; D                                                                   | A       |
| Sequence direction         | Forward; Reverse; Ping-pong inclusive; Ping-pong exclusive; Random; Brownian | Forward |
| Playback                   | Loop; One-shot                                                               | Loop    |
| Key gated                  | Off; On                                                                      | On      |
| Key transpose              | Off; On                                                                      | On      |
| Transpose reference (MIDI) | 0 to 127                                                                     | 60      |
| Chain length               | 0 to 8                                                                       | 0       |
| Quantise                   | Off; On                                                                      | Off     |

| Control           | Range / choices                                                                                                                                                                 | Default   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Scale             | Chromatic; Major; Natural minor; Harmonic minor; Melodic minor; Dorian; Phrygian; Lydian; Mixolydian; Locrian; Major pentatonic; Minor pentatonic; Blues; Whole tone; Octatonic | Chromatic |
| Scale key         | 0 to 11                                                                                                                                                                         | 0         |
| Randomise amount  | 0 to 100 %                                                                                                                                                                      | 0 %       |
| Humanise velocity | 0 to 100 %                                                                                                                                                                      | 0 %       |
| Humanise timing   | 0 to 100 %                                                                                                                                                                      | 0 %       |

### Probability and conditions

The cursor advances and publishes step/lane position before deciding whether that step produces a note. A failed condition or probability test is a timed rest; it does not stop the clock or wait for another keypress.

Evaluation is: Enabled and condition, then probability if otherwise eligible, then the tie requirement for a preceding fired step. The result becomes Previous fired for the next visited step. Probability 0% always rejects an eligible note and 100% accepts it, subject to the other conditions. Intermediate percentages are probabilities per evaluation, not guarantees of an exact count in a short phrase.

| Condition             | Meaning and example                                                                            |
|-----------------------|------------------------------------------------------------------------------------------------|
| Always                | No additional loop restriction. Probability can still reject it.                               |
| 1:2                   | Eligible on loop counts 0, 2, 4...: the first pass, then every second pass.                    |
| 1:3                   | Eligible on the first pass, then every third pass.                                             |
| 1:4                   | Eligible on the first pass, then every fourth pass.                                            |
| 1:8                   | Eligible on the first pass, then every eighth pass.                                            |
| Previous fired        | Eligible only if the previous visited step produced a successful trigger/tie result.           |
| Previous did not fire | Eligible if the previous visited step did not fire; useful for answering a probabilistic rest. |

These are the implemented condition choices. Stored numeric codes are compatibility identities; they are not consecutive loop counts. A pattern switch and a full transport/reset event have different state-reset paths, so do not assume editing a pattern restarts every condition counter in the same way.

## Chaining and scales

Chain length 0 disables chaining. Length 1-8 enables that many entries; each entry selects A, B, C or D. The sequence advances to the next chain entry at the completed traversal boundary, not immediately when an arbitrary cell is selected for editing. A switch releases/clears the old playback state and starts the new pattern transaction. Manual pattern selection is separate from selecting an editing cell.

Direction choices are Forward, Reverse, Ping-pong inclusive, Ping-pong exclusive, Random and Brownian. In this build a reset starts at step index zero, including Reverse, which then proceeds toward the previous index and wraps. Random/Brownian traversal boundaries are counted by the pattern length rather than waiting to happen upon an endpoint.

Quantise applies **after** root, pitch offset and key transposition, and applies to Sequencer rather than Arp. Choose a Scale key from C through B. Scales are Chromatic, Major, Natural minor, Harmonic minor, Melodic minor, Dorian, Phrygian, Lydian, Mixolydian, Locrian, Major pentatonic, Minor pentatonic, Blues, Whole tone and Octatonic. The nearest allowed note is chosen, with a downward preference on an equal-distance tie.

## Randomise and Humanise

NOTE GENERATION opens the selected step's probability, condition and ratchet controls, plus scale, chain and Humanise settings. Confirm the displayed editing-step number before changing a probability; it is not a global probability for all steps.

RANDOMISE PATTERN is a one-shot edit of unlocked Pitch, Velocity, Gate, Ratchet and Probability fields within the editing pattern's active length. Lock the fields you want to retain and set Randomise amount before applying it. UNDO RANDOMISE restores the previous pattern from that operation. It is not a continuous random modulator. Save a separate preset when you need a durable alternate version.

Humanise velocity and Humanise timing display 0-100%. The maximum deviations are +/-8 MIDI velocity units and +/-20 ms. The amount itself is unipolar; the variation it scales is bipolar. Zero preserves the unhumanised timing path exactly.

The scheduler can place eligible notes early using look-ahead, but the first generated note cannot precede the triggering keypress. Nearby notes are constrained to preserve their order. Tied notes are not given a new independent velocity variation. These bounds mean the actual deviation near a boundary may be smaller than the maximum.

## Start, stop, loop and state changes

Host stop in Host mode releases queued playback and blocks the old phrase; host restart can re-enable it. A new note can also establish an eligible live phrase. Host position discontinuities, including a loop/seek, clear/re-anchor scheduled state. Changing mode or restoring patch state clears the old note-generation state so its held-note queue is not treated as the new patch's phrase.

## Three starting patterns

**Up-octave arp:** choose Arp, Up, two Octaves, Octave mode Up and Within octave. Use a moderate gate, hold a three-note chord and compare one versus two octaves. Expect a monophonic ordered run through the held notes and registers.

**Probabilistic acid line:** choose Sequencer, a short pattern, positive filter-envelope sweep and a short decay. Enter pitch offsets, set selected steps to 50% probability and use Previous did not fire on a following response step. The cursor should continue through rejected notes. Add Slide only where the prior note can actually fire.

**Two-pattern lane sequence:** set A and B to four steps, Chain length 2 and entries A, B. Give Lane 1 contrasting values in each pattern, then route Seq Lane 1 to Cutoff. The playing pattern changes at the boundary; editing B while A plays does not itself require an immediate switch.

Audition these starting patterns in your host and save useful variations.

## Sequencer page reference

The A-D buttons select patterns; the 1-16 through 49-64 buttons select the visible step block. Selected step, editing pattern and playing step are separate indicators. Use Release Notes to clear held-note memory.

MODULATION AND PERFORMANCE

# 29 / Layers and monophonic performance

## What belongs where

| Per layer                                                       | Shared or global                                 |
|-----------------------------------------------------------------|--------------------------------------------------|
| Three main oscillators, Sub, Noise, Logic and source processing | Incoming note line and Motion-generated notes    |
| Filters, amp, source envelopes and Layer EQ                     | Global trigger policy and performance setup      |
| LFOs, modulation envelopes and sixteen matrix routes            | Eight macros, XY and their cross-layer ownership |
| Source racks and whole-layer rack                               | Master rack and Master Output                    |
| Layer tuning, level and stereo placement                        | Host MIDI Learn and device/buffer setup          |
| B Master Start Delay belongs to B                               | Preset loads and comparisons contain both layers |

## Layer controls and their locations

Select the layer first. **Mixer scaling**, **Glide**, **Pan** and **Layer level** are on the Sound page: Glide sits beside the filter/mixer controls; Pan and Layer level are in the amp area, with Mixer scaling beside it. Layer tuning lives at the bottom of the scrollable Modulation matrix page, labeled **LEGACY LAYER OCTAVE**, **LEGACY LAYER TRANSPOSE** and **LEGACY LAYER FINE**. These tuning controls still affect pitch despite the LEGACY captions.

| Control       | Range / choices                | Default        |
|---------------|--------------------------------|----------------|
| Mixer scaling | Legacy / fixed; Active sources | Active sources |
| Glide         | 0 to 5 s                       | 0 ms           |
| Pan           | -100.0 % to 100.0 %            | 0.0 %          |
| Layer level   | 0.0 % to 100.0 %               | 100.0 %        |
| Octave        | -3 oct to 3 oct                | 0 oct          |
| Transpose     | -12 st to 12 st                | 0 st           |
| Fine tune     | -50.0 ct to 50.0 ct            | 0.0 ct         |

The table shows A's stable IDs; B has the corresponding b\_ IDs. Init leaves B quiet; check both its Power and Layer level before expecting a contribution. Mixer scaling chooses the source-summing rule described in

**Chapter 5.** Glide sets the layer's pitch-transition time and is the destination called Glide in the legacy matrix list; Motion Slide uses it to join eligible notes (**Chapter 28**). Pan positions the layer left/right; it is distinct from DIRECTION page's Direction and Width. Layer octave, transpose and fine tuning shift all pitched sources in that layer, before each oscillator's own tuning.

## Delayed B entry

**B Master start delay** is measured in milliseconds, from 0 to 8,000 ms; its default is zero. A new phrase starts the delay clock. While waiting, the pending target follows the current eligible note/velocity, but overlapping notes do not move the phrase deadline farther away.

When the deadline is reached and a pending note remains, B starts with a fresh delayed articulation. If the phrase ends before entry, there is no requirement to sound a stale delayed note afterward. This is why playing a short note with a long B delay can produce A alone.

The delay is separate from B's amp-envelope Delay. If both are nonzero, the apparent entry can be later still. Check B's Layer level and source levels as well before concluding that delayed entry is broken.

## Shared trigger policy

**Legato** is the new-patch default. Overlapping notes maintain envelope continuity; a separate fresh phrase starts an attack. **Retrigger** articulates another envelope on a new selected note. Both layers use this shared policy. Old per-layer trigger IDs remain stored for compatibility but are inactive.

Velocity transition (99%) ranges from 0 to 200 ms and defaults to 10 ms. It controls the Motion legato peak transition, not a percentage of velocity sensitivity. Its label's 99% describes the settling time. The normal filter and amp envelope controls still determine their own time courses.

## Init, copy and clear

Layer Clear resets the selected layer's parameters and associated source/layer effects and route selectors to defaults. Clearing B also resets its Master start delay. Copy A to B copies A's layer settings and routes; it does not make the global engine or Motion settings independently per-layer. Layer-action Undo is distinct from preset Undo Load and macro Undo.

When designing a delayed layer, first audition B with zero start delay and a clearly audible level. Then restore the intended delay and play a phrase long enough to reach it. This separates a silent B patch from a correctly delayed entrance.

## Explicit Layer B Power

B POWER is a saved and automatable hard shutdown. Off fades the contribution briefly, then suspends all B processing including its tails. On restores the enabled layer. A zero fader is a different operation: routing dependencies and tails can remain relevant. If B is unused, Power Off is the deliberate CPU-saving choice.

## One line, a complete sound

Mono follows one monophonic note line through both layers. Each layer still has three main oscillators, Sub, Noise and the applicable derived sources. A different tone on Oscillator 2 is another part of the same note, not a second independently held keyboard voice. Unison copies enrich that note without adding played-note capacity.

Build a solid one-layer sound first. Add the second layer for a complementary attack, body, octave, texture or delayed entrance. Enable B Power and set an audible B level deliberately. A layer that is silent because its Power is off will not become audible just by raising an oscillator fader.

## Overlapping and separated notes

Legato preserves envelope continuity for overlapping notes. Retrigger articulates a new selected note. When you need a clear percussive sample hit on every overlap, use Retrigger. For a connected bass/lead phrase, try Legato with appropriate Glide. A long amp Attack can make a quick phrase sound late even when MIDI is processed promptly.

A one-shot recording can reach its End while a legato phrase continues. A new pitch alone need not restart that ended playhead. [Chapter 11](#) explains the intentional fixed-pitch One Shots and their saved trigger policy. Key Tracking changes pitch response; it is not a retrigger switch.

## Sustain, release and the second layer

Pedals and note release affect the held phrase. Layer effects can continue after an envelope ends, while source effects may be closed by later amplitude shaping. B Master Start Delay is phrase timing, separate from B's amp Delay. Test B with delay zero first, then restore the intended wait.

For fast laptop playing, begin with Init, zero Glide, short Attack and a sensible host buffer. Logic Musical Typing has its own focus/input behavior. A read-only Analyzer view or recorded MIDI test cannot by itself certify physical key latency. Keep a reproducible example if overlapping finger changes remain hesitant.

## Save a performance variation

Use modest unison, only the needed layer and a live Play quality the machine can sustain. Save another sound with longer releases or higher-quality processing if it serves rendering. Do not erase the editable source when using Bake.

MODULATION AND PERFORMANCE

# 30 / MIDI, MPE and host automation

## Incoming notes and controller ownership

The host delivers notes and controllers to this instrument instance. Both layers belong to that one instrument; selecting Layer B does not put it on a separate MIDI channel. Mono follows one note line. A zero-velocity note-on is treated as note-off. Sustain, sostenuto and soft-pedal state can change the lifetime or expression of a note.

Velocity, release velocity, mod wheel, pressure, pitch bend, Expression CC11, Breath CC2, Foot CC4, Slide CC74, Soft Pedal and Sustain Pedal are available where the current matrix source menu shows them. A controller source only moves an assigned destination, apart from its documented built-in performance response. Program changes do not replace the preset browser, and MIDI clock messages are not a substitute for Motion's host playhead.

## Velocity and expression level

Amp Velocity sets the direct note-on velocity-to-level response. At zero, quiet and hard notes no longer differ from that direct mapping, although a matrix Velocity route or velocity-sensitive filter can still make them different. Expression to Level separately sets CC11's level influence. This distinction is useful when a hardware expression pedal should shape a sustained sound without changing its attack.

Pressure Rise/Fall smooth the pressure source independently. Long times deliberately lag a change; shorten them when you need rapid expression. Note Expression Snap chooses the compatible slew behavior or a fresh-note snap. The effective response also depends on legato/retrigger and the note's expression ownership.

| Control              | Range / choices                 | Default            |
|----------------------|---------------------------------|--------------------|
| Amp Velocity         | 0.0 % to 100.0 %                | 100.0 %            |
| Expression to Level  | 0.0 % to 100.0 %                | 0.0 %              |
| Pressure Rise        | 0.0 ms to 2000.0 ms             | 10.0 ms            |
| Pressure Fall        | 0.0 ms to 2000.0 ms             | 10.0 ms            |
| Note Expression Snap | Legacy slew; Snap on fresh note | Snap on fresh note |

Layer A controls; Layer B has its own independent settings.

## Pitch bend and glide

Bend Up and Bend Down are independently saved patch ranges from 0 to 48 semitones, with two-semitone defaults. These ordinary patch ranges are separate from MPE member/master ranges. A matrix Pitch Bend route can add another musical movement; do not assume changing the wheel only affects the direct bend path.

Glide moves between note pitches. Exponential approaches the target, Constant Time uses the selected transition time, and Constant Rate relates timing to interval size. Trigger can be Always or Legato Only. The Glide Ceiling bounds the long transition. Each layer keeps its own glide settings; zero glide is the useful baseline when checking fast note onset.

| Control       | Range / choices                           | Default       |
|---------------|-------------------------------------------|---------------|
| Glide         | 0 to 5 s                                  | 0 ms          |
| Glide Law     | Exponential; Constant Time; Constant Rate | Constant Time |
| Glide Trigger | Always; Legato only                       | Always        |
| Glide ceiling | 1000.0 ms to 5000.0 ms                    | 1000.0 ms     |

Layer A controls; Layer B has its own independent settings.

## MIDI Learn: assign a hardware control

MIDI Learn connects an absolute MIDI controller value to a parameter. It is available through the supported parameter's context menu, including the eight macro values. The learned identity includes both the controller number and the MIDI channel. **Notes are not channel-filtered, but a learned CC is: notes on channel 1 and knobs on channel 2 can control the same instance, provided each knob was learned on channel 2.**

1. Right-click the destination control and choose **MIDI learn: move a controller**.
2. Move the hardware knob, fader, or pedal you want to use. Send a Control Change message numbered **0 through 119**.
3. The first eligible controller message establishes the binding and supplies its first value. Continue moving the controller to verify that the destination follows it.
4. To check or remove the assignment, right-click the destination again. Its menu offers **Forget MIDI CC N / channel C**, with the learned number and channel in place of N and C.

To abandon an armed assignment before moving a controller, choose **Cancel MIDI learn** from a parameter context menu. Learning another destination replaces the pending learning target. An incoming CC numbered 120 or above does not complete learning.

The mapping is absolute: the MIDI value 0-127 maps to the parameter's normalized 0-1 position. A skewed frequency control therefore follows its parameter taper rather than a straight line in hertz. Choices follow the parameter's discrete conversion. Relative-encoder increments and pickup/soft-takeover behavior are not implemented by this bridge. A controller movement may jump directly to its current value.

MIDI Learn changes are applied about every 10 ms on the interface thread. They are not sample-accurate; the host's own recorded parameter automation uses its separate mechanism.

### A concrete assignment

On Layer A, learn controller **74 on channel 2** to the cutoff control. A controller value of **96** puts the parameter at normalized position **96/127**; it does not mean 96 Hz. Sending controller 74 on channel 1 does not update that learned assignment. Sending it on channel 2 does.

A CC can be learned by several destinations. Each matching destination receives it. Learning the same controller elsewhere keeps the earlier assignments active.

Built-in messages still retain their built-in meaning. Learning CC 1 to another parameter does not remove its modulation-wheel function, and learning CC 64 does not disable sustain. Use a controller number without a conflicting built-in role when you want a dedicated knob.

## Where assignments are saved

MIDI Learn mappings are **per plugin instance**. They are saved in the instance's host state, so a host project that saves that state can restore the mappings with that instance. They are not a global preference shared by every Mosasaur instance.

The ordinary Mosasaur browser patch does **not** contain the MIDI Learn mapping. Saving or exporting a sound through the preset library captures the sound state without those instance bindings. Loading such a patch keeps the receiving instance's existing MIDI Learn assignments.

This distinction matters when sharing a preset. If you load the same browser patch into a fresh instance, your controller assignments do not come with it. If you load it into an already mapped instance, those local assignments remain in place. Loading complete host state that contains a MIDI Learn map restores that map instead.

To remove an unwanted assignment, use the destination's **Forget MIDI CC N / channel C** command. Loading Init is not a substitute for clearing your hardware mappings.

## MPE: configure the controller and the instance together

Open the MPE configuration panel when using an MPE controller. Enable it, choose the lower and/or upper zone membership and match member/master bend ranges to the controller. Lower master is channel 1; upper master is channel 16. Zero members disables a zone. The two zones are constrained so that member channels do not conflict. Changing zone topology ends held notes rather than silently reassigning their expression.

Member channels carry per-note pitch, pressure and Slide; the zone master supplies global contributions and pedals. Member and master bends have symmetric independent ranges, up to 96 semitones. Controller RPN messages can update zone membership and bend ranges. A controller that sends 48-semitone member bend while the instrument expects two semitones will not track fingers correctly until they agree.

MPE configuration belongs to the host instance/project and is retained when browsing ordinary sound presets. It is not a different preset for every external controller. In Mono, the current monophonic note still limits what simultaneous expression can mean. Both layers follow the same note ownership.

For a first test, disable unrelated pitch modulation, use a clear sustained source and match the advertised zone/ranges. Play one note and bend it, then add another where the edition's voice mode permits. Inspect controller routing before changing synth tuning to compensate for an MPE setup mismatch.

## Stable host parameters

The current sound-parameter tree retains 19,755 entries, including inactive compatibility controls. It is not a count of simultaneously visible knobs. A host wrapper can add bypass/MIDI helpers. Layer IDs distinguish A and B: automating `a_cutoff` always addresses A, regardless of the editor's layer selection.

AUTOMATION opens the searchable live reference. Search by name/group/ID, select the result, inspect its range/default/taper and copy its host name. Current Setup filters configuration relevance; All Parameters includes retired/inactive settings. Browsing does not create a Logic automation lane or select the host's Touch/Latch mode.

Use the host to record automation of a control or macro. Direct matrix destinations, macro ownership and the selected feature still determine the audible result. A moving cutoff at its effective ceiling can produce no further audible increase. A disabled effect can keep an automated value for later activation without processing it now.

## Musical parameters and structured data

Macro values and XY positions are exposed parameters. Their route definitions, labels and endpoint data are saved structures. Custom-wave drawings, wavetable frames/keyframes, Voice text, Motion grid/lane data and sample payloads are also structured sound data. They are not thousands of independent point-automation lanes. Use exposed Morph/Position, rate, amount, mix, macro and XY controls for musical automation.

Combined source/destination menus can update several compatibility selectors together. Automating only one hidden extension selector is not always equivalent to selecting the complete visible menu choice. Use a straightforward current UI assignment, then inspect its stable identities in Automation if a host workflow needs them.

## Range changes in older projects

Stable IDs preserve identity, but expanded normalized ranges can change the audible meaning of old automation. Nasty, Saturation, WRECK/NUKE, Character, PM ranges and later range extensions need a deliberate check when moving an old project forward. Native saved preset values and macro endpoints are different from a host's normalized automation lane. Save a project copy before updating and audition the automated extremes.

Envelope speed buttons expose effective times while retaining base-time compatibility values and separate multipliers. Do not multiply a displayed actual time again. EQ-handle edits address the existing band parameters, with gestures for the host; analysis-display choices such as averaging and color scale remain interface preferences.

## Controller troubleshooting

Confirm the correct instance receives MIDI, inspect the learned CC number/channel, and distinguish absolute CC values from relative-encoder protocols. A learned CC does not cancel its built-in role: learning CC1 elsewhere still leaves it as Mod Wheel, and learning CC64 does not disable sustain. Use a dedicated number when you want an independent hardware control.

If a knob moves but the sound does not, check feature Enable, source/layer audibility, macro/XY ownership, parameter limits and downstream processing. If playing feels delayed, compare host buffer/device, amp Attack/Delay, Glide, sample leading silence and control smoothing.

## MODULATION AND PERFORMANCE

# 31 / Microtuning

## Scale, mapping and reference pitch

TUNING is shared by both layers. A scale defines intervals; a keyboard mapping assigns MIDI keys to those degrees; a reference key/frequency anchors absolute pitch. These are different decisions. Start with Standard and a simple sustained oscillator before adding glide, oscillator detune or pitch modulation.

Choose a supplied scale to audition it. Enable scale/mapping to use its intervals. The preview lists each MIDI key's calculated Hz and cents from standard tuning. It is the internal patch tuning preview; an active external MTS master can supply the sounding pitch instead.

## Enter intervals

The interval editor takes one interval per line, excluding degree zero. A decimal such as 100.0 means cents. A ratio such as 3/2 means a frequency ratio. The final interval is the repeat period, commonly 1200.0 cents or 2/1 but not necessarily an octave. Up to 256 intervals are supported. APPLY EDITS validates the proposed scale before committing it.

A bare integer follows the format's ratio convention, so write a decimal point when you mean cents. Check the preview for an unexpectedly large/small interval before playing. A custom scale's name does not guarantee a familiar Western key layout.

## Reference and Root

Reference MIDI Key and Reference Hz establish the anchor. Root moves the scale's starting degree to the chosen key region without being the same as retuning the reference. Changing Root clears an imported keyboard mapping after its explicit confirmation, because the two mapping schemes conflict. Use Undo if you need to restore it.

Reference also with Scale Off controls whether the chosen reference still retunes twelve-tone playback when the scale is disabled. Disable it for the older tuning-Off A440 behavior. Turning Scale Off preserves the custom interval data for later use; STANDARD explicitly restores the ordinary setup.

## Scala files and the tuning library

IMPORT .SCL loads a Scala scale; IMPORT .KBM loads keyboard mapping. Files are limited to 64 KiB and are validated. A mapping can leave keys unmapped or limit a playable range; those keys can correctly be silent. RESET MAPPING restores a linear keyboard-to-degree layout without deleting the scale.

The tuning-library chooser can load a scale and matching keyboard map together. RESCAN updates its file list; USER FOLDER opens the personal library location. Keep related scale/map files together for reuse. Saving the full preset embeds its internal scale and mapping, so a recipient does not need the original files merely to recall that saved tuning.

## Motion and tuned effects

The Motion uses tuning periods option makes octave/period movements follow the scale's actual period and mapping degrees. A non-octave period should not be treated as twelve equal keys. Incompatible twelve-key sequencer quantization is temporarily disabled while its stored choice is retained. Test a short generated pattern and inspect unmapped destinations if notes disappear.

Tuned MosaTap tracking is retained in the shared tuning panel for compatibility with the Poly edition; it does not add another Mono tuning stage. Ordinary source tuning, expressive bend and glide can still move pitch after the tuning table.

## Follow MTS-ESP

Follow MTS-ESP is an instance/project choice. When a connected external master supplies tuning, it overrides the internal scale/reference. The status identifies connection/fallback behavior. If the master disconnects, the patch's internal tuning becomes the fallback. The Follow choice is excluded from ordinary portable sound presets, so a factory sound does not silently take over the user's global tuning connection.

Internal tuning can be edited and saved while an external master is active, but the saved change may not be what you hear until fallback. Updates are polled and held pitches settle smoothly; this is not sample-accurate external tuning automation. Keep the controller/master and instrument configured for the same intended tuning system.

## A tuning exercise

1. Use Init with one sustained oscillator and no pitch modulation.
2. Choose a supplied nonstandard scale and inspect several nearby keys in the preview.
3. Play those keys slowly. Separate a changed scale step from Fine Tune or detune.
4. Set a different reference Hz, Apply, and compare the anchor pitch.
5. Try a keyboard map; check its valid range and intentionally unmapped keys.
6. Save a new preset and reload it. If MTS is connected, verify which tuning source is sounding before judging recall.

## WORKFLOW

## 32 / Presets and backups

### Preset scope

The library keeps complete sounds with stable identities, metadata and playing notes. Factory and personal User sounds can coexist; a same-ID personal override retains your edits. Current edition counts and banks are listed in [Appendix A](#). Category totals can overlap, so they should not be added as a count of unique sounds.

### Browse and find a sound

Open **PRESETS** to show the preset library. Search matches names, techniques/categories and notes. Category paths form a hierarchy; selecting a parent includes its descendants. A minimum-star filter combines with the category/search filters. Sort is Name A-Z or Highest rated. Clear Filters removes those restrictions when an imported or saved preset appears to be missing.

Select a preset to read its purpose and playing notes, then Load. A row selection is not the same as a load. Ratings run from zero through five stars; clicking a lit star again can clear a rating. Refresh reloads the library so another instance's completed changes can be seen.

The original collection includes the three 15-preset banks Living Current, Haunted Depths and Echo Atlas. Categories can list the same sound in several places without creating duplicates.

### Opening and refreshing the library

The catalog begins loading when you press PRESETS. A loading message can appear while it prepares. Closing and reopening the browser in the same editor reuses its loaded catalog unless it has changed. Refresh reads completed changes from another instance; clear filters if an expected sound is missing. Select a row and press Load to apply the sound.

### Save, update and rename

**Save Sound As** captures the current sound under a new identity. Enter a name and optional notes/categories; semicolons separate multiple categories and / creates a nested path. Names can contain up to 120 characters. Save confirms the library operation; closing the browser alone does not save an edited sound.

**Update Sound** replaces the selected saved sound with the current one after confirmation. **Edit Details** changes metadata such as the name, categories and notes without recapturing the sound. **Delete** removes the selected library entry after confirmation while leaving the current sounding state available. Init cannot be overwritten or deleted; use Save Sound As for a variation.

**Undo Load** restores the instance state from before the last browser load while that undo snapshot is available. It is not an undo for every library edit, deletion or overwrite. Category deletion keeps presets but removes those category assignments; category rename/move updates descendant assignments.

## Files and backups

User data lives at `~/Library/Application Support/Mosasaur Audio/Mosasaur Mono/User/`. The library stores metadata in `Library.xml` and each saved sound in `States`. Back up the entire `User` folder, including `Library.xml`, `States` and `Backups`. Copying only the metadata file to another computer is insufficient.

## Importing and sharing sounds

Export writes the **selected saved sound** as a self-contained `.mosapreset` file. Save or Update Sound before exporting current edits. Importing one `.mosapreset` makes a new library identity, so importing it again creates another copy.

The Import button also accepts a whole bank `.xml`. Mosasaur validates the entire bank before committing it. Entries with existing bank IDs keep your current sound and edits; missing IDs are added. Repeating the same bank import fills missing entries without overwriting edited copies or making duplicate bank entries. A failed bank import does not leave a partly added bank.

Living Current, Haunted Depths and Echo Atlas are available under Mono > Showcase Banks. Clear text, tag and rating filters if a bank appears empty, then refresh or reopen the preset browser. Earlier separate deliveries can still be imported as whole XML banks; repeated bank import preserves existing edited entries and fills missing ones.

Exported sounds do not back up instance MIDI Learn mappings or DAW routing. Keep the original file when reporting an import failure. [Appendix B](#) explains compatibility with older software.

Supported older patches retain their PM feedback timing and Sync correction choices. A fresh Init uses Fixed / 22.68 us, Band-limited sync and ZDF ladder. Loading Init does not clear MIDI Learn assignments.

## Instrument families and categories

There are 160 new sounds in eight groups of 20, including the 40 strings/brass sounds. The later six groups are organs, electric keys, tuned percussion, synth percussion, woodwinds and everyday basses/leads. Each new preset has four named macros; begin at zero and explore each before combining them. These are synthesized interpretations for Mosasaur's monophonic engine, not sampled instruments. These banks use the monophonic engine. [Appendix A](#) lists every new sound.

Aftershock 40, Cataclysm 40 and Exploration 40 remain useful collection views. Their 120 sounds are also cross-listed under sound categories such as Bass, Lead, Pad, Keys, FX, Arpeggiator, Sequencer and Motion where appropriate. Multiple categories point to the same preset; they are not duplicate sounds. Keeping the collection folders is recommended.

Find the new sounds under Strings, Brass, Organ, Keys > Electric, Tuned Percussion, Synth Percussion, Woodwind, Bass > Everyday and Lead > Everyday. Additional tags describe tone or movement.

## Growing your library

There is no fixed normal preset-count ceiling. A 38 MB metadata-catalog safeguard and an 8 MB individual-preset safeguard remain; current ordinary presets are about 1 MB or less. Growth still depends on free disk space. Historical state versions are retained rather than automatically deleted.

If an import reports a size, validation or disk error, retain the original bank and read the message. Do not delete sounds merely because the browser screenshot shows a particular count. Exported copies are useful for sharing; a whole User-folder backup preserves the full library and its metadata.

## Factory collection

The musical factory collection contains 1,078 sounds, plus Init. [Appendix A](#) lists the collections by the category names used in the browser. Category views can overlap without duplicating the underlying sound.

## Rupture factory bank

Rupture contributes twenty sounds to the current factory collection. Init is a separate built-in starting entry. Open PRESETS, press Refresh if necessary, then select **Mono > Showcase Banks > Splice & NUKE - Rupture**. Clear search/category filters if expected entries are hidden.

Rupture combines Splice, NUKE, PM/sync/ring routing, free-running Motion, modulation, effects and eight named macros. Hold a note to start its sequences or arpeggios; no running DAW transport is required. [Appendix A](#) lists all 20 sounds and their performance controls.

The factory versions use the same stable IDs as the originally delivered personal bank. Existing User copies overlay them without a second visible entry and retain personal edits. Updating the factory package does not overwrite your User sound.

## Nuclear Textures and Custom-wave sounds

Nuclear Textures contains 30 factory presets, three per source NUKE algorithm. It is retained in the instrument factory collection. Find it under Mono > Showcase Banks > Warm & Nasty WRECK - Nuclear Textures. Existing installed copies and personal edits remain.

Custom drawings are embedded in saved sounds and project state. Export the saved preset to share a drawing with its settings. Save changes before exporting. Back up Library.xml and its States folder together; the metadata catalog alone does not contain all sound states.

## Current edition library

The musical factory collection contains 1,078 sounds, plus Init. It filters and rejects Poly-mode sounds rather than converting them silently.

[Appendix A](#) lists the current installed banks. Showcase banks demonstrate newer features; they do not require a separate general sample library. The first browser opening can prepare the catalog in the background; reopening reuses it. Refresh once after a bank update, then reload a chosen sound. Opening an old project keeps its saved state rather than automatically updating its current sound from Factory.

## WORKFLOW

## 33 / History, comparison and workflow

### Sound history

UNDO, REDO and HISTORY let you revisit sound edits, including supported parameter gestures and structured edits such as wave/table/sample changes, layer actions and Bake. The history label identifies the action. Undoing an edit is different from recalling a saved preset or restoring a whole host project. Host automation has its own recording and undo workflow.

Treat a drag as one musical edit. Save important versions as presets rather than depending indefinitely on an in-memory history. The newest valid large sample replacement retains an immediate Undo even when its audio exceeds the normal history retention target; this is not unlimited storage of every large import forever.

### Compare two states

In WORKFLOW, STORE 1 or STORE 2 captures the entire patch, including both layers. RECALL restores that stored snapshot; later edits do not overwrite it automatically. Recall is undoable. Label and save useful sounds through the preset browser when you want permanent library entries.

A good comparison changes one idea: one filter model, one routing network, or one effect chain. Match listening level and play the same phrase. A comparison snapshot includes more than the currently visible page, so do not assume it only stores the selected layer.

### Preset section locks

Locks retain selected parts while browsing another preset, including Init. Layer locks include their effects and custom wave/LFO/voice data. Sound locks also retain the necessary Macro/XY ownership and values, avoiding an inconsistent half-recalled controller arrangement. The panel identifies dependent lock states that cannot be independently cleared while another lock requires them.

Use a lock when borrowing an effect chain, retaining a performance setup or auditioning a new layer against an existing one. Afterwards inspect the combination and save it under a new name. A locked Init load is not a complete clean reset. Clear remains an explicit reset action; comparison and host-project recalls restore their stored sound rather than behaving like ordinary locked browser selection.

Locks and comparison snapshots belong to the host project. Portable presets contain the sound rather than the project's browsing workflow. A recipient should not inherit invisible lock choices merely by importing a sound.

### Capture a performance take

WORKFLOW RECORD captures the master output and played/generated notes into a take. Choose a maximum duration of 15, 30 or 60 seconds, record, then STOP. The completed audio is prepared as stereo 32-bit float WAV; MIDI is prepared separately. Takes remain in memory until saved. Do not close the instance expecting an unsaved take to become a library entry automatically.

SAVE WAV and SAVE TAKE MIDI write explicit files. DRAG WAV and DRAG TAKE MIDI let a compatible host accept them. If a drag cannot start, use Save and import the resulting file through the host. MIDI contains note/controller performance data as implemented by the capture; it is not a rendered copy of every timbral process.

The workflow recorder is different from Sample Live Capture. It makes an exportable performance; Sample Live Capture additionally prepares an oscillator recording at its selected source tap. Choose the tool according to whether you want an arrangement file or reusable sample source.

## Export Motion MIDI

SAVE MOTION MIDI or DRAG MOTION MIDI generates a MIDI file from the current Motion setup using the panel's root note, tempo and bar count. These inputs make the generated test performance concrete; they do not capture arbitrary previous live keyboard gestures. After importing, compare the notes and timing in the host and assign the desired instrument/patch.

Audio export prints filters, distortion and effects. MIDI export preserves a note sequence that can be rearranged or used to drive another instrument. Keep both when the final sound and future editability matter.

## A reliable design session

Store the starting sound, save a personal preset, and make an experiment. Use history for local edits and comparison for broader alternatives. Clear inspection solos/mutes before saving a finished sound. Export a performance when the result is useful, then save the host project. Before Bake or a major table conversion, keep an editable original with a meaningful name.

If a recall seems incomplete, check active locks, the product edition, ownership, macro/XY positions and whether you loaded a portable sound or complete host state. The visible preset name alone does not prove that an old project has reloaded a newly edited factory bank.

## Save the right thing

Save a preset for the complete reusable sound, an envelope shape for a reusable contour, a table for a reusable wavetable, or a library sample for reusable recorded audio. Save the host project for the arrangement, automation and complete instrument instance. Export a portable preset when moving a sound with embedded audio/custom data to another machine. [Chapter 33](#) explains which additional workflow choices belong to projects rather than ordinary sound presets.

WORKFLOW

# 34 / Resample, live capture and Bake

## Why resample Mosasaur

Resampling turns a synthesized result into new oscillator material. You can print a complex transient, preserve a vocal gesture, make a resonant body reusable, or feed a processed texture back through another round of synthesis. A single captured note can also reduce repeated source work, at the cost of freezing behavior into the recording.

Open RENDER / RESAMPLE from a Sample editor. Choose Source Tap and Target Oscillator before starting. Offline Render makes a held-note capture from a separate snapshot engine. Live Capture records the instance you play. Bake additionally neutralizes the layer processing it printed so that the result is not processed twice.

## Source taps

| Tap                    | What is recorded                                                                     | Useful purpose                                              |
|------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Master output          | Both layers and the master chain, after the output path                              | Print the complete sound as new material.                   |
| Layer A/B post-effects | The chosen layer including its layer rack and Layer EQ                               | Capture one finished layer without the other/master.        |
| Layer A/B pre-effects  | Oscillators, filters, envelopes, level and placement, before the layer rack/Layer EQ | Keep the current layer rack available for later processing. |

Pre-effects does not mean an untouched oscillator. Master capture is not eligible for own-layer Bake because it contains a combined result. If you replay a master capture through the same active master chain, that chain processes it again. Lower levels and compare deliberately.

## Set up an offline render

1. Save the editable source preset.
2. Select Source Tap and the destination layer/oscillator.
3. Set MIDI Note, Velocity and Hold. Note is 0-127, Velocity 1-127 and Hold 0.1-30 seconds.
4. Choose automatic release tail or Fixed Seconds. Auto waits for the defined quiet interval, with a ten-second cap. Fixed allows up to ten seconds.
5. Decide whether to Normalize and Find Sustain Loop. Leave Bake off for the first ordinary resample.
6. Name the take and RENDER OFFLINE. Watch progress and status.

The separate render engine uses a sound snapshot, Motion off and fresh controllers. It does not reproduce an arbitrary live arpeggio, a previously running LFO phase or the host's entire transport performance. Use Live Capture for your exact played gestures. You can keep playing the live patch while offline work prepares, but changing the target sound can prevent a stale take from applying automatically.

## What happens when the render finishes

The take is trimmed/prepared and a sustain-loop search runs when requested. A successful current take applies to its target and reports that one Undo restores the previous sound. A suitable loop is a proposal; inspect and listen to it. If none is found, Loop remains Off. The tool does not invent a guaranteed seamless loop for a changing or percussive source.

The completed take can be saved to the library or exported. If application is rejected because the target changed or a state budget is exceeded, the retained take can still be useful. Read the status, save/export it, then start a new job for the current sound rather than assuming the old target is unchanged.

## Live capture

ARM LIVE CAPTURE prepares bounded recording storage. When armed, the first played note starts the take. Play the phrase and move the controls you want printed; STOP TAKE ends it. The capture is limited to 60 seconds. Processing then prepares the recording and attempts application using the current-target safeguards.

A live capture includes what reaches the selected tap during the performance. It is the right choice for Motion, expressive controller changes, evolving feedback and timing that the one-note offline snapshot intentionally does not reproduce. A change of host sample rate invalidates the prepared recording context; arm again if prompted.

STOP ends a recording; CANCEL abandons the current job. Closing the render panel cancels its active work. If a take matters, use SAVE TO LIBRARY or EXPORT TAKE WAV before leaving it behind. Saving a project is not a substitute for explicitly saving every transient uncommitted take.

## Normalize and loop proposals

Normalize aims at -1 dBFS for ordinary captures. It is level preparation, not a final limiter or equal-LUFS guarantee. Raising a capture's level can drive later nonlinear stages harder. Find Sustain Loop looks for suitable repeated material; a slowly moving texture can remain noticeably cyclic after any finite loop.

For a pluck, leave looping off and retain enough release. For a drone, render a stable middle period, inspect the suggested loop and try a crossfade. For rhythmic or spoken material, decide whether you want its timing transposed with pitch before turning it into a keyboard instrument.

## Bake Own Layer

Bake is enabled only for a layer tap with a target in that same layer. It prints that layer, changes the target to the captured sample, shuts down the other sources and neutralizes the layer processing already included by the chosen tap. The master chain remains. Normalize is disabled for Bake so it does not silently change the printed level.

The aim is to avoid hearing the printed filter/rack/EQ twice. Bake is not a perfect replacement for every moving patch. Sample transposition changes durations, modulation is frozen into the recording, and new controller gestures can behave differently. Compare the actual note range and playing style. Undo or recall the source preset when you need the editable network again.

### A CPU-saving Bake comparison

Save an expensive layer as Original. Render its own appropriate tap at a useful root note with enough hold/tail. Bake it, then play the same phrase while observing DSP load. Listen to attack, release, pitch range, loops, stereo and effects. Save Baked as a new preset. Keep Original even when the result is useful; you may want a different root or another printed articulation later.

## Export and reuse

SAVE TO LIBRARY stores the processed capture under My Sounds/Resamples. EXPORT TAKE WAV writes a native-rate 24-bit WAV of the take. Use it in another oscillator, another preset or another application. The Sample editor's ordinary region export has different scope: it exports selected source audio and Normalize, without printing pitch, loop, Reverse or the synth chain.

## Common capture problems

A silent take may be the wrong tap, disabled layer, closed envelope or inaudible source. A late reversed impact can contain leading silence in the reversed region. A clipped texture can have been distorted before the capture, so turning down the captured sample cannot reconstruct clean peaks. A job that reports busy needs to finish or cancel before another request. A take that will not apply can still be exported; preserve it before making unrelated target changes.

## WORKFLOW

## 35 / Your sample library

### The library is yours

The managed Samples library is a reusable collection of recordings, organized by names, collections and favorites. Import individual files, several files or folders, and save your own Mosasaur captures. It is separate from the preset browser: a preset is a complete synth sound, while a library sample is audio with playback/root/loop metadata.

Open LIBRARY from the Sample editor. Search narrows entries; Collections and Favorites filter the result. Clear all filters before concluding that a sample vanished. The browser displays total count and pages, showing up to 256 entries per page. Previous/Next changes pages; it does not replace the oscillator automatically.

### Import files and folders

Choose a collection name first if you want an organized destination. Import Files can select several WAV/AIFF recordings. Import Folder walks supported recordings in that folder and its subfolders, keeping useful folder hierarchy as collection paths. Unsupported files are skipped. Progress/status reports imported, skipped and shortened items; retain any first error if an import is incomplete.

Imports create managed copies and leave original files unchanged. A recording longer than 60 seconds is shortened to its first 60 seconds for this feature; preserve the source elsewhere if you need the whole take. Trim a long source externally first when the interesting passage is later in the file.

### Audition before applying

Select an entry and Preview. The audition runs through the current target oscillator's filters/effects, so it is not necessarily raw audio at a fixed loudness. Stop Preview before comparing another context. USE SAMPLE or double-click applies the recording to the selected oscillator and returns to its editor. Simply selecting a row does not commit a new patch source.

Auditioning and applying are separate actions. If you edit/load another target while a recording prepares, select it again when prompted. That check protects your newer sound from a late background result. Save the preset after application when you want the chosen recording embedded in the sound.

### Save an edited recording

After tuning and looping a sample, enter a useful name and collection and SAVE TO LIBRARY. The entry is an independent library copy with its root and loop settings. It is useful for returning to a consistent source without rebuilding the rest of the synth patch.

Captured takes can be saved directly into My Sounds/Resamples. Add names that describe source and use, such as Glass drone C4 or Metallic strike fixed pitch. Save a full preset as well when its routing and effects are an essential part of the sound.

## Rename, move and favorite

Favorite marks an entry for the Favorites filter. Rename/Move changes its displayed name and collection. This library organization does not rewrite the embedded copies in previously saved presets; those sounds retain their audio. A collection path is organizational metadata, not a MIDI key zone or velocity layer.

Avoid managing a large library by editing metadata files manually. Use the browser operations and verify a test entry after organizing. The release does not impose a fixed total-library disk quota, but available storage, import preparation and sensible organization still matter.

## Understand the size limits

Each imported or recorded source is limited to 60 seconds. A preset's distinct compressed embedded audio budget is 32 MiB. A distinct-original-PCM guard of 256 MiB also protects state preparation. Sharing the same recording across oscillator slots can reuse its asset; six slots do not automatically require six independent embedded copies.

Compressed size depends on the material, channels and rate. A quiet mono tone and dense stereo noise of the same duration can have very different compressed sizes. Do not assume that every 60-second recording fits alongside five other 60-second recordings in one preset. The status explains a rejected assignment rather than silently truncating an already prepared patch state.

Prepared playback data uses RAM in addition to stored originals. Higher rates, stereo material, HQ preparation and several distinct assets can raise memory use. The library on disk and the currently loaded patch in RAM have different costs; only the sounds needed for the current patch are prepared for playback.

## Portability and backup

Back up the entire Samples directory under the edition's application-support area, including metadata and payloads, rather than just a catalog file. Keep host projects, portable preset exports and source WAVs separately where useful. Mono and Poly have separate managed sample libraries; use exports/imports to share personal sources deliberately.

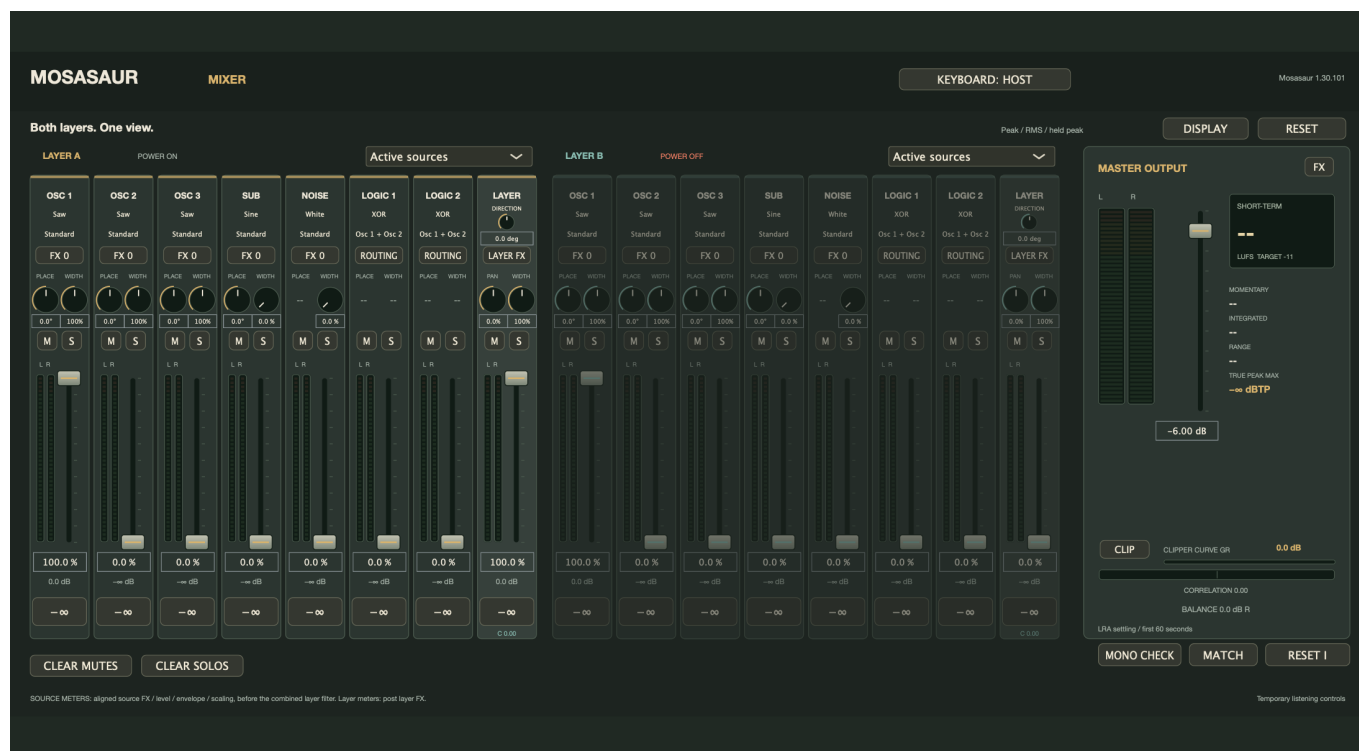
A saved portable preset embeds the recording needed by that sound. Renaming a library entry or removing its original external source later does not change the audio already embedded in that saved preset. Conversely, copying only the library's names/metadata without its payload files is not a complete library backup.

## A practical library workflow

Import a small folder, verify count/status, audition several entries and assign one. Set root and a useful loop, save a named library copy, then save a complete preset. Reopen both in a new session before scaling up to hundreds of files. When resampling, keep editable source presets beside the rendered recordings so you can regenerate them at another note or quality later.

## WORKFLOW

# 36 / Mixer and Master Output



The Mixer displays source, layer and master levels together.

## A view of both layers

MIXER in the Master Output module opens a resizable native window. Both layers appear together, so you can balance sources without changing the main editing layer. The title can include the host track name. Dark/Light follows the editor's appearance. Window size, position, open intent and display settings are interface preferences rather than a different synth patch.

In a plugin, KEYBOARD: HOST preserves host performance typing; EDIT permits text entry. Return to Host to use Logic Musical Typing while adjusting the mouse controls. The standalone starts in Edit. Closing/reopening and display behavior follow the instrument's window preferences; explicitly closing Mixer clears its open preference. Replacing a plugin build still requires closing the host itself.

## Read a channel strip

Each layer provides Osc 1, Osc 2, Osc 3, Sub, Noise, Logic 1, Logic 2 and a whole-Layer strip. Read-only source/character/damage labels identify the current source. FX opens the corresponding source/layer rack; Logic ROUTING opens its controls. B dims when its saved Power is off.

The fader, placement, Width, layer Pan, Mixer Scaling and Master Output are additional views of the existing saved/automatable controls. Moving one view changes the same parameter everywhere. Shift-drag is fine control; double-click permits exact entry; right-click opens supported assignments. A dash means no corresponding control on that source. A displayed Width percentage can represent a different native unit in a macro endpoint; use its descriptor when assigning.

## Understand the meter locations

Source meters observe aligned source audio after its source effects, level, envelope and mixer scaling, before the combined layer filter. The layer meter observes its complete output, including layer processing, level and placement. Master observes the final host output. A source can show high energy while a later low-pass removes much of it; the two meters are not contradictory.

An internal source may be active as a modulator at zero direct level. Its audible source meter can be empty while another source changes from its influence. Observations do not force unused generators to run. Use the Analyzer's appropriate raw/pre-distortion tap when diagnosing the signal network, remembering that unavailable/dormant paths can correctly report no samples.

## Temporary Mute and Solo

Mixer Mute and Solo are per-instance listening controls. They are excluded from presets and DAW session state, are not automatable or MIDI-learned, and clear on preset load. Short fades reduce abrupt clicks. They do not replace saved source Power or B Power.

Solo works across both layers. Soloing A Osc 2 excludes other direct sources, including B; multiple solos can be combined. Soloing a complete layer admits that layer's sources. Alt-click Solo makes an exclusive selection. Mute wins over Solo. CLEAR MUTES and CLEAR SOLOS operate independently, so check both when a source seems absent.

Listening gates preserve modulation feeds, clocks and dependencies. Shared effects may carry previous tails. Solo is therefore a useful way to hear a branch, while processing needed by other paths can remain active. Power is the deliberate shutdown tool.

## Mono Check

MONO CHECK sends  $(L+R)/2$  to both final channels. This tests stereo compatibility and has no connection to the instrument's Mono playing architecture. A wide unison or sample can become quieter under the check because of cancellation. Compare at a consistent monitoring level and decide whether the stereo effect is appropriate for your mix.

A lit MUTE, SOLO or MONO CHECK badge in the main header warns that temporary listening is active. Click it to open Mixer and inspect the cause before recording or bouncing. These listening tools change what reaches the output while active even though they are not stored as a musical preset setting.

## Meter styles and scales

Choose the displayed meter style and scale for the job. Wider dynamic scales show quiet tails; narrower scales make useful operating differences easier to see. Peak markers reveal transient events that averaged energy can obscure. Hold and release preferences affect the display's persistence, not the decay of the synthesizer.

Peak hold options include timed holds and an indefinite hold until reset. Meter reset clears displayed history; it does not lower gain, mute a note or remove an effect. A dark meter can mean silence, an unavailable observation, a disabled source or a new warm-up interval. Check its position before treating it as a failed audio path.

## Sample peak, true peak and clip

Sample peak is the largest stored digital sample in the measured interval. True peak estimates the reconstructed waveform between samples and is displayed in dBTP. It can be higher than sample peak. TRUE PEAK MAX retains the highest estimate since reset. CLIP indicates the measured clipping condition; clearing it is an acknowledgment, not audio repair.

If a peak is too high, reduce the signal before the stage that overloads. Lowering Master Output can protect the host output while leaving earlier distortion intact. A final SoftClipper can be useful when chosen deliberately, but it colors the signal and is not an unconditional protection after every output-gain setting.

## Short-term loudness and target

Short-term LUFS measures perceived-level-related energy over a longer window than a peak bar. Let a sustained representative phrase establish the reading. Very short accents, silence and changing notes can make a single number misleading. The displayed target comparison is a reference for judging patches, not a mandatory streaming/mastering standard.

MATCH is a deliberate level-comparison action using the measured loudness and chosen target. It changes the applicable output gain; it is different from Analyzer MATCH DISPLAY, which changes visual trace scaling only. Play representative material, let the measurement settle, then compare and listen before saving. Do not use a tiny quiet tail to choose a whole patch's gain.

## Compare A and B fairly

Clear temporary controls, play the same note/phrase and inspect each layer at its output. Solo a layer to learn its role, then return to the sum. A fixed fader difference is not necessarily a loudness difference if one layer is dense and the other transient. Use short-term loudness alongside peak and your ears. Check the loudest combined phrase after balancing individually.

When comparing an effect, its input/output levels should be understood. A louder distorted signal can seem more exciting before any real tonal improvement. Use the effect's own Output/Auto Gain where appropriate and a later trim for fair listening. Avoid changing the drive input merely to hide an output-level difference.

## Master Output module

The main header provides horizontal L/R output bars, retained true-peak maximum, short-term loudness/target view, output gain and clip/reset access. MIXER opens the larger balancing view; MASTER EFFECTS opens the shared rack. These are the same output parameters rather than a second master channel strip hidden after the first.

## Observation cost and saved state

Source analysis follows visible Mixer demand. Layer/header observations have their own visible consumers. Hidden analysis sleeps after its demand ends; synthesizer processing and unavoidable host bookkeeping remain. Closing Mixer is useful when finished inspecting, but it does not bypass the effects whose meters you watched. The DSP Load bar measures callback time, not the loudness engine's output or total computer CPU.

## WORKFLOW

## 37 / Analyzer

### Five views and two signal traces

ANALYZER opens a detachable native analysis window. Scope shows amplitude over time; Spectrum shows frequency amplitude; Spectrogram shows frequency changes through time; Modulation shows four read-only control traces; Stereo shows the channel relationship. Trace A is amber and B is mint. Pick each tap deliberately; the letters identify traces, not automatically synth layers.

TRACE B enables the second audio trace. SPLIT: SCOPE + VIEW retains Scope above another selected view. FOUR MOD TRACES adds the modulation rail. Choose the simplest layout that answers your question first. More plots do not explain the sound until you know their coordinates.

### Window and keyboard

The window follows theme and track name, with saved size/position and analysis preferences. In plugins, KEYBOARD: HOST preserves host typing; EDIT permits text entry. Search and Scope fine controls temporarily enable editing and return to the prior mode after closing. Scope Controls and the modulation picker appear over the Analyzer in its own window; they should not replace the plot with an isolated popup.

Display choices, taps, gain, freeze and references are read-only analysis state. They do not write patch parameters or host sound automation. Closing the Analyzer stops its analysis worker; hiding/minimizing stops requesting live capture. Do not assume closing only a different panel has closed a detached observation window. Explicitly close the window when finished.

### Pick the signal point

Master is the final host output. Layer is its whole layer output. Osc/Sub/Noise/Logic source taps use the aligned, summed source coordinates corresponding to Mixer observations. Main source choices also offer pre-distortion and post-damage points; Noise offers its actual pre-character signal. Filter Input/Output identifies the layer filter path; read any native audio-rate FM coordinate shown by the selected tap.

Logic 1 and Logic 2 are synthesized combination sources; their names are not references to two Logic Pro application instances. An unused source, disabled optional filter or unavailable voice path can report dormant/unavailable. The Analyzer does not wake an unused generator merely to draw a waveform.

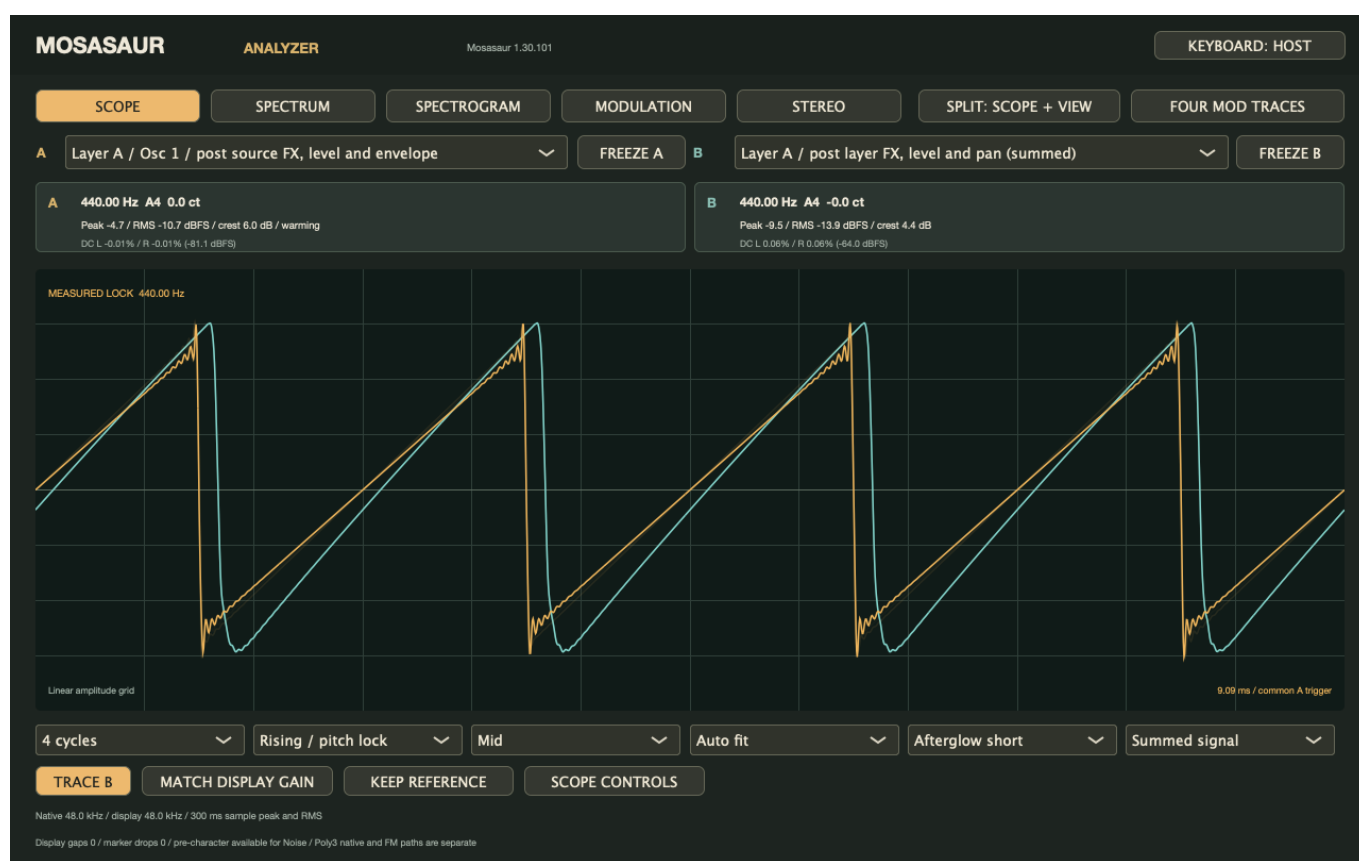
To inspect a running sound quietly, lower Master Output or use temporary listening gates while retaining the desired source/dependency. Turning that source's saved Power off can remove the very signal you want to inspect.

## Read measurements before interpreting the graph

Peak and RMS use observed audio before display gain. Crest is peak minus RMS, describing how far peaks stand above the average. DC L/R reports signed channel offset as a percentage, with a dBFS view. Correlation and balance use a 300 ms window. Warming, capture gaps and rate changes affect how comparable fresh measurements are.

Measured pitch comes from audio. The played MIDI note is only a validation hint and is not substituted for a failed estimate. A chord, noise burst, inharmonic body, short hit or heavily unstable source can correctly show no stable pitch. A musical label is a convenience around a measured frequency, not proof that the sound is monophonic or in tune.

## Scope timing



Scope compares two selected signal points.

The default is four cycles with a rising trigger. Cycle choices show 1, 2, 4, 8 or 16 periods when a useful period is available. Fixed time windows are appropriate for attacks, noise and non-periodic motion. A last stable period can hold timing while the display waits for another reliable lock.

Trigger polarity chooses the crossing direction; threshold chooses crossing level. Hysteresis prevents repeated triggering from small fluctuations near threshold. Too high a threshold can miss a quiet waveform; too little hysteresis can jitter on noise. Start near zero crossing and modest hysteresis, then adjust only enough to stabilize the intended signal.

SCOPE CONTROLS provides Trigger Threshold (-1 to +1), Trigger Hysteresis (0.0001-0.5), Display Gain (0.01-100), Time Window (0.0005-2 seconds) and the optional dBFS grid. Changing fixed gain turns off automatic fitting; entering a time window selects fixed-time behavior. These are display changes, not changes to recorded or output amplitude.

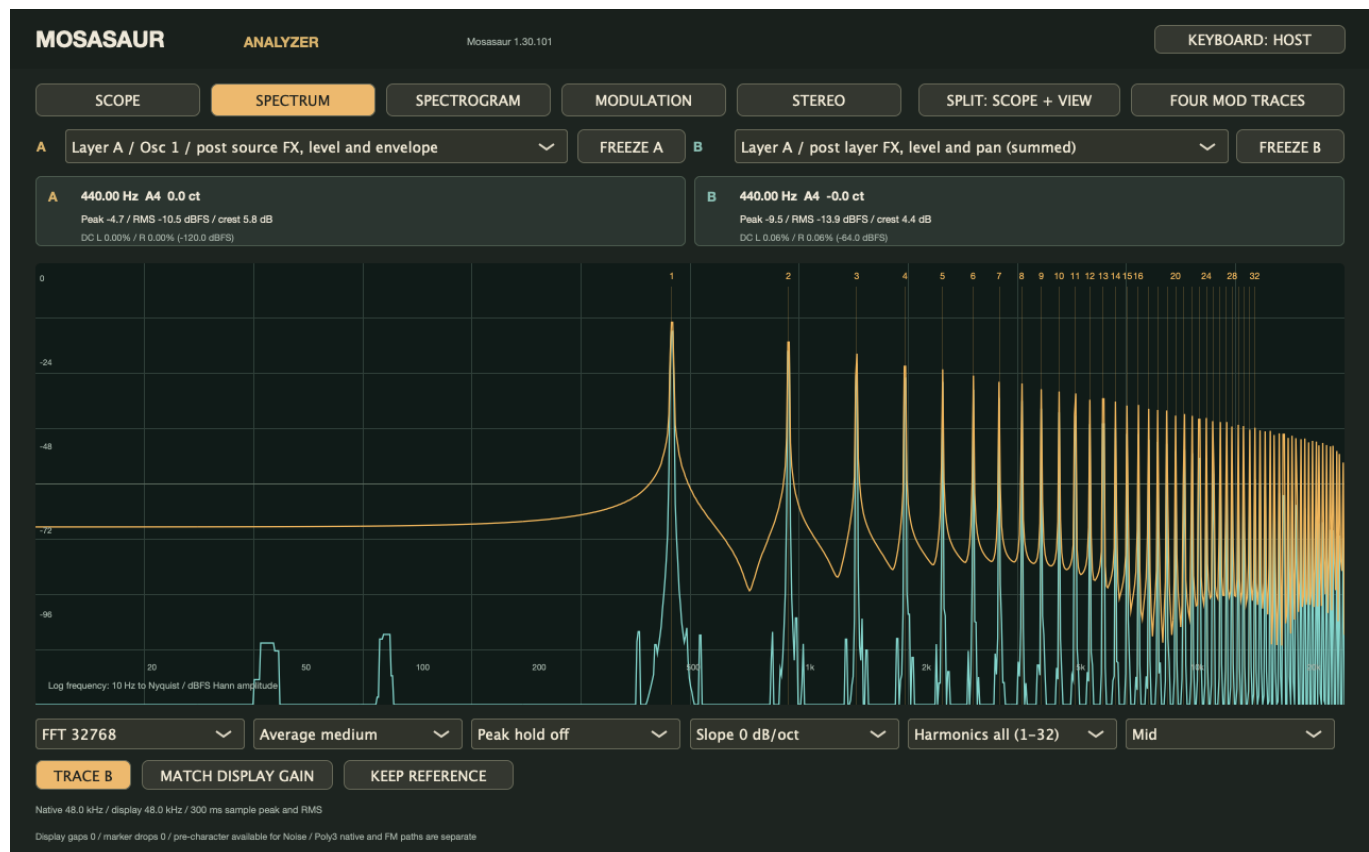
Afterglow retains recent curves. Auto Fit is useful for seeing a quiet shape but can conceal an actual level change. Disable it and use a fixed display gain for a visual amplitude comparison. MATCH DISPLAY GAIN offsets B visually toward A; it does not match the audio or move a fader.

## Freeze and reference

FREEZE A/B hold their traces independently. A frozen recording can be inspected in another view while the other trace resumes. Tap selection starts a new measurement where allowed; a frozen trace intentionally retains its earlier data. KEEP REFERENCE saves the current traces as a visual overlay; CLEAR REFERENCE removes them. References are temporary and not part of a portable sound.

Use a reference for a before/after filter or distortion experiment. Keep the same tap and note. Disable Auto Fit or remember its influence when judging size. A frozen plot is evidence of the captured event, not the current audio after every later edit.

## Spectrum



Spectrum compares frequency content at the selected taps.

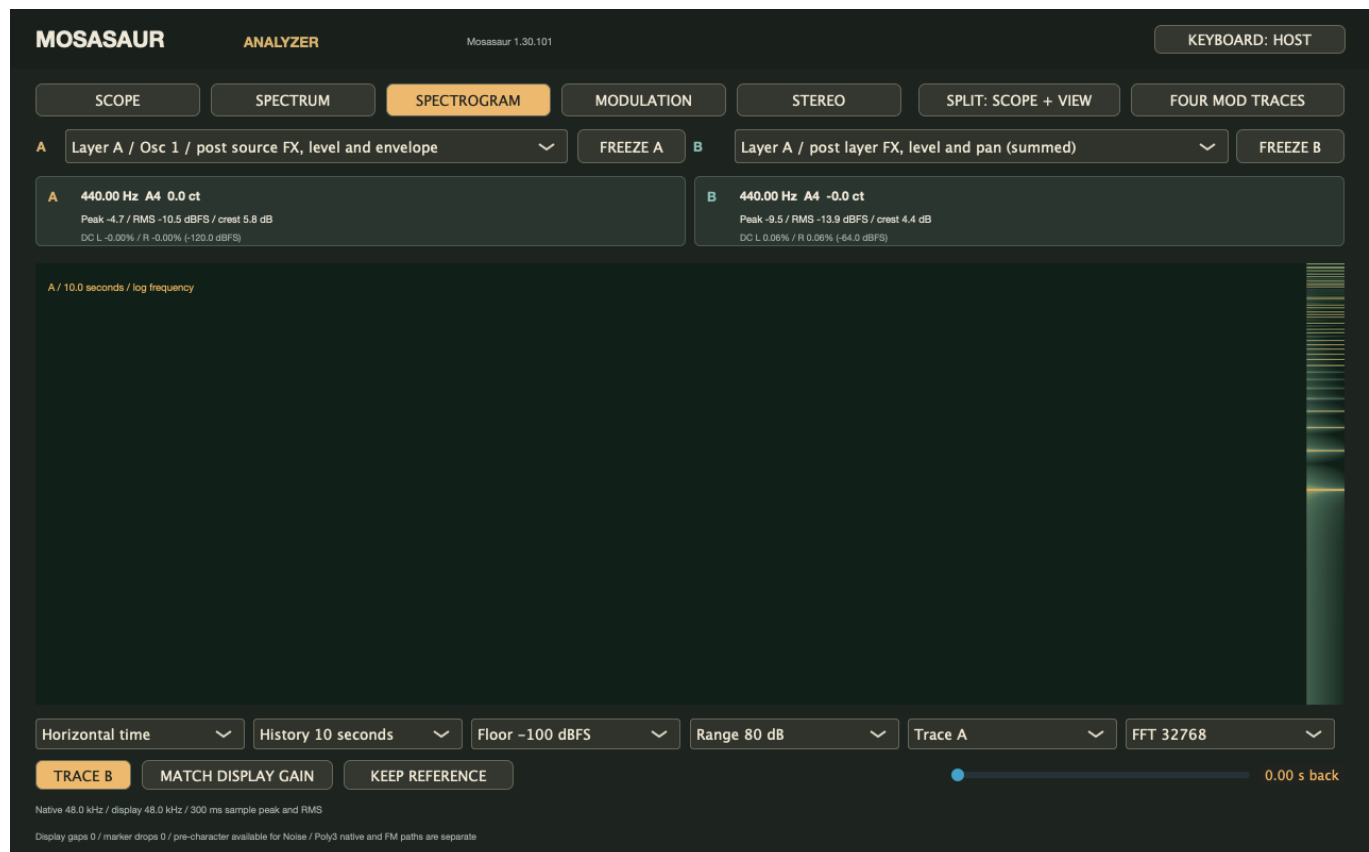
The FFT choices range from 2048 to 32768 samples. Larger windows resolve closer frequencies but cover more time and require more work. Smaller windows respond more quickly to transients. Averaging smooths variations; peak hold retains maxima. The horizontal axis is logarithmic from 10 Hz to the relevant Nyquist limit, and amplitude uses the Hann-windowed dBFS convention.

The 0/3/4.5 dB per octave slope options tilt only the display. A tilted trace is not an EQ curve applied to audio. Harmonic guides derive from the measured fundamental and show all, odd or even guides through the 32nd harmonic. If pitch is not stable, do not use missing guides as proof that a harmonic was removed.

## Compare a waveform with distortion

Use one saw, choose a pre-distortion source tap for A and the corresponding later source tap for B. Keep note and level stable. Add a modest WRECK amount and observe new/changed harmonics. Match display gain only if the question is spectral shape rather than actual amplitude. Then compare the final master to learn what subsequent filtering removes.

## Spectrogram

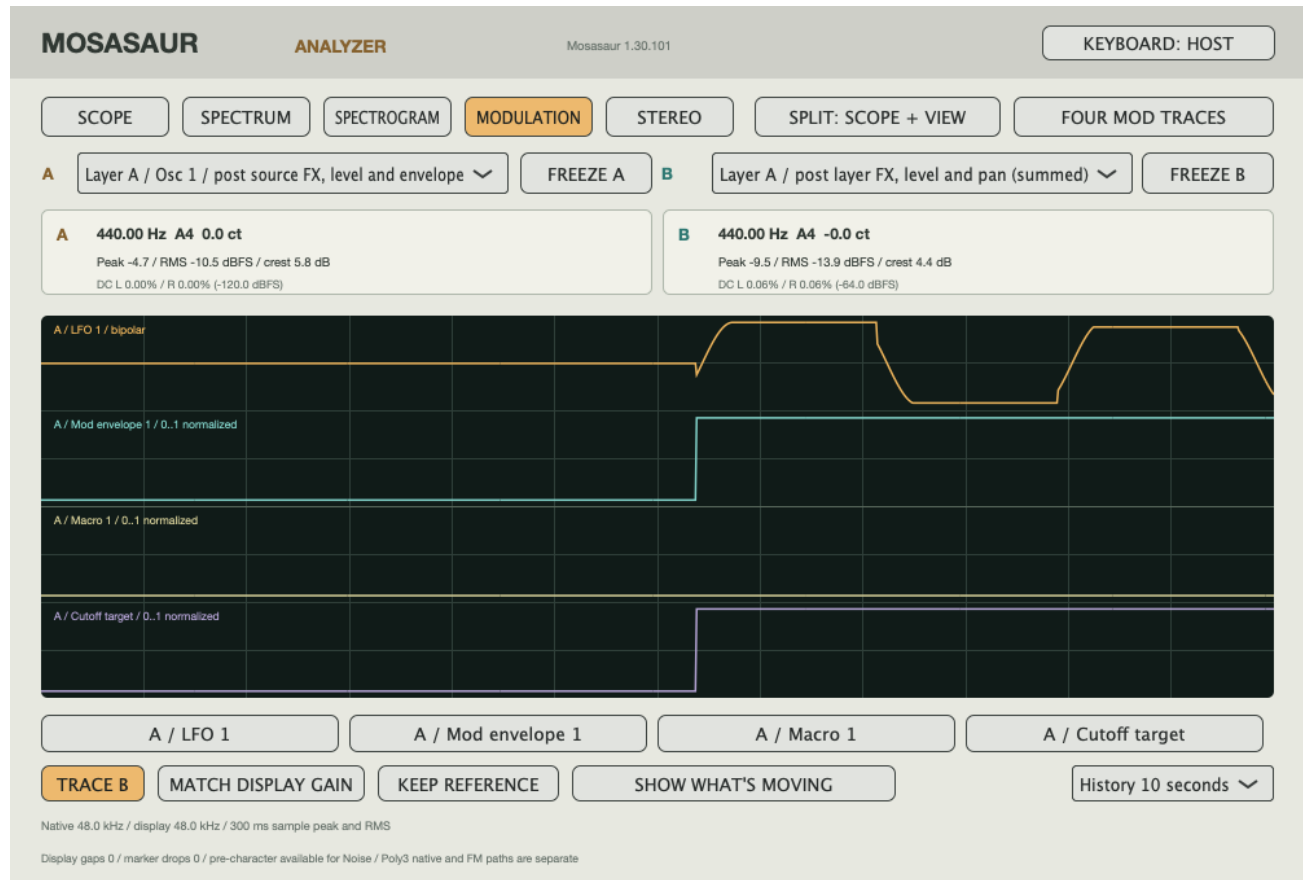


Spectrogram shows how frequency content changes over time.

Spectrogram plots frequency through history. Choose A or B, horizontal/vertical orientation, a 2-30 second history, Floor and Range. Floor sets the bottom visible level; Range spans the visible intensity scale. Raising visibility of quiet material can also emphasize background noise. It does not boost the audio.

Scrollback inspects recent history. A new tap/rate/gap may restart the relevant history. Use a long view for slow wavetable/vowel changes and a shorter view for attacks. A decaying resonant body produces partials with different decay slopes; a bright line is not automatically the fundamental.

## Modulation view and targets



Modulation view follows four selected sources or targets.

Each of four searchable pickers can select an existing LFO, envelope, expression, Motion, macro or dynamics source, or a post-modulation parameter target. Source traces show their effective unipolar/bipolar ranges as labelled. Target traces are normalized read-only values, not a graph in the control's native Hz/ms units. An inactive destination label explains that its feature is unavailable in the current path.

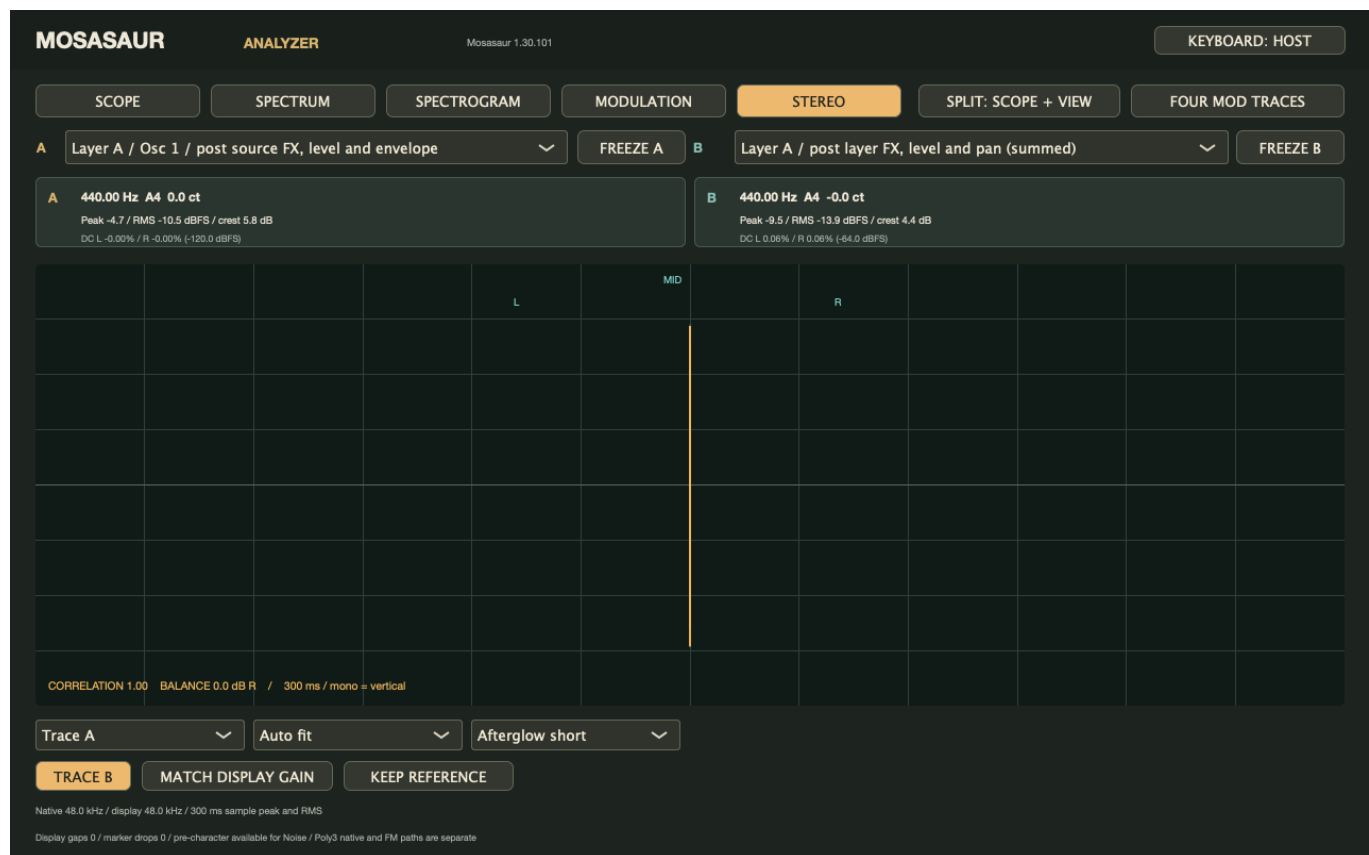
MIDI On/Off markers retain their audio-frame timestamps. They help relate a contour to note events, but do not measure the mechanical instant a laptop key was pressed. A marker/audio plot alone cannot certify physical keyboard latency.

SHOW WHAT'S MOVING measures activity among assigned matrix sources/vias and picks the strongest four as a useful starting view. It is not a complete analysis of every audio-rate interaction or all controller ownership. Read the actual matrix/macro routes to explain why a parameter changes.

## Diagnose an envelope route

Pick Env 1 and the intended cutoff target. Play a note and confirm Env 1 rises. If the target remains still, check matrix Source, Destination, Amount and Via, plus macro ownership. If the target moves but the sound does not, check audible layer, filter mode, effective limits and downstream processing. This separates missing control routing from a valid but inaudible change.

## Stereo view



Stereo view shows channel relationship and balance.

The horizontal axis uses R minus L; mono is vertical. Auto Fit and afterglow change presentation. Correlation near +1 means similar channels; near -1 suggests opposing polarity; silence has no useful image. Balance reports the channel level relationship. A wide cloud does not by itself prove good mono compatibility.

Compare one unison copy with several spread copies, then use Mixer Mono Check to hear what sums. A stereo sample can already have width before unison or effects. Source Width changes existing side information; it need not create new channel independence from mono content.

## Native clocks, summed voices and Follow Last

Internal tap clocks can differ from host rate. Native rates and the common display rate are labelled separately. Full-band statistics use the observed streams; plotted history is reconstructed and antialias-filtered to at most 192 kHz. The graph's Nyquist limit should be read with its rate rather than assumed from the host alone.

Follow Last Voice applies to Scope and pitch where a suitable voice coordinate exists. In Mono, the layer follows one played note, but unison, routing and effects can still produce a composite waveform. Level and spectrum report the observed sum. Master and layer buses remain summed where indicated.

## Gaps, performance and limitations

Capture and note-marker drops are reported. They are display transport gaps, not proof of an audio dropout. Let a restarted/warming measurement settle before comparing it with another meter. Very large FFTs, two high-rate taps, mixed clocks and spectrogram/modulation histories add background work and memory. Closing the window is the clearest way to stop its analysis demand.

The Analyzer is an internal creative/diagnostic instrument, not a calibrated substitute for every mastering test. Optional THD measurement is not part of this build. Use controlled notes, known taps and listening comparisons, and keep physical input latency or host scheduling questions separate from a read-only plot.

# 38 / Managing CPU and playing response

Practical CPU management for Mosasaur Mono.

## The deadline comes first

### What a buffer allows

Your host requests a block of audio. Its duration is frames divided by sample rate. At 48 kHz, 128 frames last 2.67 ms. That time is shared with the host and other processing on the audio path. A low average does not guarantee that every block finishes on time.

### Why busy passages matter

Test the fastest transitions and longest releases you actually use. New notes can arrive while earlier voices, filters and effects are still settling. A short scheduling delay can also push one block over budget. A measured overrun is a risk indicator; it does not by itself prove an audible dropout.

### Buffer and sample rate

A larger buffer gives each callback more time and can reduce fixed overhead per second, at the cost of playing latency. Doubling sample rate halves the duration of the same frame count and usually increases processing work. The relationship is not a universal two-times CPU rule.

### Choose a workable starting point

Try 48 kHz and 128 frames for playing. If the part overloads, try 256, then 512. Use the smallest buffer that remains reliable in your complete project. These are starting points, not supported-performance guarantees.

| Frames | 44.1 kHz | 48 kHz   | 96 kHz   |
|--------|----------|----------|----------|
| 32     | 0.73 ms  | 0.67 ms  | 0.33 ms  |
| 64     | 1.45 ms  | 1.33 ms  | 0.67 ms  |
| 128    | 2.90 ms  | 2.67 ms  | 1.33 ms  |
| 256    | 5.80 ms  | 5.33 ms  | 2.67 ms  |
| 512    | 11.61 ms | 10.67 ms | 5.33 ms  |
| 1024   | 23.22 ms | 21.33 ms | 10.67 ms |

Block durations, calculated rather than measured.

## Read the DSP Load meter

### The definition

DSP Load is this instance's callback elapsed wall time divided by block duration, multiplied by 100. Waiting for internal rendering workers is inside that interval. Worker CPU times are not summed by this meter. The measurement excludes the host wrapper around the callback, preset preparation, UI drawing and background analysis, although competition from those tasks can delay the callback.

### Average, number and peak

The filled bar smooths the recent elapsed-time-to-budget ratio with a 250 ms time constant. The numeric display refreshes about five times per second and shows that smoothed value. The thin marker captures the largest block since the previous UI poll, holds a new high for 1.5 seconds, then decays with a 0.7-second time constant. It is not a permanent worst-ever reading.

### Colors and overruns

Green is below 70%; amber runs from 70% through 85%; red is above 85%. These are guide marks, not guarantees. OVERRUN stays lit for three seconds after a measured block exceeds its duration. Watch the peak marker and the host's performance meter during difficult passages; leave margin rather than aiming for 99%.

### Different meters answer different questions

Logic includes other work on its processing threads. Activity Monitor accounts for CPU differently again: its process reading can exceed 100% when several cores work. That reading is not Mosasaur's DSP Load percentage or a percentage of the whole Mac.

### Output meters are separate

Mixer peak, RMS, true peak and LUFS describe audio level. A loud signal is not automatically an expensive signal, and a quiet signal can still require substantial processing. Turning the listening volume down does not solve an overloaded callback.

## Understand the multipliers

### This edition

Mono keeps one playing note per layer. Three oscillators can still have multiple unison copies, routing, filters and source effects, and Layer B can add another complete layer. Mono is musically monophonic; it does not force the patch to use only one oscillator or one CPU thread.

### Count generator work

Three oscillators with eight unison copies each mean 24 generator copies for the current note in a layer. A similar second layer adds another set. This arithmetic explains growth; it is not a CPU multiplier for the whole instrument. Shared work, dormant paths, routing and filter clocks also matter.

## Where effects run

Source racks process individual generators. Layer racks process the complete layer, once per layer; the master rack runs once after A and B. Master Multiband is available only at the master in this build. Moving an effect changes processing order and can change its sound.

## Release and silence

Releasing a key does not instantly end a voice or a reverb tail. Rendering can continue while envelopes, filter state or rack tails settle.

## Power is a deliberate shutdown

Use source Power and Layer B Power for parts you do not need. B Power fades briefly and then suspends the whole layer, including tails. A fader at zero can leave modulation, routing or tails in use. Settled unused features skip their feature DSP; control checks, telemetry and host bookkeeping still have a cost.

## Make the largest musical decisions first

### Save a working copy

Save Sound As before reducing a finished patch. Change one thing, play the same difficult phrase, and compare both sound and peak load. The order here is a practical workflow, not a measured ranking for every possible patch.

### 1. Use only the layers you need

Concentrate on oscillator unison, a lighter Layer B and quality. If the part uses only A, switch B Power off. If B supplies a simple sub or top, reduce its sources and processing rather than copying all of A.

### 2. Reduce unison selectively

Compare 8, 4, 2 and 1 copies on the sources that actually need width. Keep a single strong center source and reserve unison for the layer or oscillator that creates the spread. Detune and stereo spread can help compensate, but fewer copies will not sound exactly the same.

### 3. Lower Play quality when necessary

Compare Off, 2x and 4x on the same passage, including bright high notes and driven routing. Lower settings can change aliasing and nonlinear tone. Higher quality does not guarantee an improvement for every sound. Keep the setting that is both useful and playable.

### 4. Shorten overlap when musically acceptable

A shorter amp release can let a released Mono layer settle sooner; it does not remove a pool of independent notes in this edition. Let a shared layer or master ambience provide some of the space when that sounds right. This is a sound-design choice: a reverb tail is not interchangeable with a releasing, modulated synth voice.

## Effects, Sample and Bake

### Use the right rack tier

A common ambience after the summed layer or master can avoid repeating similar source-rack processing. Retain source effects when they are essential to the patch. Nonlinear effects, compression and modulation generally react differently before and after signals are mixed, so moving them is not a transparent optimization.

### Check heavy combinations

Long reverbs, many Multi-Tap taps, dense Grain, Talk Box, resonators and complex voice/routing combinations deserve an A/B check. Their costs depend on settings and location. There is no verified universal table saying that a particular effect is always the most expensive.

### Sample quality and memory

Try Standard Sample quality if a sample-heavy patch is expensive. Compare high notes, looping and transposition before saving. Large personal libraries mainly occupy storage; assigned recordings and their prepared playback data occupy RAM. Mosasaur prepares recordings in memory rather than streaming a multisample instrument from disk.

### Print a layer with Bake

Bake renders a frozen layer sound into a Sample oscillator and neutralizes the layer processing printed into that recording. It can replace an expensive construction with simpler playback. Use Undo or preserve the original preset to revise the synthesis later.

### What a recording cannot preserve

A baked recording has a finite duration and a chosen reference pitch. Its modulation is printed rather than freely evolving in the same way; transposing also changes duration and timbre. Loop only where the material supports a useful seam. Verify that effects have not been applied a second time.

### Keep library size separate from CPU

Each recording is limited to 60 seconds. Presets have a 32 MiB distinct compressed embedded-audio budget and a 256 MiB distinct original decoded-PCM guard; preparation and history need more RAM. Export and back up personal sounds. These limits are not limits on how many recordings you can organize on disk.

## Multicore and visual tools

### What Multicore does

Multicore spreads eligible rendering work; it does not remove that work. Coordination and waiting can add overhead. Compare the same part in the actual project with Multicore off and with two threads.

### Edition-specific choices

Mono uses its layer-thread preference: one rendering thread, or up to two threads when A and B provide eligible work. B Power off or a sleeping layer can leave rendering serial.

## Host cooperation

On macOS, workers join an audio workgroup when the host supplies one, and rendering is bounded by its parallel-thread recommendation. Startup or scheduling failure falls back to available rendering paths. A host is not required to grant every selected thread, and this does not guarantee a particular performance-core placement.

## Test for the result you need

The useful result is fewer slow callbacks in the complete session. More total CPU with a shorter callback can be worthwhile. Conversely, a lightly loaded patch or very small buffer can be better without worker coordination. Leave resources for the host and other instruments.

## Close inspection windows when finished

Analyzer capture performs bounded work on the audio path, while FFT, pitch analysis and history processing use a background worker and drawing uses the UI. Large FFTs, multiple taps and histories add work. Close the detached Analyzer when you no longer need it; closing only the main editor may leave that window open. Mixer and small scopes have their own observation costs. Dormant observation paths skip capture after their consumers close.

## Avoid misleading tests

Do not benchmark while importing many recordings, scanning a changed factory library, compiling software or recording the screen. Warm the patch, repeat the same phrase and check sustained sessions as well as short ones. First-time catalog preparation can take longer than reopening a warm browser.

## Play, mix and render

### Playing and recording

Start with Play Off or 2x, Audition Render off, and a buffer that responds comfortably. Try 128 frames, then increase only as needed. Check both the loudest and busiest passages. Prefer a reliable performance over a quality setting that repeatedly overruns.

### Sound design and mixing

A 256- or 512-frame buffer can give more working room when immediate keyboard response matters less. Freeze or bounce completed parts and keep the editable source. Save a lower-cost performance version separately from a high-quality render version if useful.

### Render quality is a separate setting

Render can match Play or select Off, 2x, 4x, 8x or 16x. The selected factor applies during a host-reported offline render or when Audition Render is enabled. The engine can use selective generator/filter clocks according to the signal path; different stages can run at different rates.

## Logic freeze and bounce quality

In Logic 12.4, Source Only Freeze, Pre-Fader Freeze, offline project Bounce and offline Bounce in Place use Render quality. Real-time project Bounce uses Play. Audition Render selects Render while playing and returns to Play when turned off. Check the active-quality label if a different host option behaves unexpectedly.

## Preview before committing

Audition Render lets you compare the render sound live and can be much heavier. Disable it after listening. Freeze and offline bounce may legitimately differ from low-quality playback. Check the printed attack, modulation, loop and ending; raising oversampling does not repair a poor edit or make an unsuitable sample loop seamless.

## Latency is a separate cost

The plugin reports its quality-path and Soft Clipper latency to the host. Positive Lookahead in an enabled master Dynamics Limiter adds a separate delay that is not included in that report; use 0 ms Lookahead when exact track alignment matters. Use Details for the current setting. That figure excludes device buffering, converters and the rest of the project. Lower CPU load and lower playing latency are related choices, not the same measurement.

## Logic and a busy session

### Change the device buffer deliberately

In Logic, open Settings > Audio > Devices and increase I/O Buffer Size one step if overloads occur. Larger buffers trade playing response for headroom. Watch Logic's Processing Threads and Drive I/O meters as well as Mosasaur's meter.

### Playback and track selection

When only listening, selecting an empty track can reduce the extra strain of a selected software-instrument track. Freeze finished instrument parts when CPU is the limit; freezing can increase disk activity, so check Drive I/O if that meter is already peaking.

### Low Latency Mode

Low Latency Mode can route around latency-inducing plugins. It is not a general CPU-quality switch and can alter the monitored signal. If a chain sounds different while recording, check this mode and the host's bypass indications.

### Other hosts

Use your host's buffer controls, performance meter and freeze or render workflow. Automatic Render quality follows the host's offline-render signal, so check the active quality label when trying a new host operation.

### System conditions

Compare on mains power under consistent power and thermal conditions. Reduce unrelated background tasks before diagnosing a patch. A gradual slowdown may have several causes: check the complete session and system rather than assuming a specific module is defective.

## Official host references

Apple's guides "Avoid system overloads in Logic Pro for Mac" ([support.apple.com/en-us/108295](https://support.apple.com/en-us/108295)) and "Manage input monitoring latency in Logic Pro for Mac" ([support.apple.com/en-us/105040](https://support.apple.com/en-us/105040)) provide additional host setup advice.

## CPU quick reference

### Before you play

Save a copy. Set Audition Render off. Choose low Play quality that sounds acceptable. Use a stable host buffer. Play the hardest phrase and watch the peak marker plus the host performance meter.

### If load is high

Reduce unison on selected sources. Turn off an unnecessary Layer B or simplify it. Shorten excess release overlap. Compare shared effects with repeated source effects. Try a two-thread setting only where there is enough eligible work.

### If it still overloads

Increase the host buffer. Close Analyzer and inspection windows. Try Standard Sample quality or Bake a complex layer. Freeze or bounce finished parts. Preserve editable originals and check the rendered audio before relying on it.

### Symptom: a quiet patch still uses CPU

Level is not a reliable power switch. Check source Power, B Power, routing dependencies and tails. Wait for tails to finish. If load stays unusually high, save a small reproducible project and report it rather than assuming silence must mean zero total processing.

### Symptom: delay without a high meter

Check host buffer, output device, look-ahead effects, glide and amp attack. Record MIDI and audio to separate input timing from synthesis onset. Laptop keyboard overlap/rollover can be a separate issue. A normal DSP reading alone does not diagnose the cause.

### Symptom: a bounce sounds different

Check Render versus Play and Audition Render. Verify which quality the host operation actually activates. Compare the same performance, controller positions and sample rate before treating a difference as a bug.

### A useful problem report

Include edition/version, preset or exported sound, host/version, sample rate and buffer, Play/Render/Audition settings, thread choice, windows open, and the shortest repeatable note sequence. Include whether it occurs only with a selected live track or also in playback.

### Keep the musical trade-off visible

CPU savings can change voice overlap, width, nonlinear character, modulation or latency. Choose the smallest change that solves the real passage. No meter threshold can certify an entire session.

## Read the horizontal meter

The segmented DSP Load bar fills from left to right; its percentage is at the right. The held peak helps reveal short spikes that the averaged number can conceal. Green, amber and red correspond to the existing load guidance; an OVERRUN indication is held briefly after a missed deadline. Above 100%, the number shows the real reported value even though the bar is full. It is callback wall time, not the whole Mac's CPU percentage.

## A repeatable before-and-after test

Save a copy, close analysis windows you do not need, warm the patch, and play the same hardest phrase for each comparison. Change one setting, then listen for altered attacks, release overlap, width, brightness and effect behavior as well as watching the meter. A lower average with occasional new overruns is not necessarily a better performance setting. Check the complete project after finding a useful isolated setting.

## 39 / Troubleshooting

### No sound

Start with a saved project copy, Init, Layer A, one enabled oscillator and a moderate Master Output. Check the host's MIDI input and audio output first. Then inspect source Power/Level, layer level, B Power if using B, amp sustain/release, filter cutoff, effect wet settings, Mixer mutes/solos and sample assignment. A locked Init load can retain part of the previous sound; clear locks when you need a clean baseline.

Use Mixer meters to locate where signal stops. Source energy with a silent layer suggests later filtering/envelope/level processing. An empty source meter can be correct for a routing-only modulator. Analyzer taps have different positions and may be dormant; an unavailable tap is not synthesized just for inspection.

### A sound is much quieter than another

Compare the same note/velocity and let the loudness display settle. Check a User override of the factory preset, saved master gain, source/table/sample level, Normalize/Auto Level, effect Output and band solos. A transient accent and sustained pad can have similar peaks but very different loudness. Avoid raising a nonlinear stage's input merely to correct a final level difference unless its extra distortion is wanted.

### A note begins late

Check host buffer/output device, latency-inducing effects, amp Delay/Attack, Layer B Master Start Delay, glide and leading sample silence. Reverse can turn a long quiet tail into a slow onset. Start Random can skip a transient. In Voice, check onset/articulation mode. Record MIDI/audio to separate event arrival from sound development; this does not measure the physical instant a laptop key moved.

### A one-shot does not retrigger or change pitch

Loop Off reaches End and then stops. Legato can keep an ended playhead across overlapping notes; use Retrigger for repeated hits. Key Tracking at zero intentionally keeps pitch fixed. The five factory One Shots discussed in [Chapter 11](#) retain fixed pitch and use Retrigger. An existing project or personal preset can keep its earlier state until reloaded or edited.

### A patch clicks or breaks up

Watch DSP peak/overflow and the host's performance meter during the actual phrase. If the callback is overloaded, reduce work or increase the buffer using [Chapter 38](#). If the meter is comfortable, inspect sample loop seams, rapid region/sync changes, extreme feedback/damage, short envelope transitions and deliberate digital crushing. A designed glitch texture and a missed processing deadline require different remedies.

## An effect appears inactive

Check the correct rack/slot, Type, Enable and Mix. An input-dependent effect needs a signal at that point. A compressor at unity ratio or above the input threshold can be neutral. A delay in Freeze may retain existing material rather than taking a new input. Some options require their own section On. Look at the processor's status and compare its immediate input/output, then remove unrelated later effects.

## A routing control does nothing

Confirm the directed connection, source Power, target source and range. A zero direct mixer level can still be a useful modulator; Power Off is different. Soft/Reverse Sync thresholds apply to their modes. Shape sources apply only to supported generators. Character can be unavailable on a waveform. Macro ownership, a bypassed route or an effective limit can conceal a valid edit. Test one carrier and one modulator from a plain sound.

## A table or custom drawing is silent

A flat cycle becomes silence after DC removal. Editing Frame B while Morph stays at A does not make B audible. Opposite frames can cancel during an amplitude blend. In Wavetable, selected Edit Frame and playback Position are independent; Auto Scan can own the position movement. Check a table's Gain/Auto Level and its source Power before compensating at the master.

## Preset browser opens slowly

First catalog preparation, a changed library, explicit Refresh and applying a selected sound are separate operations. Let preparation finish. Reopening a warm browser can be much quicker. Clear filters before diagnosing missing entries; Refresh once after an installed-bank change. Repeated refreshes do not repair an unexplained selected-state delay. Report whether the delay is browser opening or actual sound loading, with bank/version and approximate time.

## A sample import or render will not apply

The worker may be busy, the target sound may have changed, the host rate may have changed or the embedded-size budget may be exceeded. Read the status. Keep a completed take by Save to Library/Export, then start a current job. Do not repeatedly reload a large file without resolving the first error. Sample library import copies originals and can shorten long recordings to 60 seconds.

## Analyzer or Mixer looks wrong

Check the selected tap/strip, warm-up, frozen trace, reference, display gain and temporary listening controls. Scope Controls should stay above the Analyzer. A pitch reading can be unavailable for a chord/noise source. Spectrum slope and Match Display are visual; they do not alter audio. Closing analysis windows stops their demand without bypassing the musical processors.

## Tuning or expression surprises

Check whether MTS overrides the internal tuning preview, whether a mapping intentionally leaves keys silent, and whether MPE controller/instance zones and bend ranges match. Ordinary Bend Up/Down and MPE ranges have separate ownership. Pressure smoothing, expression-to-level and matrix routes can each contribute. Return to a clear one-source patch for a controlled test.

## A useful report

Include edition/version/Details identity, host/version, sample rate/buffer, preset or portable export, Play/Render/Audition settings, thread setting, open windows and the shortest repeatable actions. Say whether it happens on a live selected track, normal playback, offline render or standalone. Save a small reproducer without unrelated private project material. Retain source audio if the issue involves import or looping.

APPENDICES

# Appendix A / Factory directory and preset notes

The musical factory collection contains 1,078 presets, plus Init. The directory below assigns each sound to one of its visible browser categories so the counts add to 1,078. Other category views can include the same sound without creating a duplicate. Personal sounds, ratings, search filters and User overrides can change the list you see.

## Explore with a purpose

Use a simple bass or lead to learn envelopes and filtering. Routing studies isolate sync, PM, ring and related interactions. Showcase Banks combine features into finished sounds. Resample Showcase contains recordings made from Mosasaur; its fixed-pitch one-shots are intentional percussion. Custom Waves - Alien Worlds and Multiband Showcase are useful for comparing source colour and frequency-dependent processing.

Clear temporary Mixer Mute/Solo controls before comparing presets. Let a slow attack or Motion phrase develop, and explore the named macros one at a time. Use Save Sound As to keep an editable variation.

## Browser directory

| Browser category                                          | Musical sounds in this directory |
|-----------------------------------------------------------|----------------------------------|
| Mono > Showcase Banks > Custom Waves - Alien Worlds       | 30                               |
| Mono > Showcase Banks > Custom Waves - Dangerous Toys     | 15                               |
| Mono > Showcase Banks > Custom Waves - Permanent Waves    | 30                               |
| Mono > Showcase Banks > Delay - Echo Worlds               | 17                               |
| Mono > Showcase Banks > Distortion - Tempered Violence    | 30                               |
| Mono > Showcase Banks > Dynamics - Living Pressure        | 20                               |
| Mono > Showcase Banks > Formant & Glottal - Vocal Alchemy | 20                               |
| Mono > Showcase Banks > Grain FX - Fracture Explorations  | 40                               |

| Browser category                                              | Musical sounds in this directory |
|---------------------------------------------------------------|----------------------------------|
| Mono > Showcase Banks > Harmonic Character - Isotope Gardens  | 30                               |
| Mono > Showcase Banks > Harmonic Synthesis - Resonant Vessels | 15                               |
| Mono > Showcase Banks > Harmonics & Morph - Hostile Geometry  | 30                               |
| Mono > Showcase Banks > LFO Modulation - Haunted Depths       | 15                               |
| Mono > Showcase Banks > Microtuning - Lattice Lanterns        | 30                               |
| Mono > Showcase Banks > Modulation FX - Hole in the Sky       | 30                               |
| Mono > Showcase Banks > MosaTap - Time Machines               | 30                               |
| Mono > Showcase Banks > Motion & LFOs - Living Current        | 15                               |
| Mono > Showcase Banks > Multiband > Split Drive               | 3                                |
| Mono > Showcase Banks > Multiband > Squashed Bass             | 6                                |
| Mono > Showcase Banks > Multiband > Squashed Leads            | 6                                |
| Mono > Showcase Banks > Resample > Grain                      | 5                                |
| Mono > Showcase Banks > Resample > NUKE                       | 5                                |
| Mono > Showcase Banks > Resample > One Shots                  | 5                                |
| Mono > Showcase Banks > Resample > Self Resampled             | 3                                |
| Mono > Showcase Banks > Resample > Splice                     | 5                                |
| Mono > Showcase Banks > Route Damage - Rift Carnival          | 30                               |
| Mono > Showcase Banks > Routing NUKE - Containment Breach     | 30                               |

| Browser category                                              | Musical sounds in this directory |
|---------------------------------------------------------------|----------------------------------|
| Mono > Showcase Banks > Splice & NUKE - Rupture               | 20                               |
| Mono > Showcase Banks > Stereo Delay - Echo Atlas             | 15                               |
| Mono > Showcase Banks > TalkBox - Mouth Machines              | 12                               |
| Mono > Showcase Banks > Warm & Nasty WRECK - Nuclear Textures | 30                               |
| Mono > Showcase Banks > XY Pad - Vector Atlas                 | 30                               |
| Mono (top level)                                              | 2                                |
| Mono > Aftershock 40                                          | 40                               |
| Mono > Bass                                                   | 3                                |
| Mono > Bass > Analog                                          | 1                                |
| Mono > Bass > Hollow                                          | 1                                |
| Mono > Bass > Layered                                         | 1                                |
| Mono > Bass > Legato                                          | 1                                |
| Mono > Bass > Plucked                                         | 1                                |
| Mono > Bass > Punchy                                          | 1                                |
| Mono > Bass > Rounded                                         | 1                                |
| Mono > Bass > Sub                                             | 1                                |
| Mono > Bass > Tight                                           | 1                                |
| Mono > Bass > Warm                                            | 1                                |
| Mono > Bells > Resonance Editions > Echo Atlas                | 1                                |
| Mono > Bells > Resonance Editions > Haunted Depths            | 1                                |
| Mono > Bells > Resonance Editions > Hole in the Sky           | 1                                |
| Mono > Bells > Resonance Editions > MosaTap - Time Machines   | 1                                |
| Mono > Bells > Resonance Editions > Resonant Vessels          | 15                               |

| Browser category                                    | Musical sounds in this directory |
|-----------------------------------------------------|----------------------------------|
| Mono > Bells > Resonance Editions > Selected Sounds | 2                                |
| Mono > Brass                                        | 20                               |
| Mono > Cataclysm 40                                 | 40                               |
| Mono > Effects > Expo FM Studies                    | 2                                |
| Mono > Effects > Filter FM Studies                  | 2                                |
| Mono > Effects > Logic Studies                      | 2                                |
| Mono > Effects > PM Scaling Studies                 | 2                                |
| Mono > Effects > Ring Character Studies             | 2                                |
| Mono > Exploration 40                               | 40                               |
| Mono > Keys > Electric                              | 20                               |
| Mono > Keys > Resonance Editions                    | 23                               |
| Mono > Lead > Aggressive Leads                      | 30                               |
| Mono > Lead > Classic                               | 1                                |
| Mono > Lead > Classic Analog Leads                  | 30                               |
| Mono > Lead > Expressive                            | 1                                |
| Mono > Lead > Focused                               | 1                                |
| Mono > Lead > Full                                  | 1                                |
| Mono > Lead > Hollow                                | 1                                |
| Mono > Lead > Octave                                | 1                                |
| Mono > Lead > Plucked                               | 1                                |
| Mono > Lead > Pure                                  | 1                                |
| Mono > Lead > Reed                                  | 1                                |
| Mono > Lead > Scatter Studies                       | 1                                |
| Mono > Lead > Soft                                  | 1                                |
| Mono > Learning                                     | 1                                |
| Mono > Mood > Aggressive > Iron Temper              | 30                               |
| Mono > Movement > Evolving                          | 1                                |

| Browser category                 | Musical sounds in this directory |
|----------------------------------|----------------------------------|
| Mono > Organ > Chapel            | 1                                |
| Mono > Organ > Digital           | 1                                |
| Mono > Organ > Drawbar           | 5                                |
| Mono > Organ > Experimental      | 1                                |
| Mono > Organ > Hybrid            | 1                                |
| Mono > Organ > Pedal             | 1                                |
| Mono > Organ > Pipe              | 2                                |
| Mono > Organ > Psychedelic       | 1                                |
| Mono > Organ > Reed              | 1                                |
| Mono > Organ > Rhythmic          | 1                                |
| Mono > Organ > Rock              | 2                                |
| Mono > Organ > Transistor        | 2                                |
| Mono > Organ > Vintage           | 1                                |
| Mono > Pad                       | 1                                |
| Mono > Pads > Resonance Editions | 4                                |
| Mono > Reference                 | 2                                |
| Mono > Showcase 12               | 12                               |
| Mono > Strings                   | 39                               |
| Mono > Synth Percussion > Bell   | 1                                |
| Mono > Synth Percussion > Clap   | 2                                |
| Mono > Synth Percussion > Hat    | 3                                |
| Mono > Synth Percussion > Impact | 1                                |
| Mono > Synth Percussion > Kick   | 4                                |
| Mono > Synth Percussion > Rim    | 1                                |
| Mono > Synth Percussion > Shaker | 1                                |
| Mono > Synth Percussion > Snare  | 4                                |
| Mono > Synth Percussion > Tom    | 2                                |
| Mono > Synth Percussion > Zap    | 1                                |
| Mono > Tuned Percussion > Bell   | 4                                |

| Browser category                                        | Musical sounds in this directory |
|---------------------------------------------------------|----------------------------------|
| Mono > Tuned Percussion > Glass                         | 2                                |
| Mono > Tuned Percussion > Hollow                        | 1                                |
| Mono > Tuned Percussion > Metal                         | 6                                |
| Mono > Tuned Percussion > Plucked                       | 1                                |
| Mono > Tuned Percussion > Synthetic                     | 2                                |
| Mono > Tuned Percussion > Wood                          | 4                                |
| Mono > Woodwind > Clarinet                              | 3                                |
| Mono > Woodwind > Flute                                 | 6                                |
| Mono > Woodwind > Hybrid                                | 3                                |
| Mono > Woodwind > Reed                                  | 5                                |
| Mono > Woodwind > Whistle                               | 3                                |
| Mono > Woodwinds > Resonance Editions > Selected Sounds | 6                                |

## Learn from a factory sound

Save a personal copy and store a comparison. Disable one source or effect at a time to hear its contribution. Inspect the matrix and macro routes before assuming a named knob moves only one parameter. Compare source, layer and master taps in the Analyzer, then return to the saved copy if the experiment becomes unclear.

If a factory update appears unchanged, check whether a same-ID User sound or a saved project state is taking precedence. Refresh updates the catalog; reloading the desired sound applies its saved state. Keep personal edits under a new name when you want both versions available.

## Instrument-family preset notes

The 160 additions below are grouped by sound type. Every entry lists its four named macros. Most synth interpretations use single-note lines; percussion patches are individual voices, not a mapped drum kit. For woodwinds and leads, the Vibrato macro sets the depth available from the mod wheel.

## Strings and brass - 40

### Velvet Ensemble

Warm, gently moving ensemble with a soft bow-in and rounded upper harmonics. Macros: Brightness, Ensemble, Bow Bloom, Space.

### Crown of Bows

Broad octave-layered strings: a firm lower body with a later-arriving upper sheen. Macros: Brightness, Ensemble, Bow Bloom, Space.

### Glass Horizon

A slow string-like swell with a soft upper layer and independently breathing filters. Macros: Brightness, Ensemble, Bow Bloom, Space.

### Clockwork Silk

Pulsing bright strings above a steady warm body. Free-running rate gives two pulses per second. Macros: Brightness, Ensemble, Bow Bloom, Space.

### Amber Horn

Rounded horn-like brass with a gentle breath-shaped attack and warm sustain. Macros: Brightness, Ensemble, Brass Bloom, Space.

### Sunburst Fanfare

An assertive layered brass attack with an octave glint and a solid lower foundation. Macros: Brightness, Ensemble, Brass Bloom, Space.

### Copper Engine

Dark low brass with a raspy reed edge and restrained sub weight. Macros: Brightness, Ensemble, Brass Bloom, Space.

### Prismatic Brass

A climbing eight-step filter pattern above a steady brass layer; hold a note to hear the four-second cycle. Macros: Brightness, Ensemble, Brass Bloom, Space.

### Rosin and Wood

A close, raspy bow attack that settles into a woody sustained tone. Macros: Rosin, Open Bow, Pressure, Room.

### Midnight Cellos

Low octave strings with a slow, weighty body and a faint upper bow layer. Macros: Bow Light, Low Weight, Slow Bow, Hall.

### Silver Spiccato

Short, springy string-like plucks with a crisp upper edge and little sustain. Macros: Bite, Length, Silk, Room.

### Octave Pizzicato

A rounded low pluck with a higher octave answering in the second layer. Macros: Pluck, Answer, Spacing, Room.

## Seventies Solina

Bright string-machine saws with pronounced ensemble chorus and an even sustain. Macros: Ensemble, Aged Tone, Flutter, Hall.

## Ice Filaments

A narrow high-pass string texture with a quieter warm layer underneath. Macros: Ice, Warmth, Fracture, Space.

## Cathedral Bows

A broad root-and-fifth string stack with a deep octave floor and a long release. Macros: Brilliance, Fifth, Foundation, Cathedral.

## Reverse Satin

A long swelling attack with a contracting filter, followed by a short soft release. Macros: Rise Time, Dark Arrival, Swirl, Afterglow.

## Pendulum Violins

Sustained violins swing across the stereo field while the filter breathes slowly. Macros: Swing, Breathing, Glow, Room.

## Amber Tremolo

A quick tremolo bow pattern above a softer steady string layer. Macros: Tremolo, Rate, Still Layer, Space.

## Stairway Strings

A descending stepped filter changes the bow colour over a four-second cycle. Macros: Step Range, Cycle Speed, Echo, Soft Edge.

## Dusty Tape Strings

Muted ensemble strings with slow pitch drift and a worn, soft-edged attack. Macros: Wear, Tone, Ensemble, Distance.

## Wire and Velvet

A bright metallic string edge sits above a darker bowed lower layer. Macros: Wire, Velvet, Muffle, Space.

## Frosted Harmonics

A quiet fundamental supports an airy fifth-and-octave shimmer. Macros: Overtones, Fundamental, Phasing, Air.

## Urgent Ostinato

A firm saw-string pulse with a short filter flick and repeating stereo echoes. Macros: Chop, Attack Bite, Echo, Sustain.

### Ember String Choir

A nasal band-pass string layer floats over a warm low-pass bed. Macros: Vowel, Throat, Body, Sanctuary.

### Muted Copper

Narrow, nasal muted brass with a restrained attack and intimate room. Macros: Mute, Bell Open, Tongue, Room.

### Velvet Flugel

A round triangle-and-saw horn with a gentle swell and very little edge. Macros: Brass Edge, Breath, Slide, Room.

### Pocket Stabs

Very short, dry brass hits with a fast filter snap. Macros: Snap, Length, Buzz, Room.

### Triumphant Octaves

Large octave brass with a solid low layer and a sharp upper bloom. Macros: Crown, Foundation, Brilliance, Hall.

### Fifth Avenue Horns

A fixed fifth gives the bright brass attack an immediate anthem-like colour. Macros: Fifth, Bloom, Soft Landing, Space.

### Baritone Foundry

Dense low brass with a square-wave rasp and a compact, heavy envelope. Macros: Furnace, Rasp, Bell, Room.

### Neon Trumpet

A piercing pulse-and-saw lead with a fast trumpet-like bloom and a short glide. Macros: Pulse Colour, Neon, Slide, Room.

### Slow Gold

A broad brass crescendo with a later upper layer and a long release. Macros: Arrival, Golden Bell, Upper Crown, Hall.

### Talking Trombone

A slowly moving nasal brass formant above a rounded lower body. Macros: Vowel, Speech, Chest, Room.

### Rubber Bellows

A pulse-width brass tone stretches and relaxes as you hold a note. Macros: Flex, Flex Rate, Bell, Space.

### Brass Rotor

A square filter pulse gives sustained brass a firm rhythmic chop. Macros: Rotor Depth, Rotor Rate, Echo, Warmth.

### Descending Herald

A descending stepped filter makes brass overtones fall against a steady low horn. Macros: Step Span, Cycle, Low Horn, Room.

### Scattered Signals

Random held filter positions turn a stable brass note into changing spectral calls. Macros: Scatter, Rate, Echo, Soft Edge.

### Phosphor Horns

Broad sustained brass coloured by a slow phaser sweep. Macros: Swirl, Swirl Rate, Brilliance, Hall.

### Double Tongue

Two short brass attacks form a delayed call-and-response across the layers. Macros: Reply, Separation, Attack, Room.

### Distant War Horn

A deep root-and-fifth horn grows slowly with a darker octave underneath. Macros: Approach, Fifth, Earth, Distance.

## Organs - 20

### Maple Drawbars

Clean fundamental, octave and third-harmonic sine registration with a rounded attack. Macros: Upper Drawbars, Lower Stop, Mellow, Room.

### Blue Note Percussion

A decaying third-harmonic ping speaks above a warm sustained root and octave. Macros: Percussion, Perc Length, Key Click, Room.

### Sunday Gospel

A broad sustained drawbar blend with a lower octave and slow rotary-like movement. Macros: Upper Choir, Rotor Speed, Low Stop, Room.

### Fast Rotor Club

Fast linked pan and amplitude modulation with chorus supplies an urgent spinning impression. Macros: Slow Rotor, Spin Width, Overdrive, Room.

### Felt Chapel

A nearly pure low registration with soft entry and a dark, gently lingering room. Macros: Flute Stop, Pedal, Soft Entry, Chapel.

### Silver Pipework

Octave and high fifth sine stops form a bright, clean pipe-like registration. Macros: Mixture, Lower Pipes, Shade, Vault.

### Great Cathedral

Low reed-like body and high sine stops grow into a large octave-and-fifth registration. Macros: Great Stops, Pedal Body, Reed Bite, Cathedral.

### Wooden Reed Stop

A nasal pulse register with a small pure octave gives an intimate reed-organ colour. Macros: Reed Shape, Reed Edge, Octave Stop, Room.

### Basement Combo

A wiry square-wave combo organ with a high-pass edge and quick release. Macros: Thin Tabs, Octave Tabs, Key Click, Room.

### Ruby Compact

Bright pulse tabs, upper octave saw and narrow chorus give a colourful compact-organ bite. Macros: Pulse Tabs, Bright Tabs, Chorus, Room.

### Iron Gospel

A rooted drawbar tone driven into a growling filter with a restrained spinning field. Macros: Drive, Upper Stops, Rotor Speed, Room.

### Garage Tab Riot

Saw-and-square organ tabs with coarse upper harmonics and a dry biting attack. Macros: Grind, Upper Teeth, Tone, Room.

### Deep Pedal Console

A deep pure pedal registration with a quiet upper harmonic that keeps the note readable. Macros: Upper Stop, Sub Pedal, Growl, Room.

### Glass Tab Organ

A steady sine registration with restrained phase modulation and a decaying high harmonic. Macros: Glass, Ping, Ping Length, Space.

### Phased Sunday

A hollow triangle-and-square organ moves through a slow resonant phaser. Macros: Phase Depth, Phase Speed, Octave Buzz, Room.

### Clockwork Chapel

A square-wave filter pulse chops a sustained organ registration above a steady low stop. Macros: Chop, Pulse Rate, Pedal, Space.

### **Dusty Tape Console**

A muted drawbar tone with slow pitch drift and soft chorus recalls a worn recording. Macros: Tape Drift, Open Tone, Chorus, Room.

### **Afterhours Jazz**

A dark lower registration with a short second-harmonic percussion and slight saturation. Macros: Percussion, Lower Stop, Smoke, Room.

### **Acid Chapel**

A pulse organ with resonant descending filter steps and a stable sine body beneath. Macros: Step Span, Resonance, Steady Body, Space.

### **Orbiting Mixture**

High pipe stops wander in stereo above a steady dark octave foundation. Macros: Orbit, Upper Mixture, Foundation, Deep Space.

## **Electric keys - 20**

### **Velvet Tines**

A rounded sine body with a short high tine and soft chorus. Macros: Tine, Body Length, Chorus, Room.

### **Suitcase at Midnight**

A smoky low electric key with slow stereo movement and a muted attack. Macros: Open Lid, Stereo Swing, Tremolo, Room.

### **Chrome Tine Strike**

A sharp metallic tine over a clean body with a quick high-partial decay. Macros: Metal, Hammer, Ring Length, Room.

### **Amber Reed Piano**

A gently driven triangle and narrow pulse give a woody reed-piano bite. Macros: Bark, Reed, Open Tone, Length.

### **Roadhouse Bark**

A thick low reed strike with a hard filter attack and short dirty tail. Macros: Bark, Grind, Body, Room.

### **Silver Screen EP**

A glossy phase-modulated key with a bright bell edge and wide chorus. Macros: Glass, Chorus, Long Ring, Space.

### **Porcelain Droplets**

A small hollow mallet-like key with a short bell transient and uneven stereo echoes. Macros: Hollow, Length, Echo, Echo Tail.

### Rubber Mallet Keys

A thick rounded mallet with a brief low-pass knock and dry release. Macros: Knock, Roundness, Body, Room.

### Pocket Clav

A tight pulse pluck with a nasal attack for rhythmic single-note funk lines. Macros: Pickup, Snap, Length, Drive.

### Wah Wire Clav

A bright plucked string-like pulse swings through an envelope-driven resonant wah. Macros: Wah Travel, Wah Time, Resonance, Room.

### Phaser Pocket

A dry triangle-saw pluck passes through a broad, slow phaser. Macros: Phase, Phase Rate, Length, Room.

### Neon Tremolo EP

A long bright tine tone pulses quickly with a steady low body underneath. Macros: Tremolo, Rate, Foundation, Chorus.

### Cassette Living Room

A dark, softly struck electric key with pitch drift and a worn chorus haze. Macros: Tape Wobble, Tone, Chorus, Room.

### Broken Amplifier Keys

A dirty midrange reed key with a sharp attack and compact distorted body. Macros: Overdrive, Edge, Pickup, Room.

### Subway Octave Keys

A low rounded electric piano body with a short bright octave strike. Macros: Octave Strike, Low Length, Bite, Room.

### Celestial Keybed

A clear long bell attack floats over a delayed, swelling soft octave halo. Macros: Halo, Metal, Bloom, Space.

### Reverse Felt Keys

A soft rising key layer blooms behind a small immediate mallet strike. Macros: Rise Time, Mallet, Glow, Space.

### Copper Chime Circuit

An inharmonic phase-modulated strike with a darker clean fundamental beneath. Macros: Metal, Clean Body, Shade, Echo.

## Stepping Crystal Keys

A long crystalline electric key changes brightness in descending steps. Macros: Step Depth, Step Rate, Crystal, Echo.

## Dusk and Spark

A quick bright digital strike gives way to a warmer, slower reed-like body. Macros: Spark Length, Warm Body, Reed Edge, Room.

## Tuned percussion - 20

### Rosewood Marimba

A dark hollow wooden bar with a soft fundamental and short upper knock. Macros: Knock, Body, Darker Mallet, Space.

### Bamboo Hollow

A light hollow tube strike with a brief upper octave and dry tail. Macros: Tube Overtone, Length, Darker Mallet, Space.

### Low Log Drum

A deep woody impact with a rounded low body and a quick bright tap. Macros: Tap, Body, Darker Mallet, Space.

### Hardwood Xylophone

A hard high wooden bar with a thin fifth partial and a sharply decaying attack. Macros: Hardness, Length, Darker Mallet, Space.

### Soft Felt Vibes

A softly struck metallic bar with gentle chorus and a rounded long ring. Macros: Metal, Ring, Darker Mallet, Space.

### Motor Vibes

A bright vibraphone-like bar with a pulsing decay and clear fundamental. Macros: Motor Depth, Motor Rate, Darker Mallet, Space.

### Celesta Sparks

A small bright bell with a clean high register and a compact sparkling tail. Macros: Sparkle, Ring, Darker Mallet, Space.

### Music Box Teeth

A tiny metallic pluck with a dry mechanical tick and an inharmonic upper edge. Macros: Teeth, Tick, Darker Mallet, Space.

### Thumb Piano Copper

A rounded thumb-piano-like pluck with a brief copper overtone. Macros: Tine, Metal, Darker Mallet, Space.

### Steel Bowl Notes

A hollow tuned steel strike with a softly ringing inharmonic shell. Macros: Shell, Fundamental, Darker Mallet, Space.

### Bronze Gamelan

A bright bronze attack beats against a slightly offset ringing companion. Macros: Bronze, Beating Layer, Darker Mallet, Space.

### Temple Bell Low

A low bell body with a higher metallic crown and a long dark decay. Macros: Crown, Metal, Darker Mallet, Space.

### Glass Prism

A clear struck glass note with a narrow, high crystalline edge. Macros: Prism, Ring, Darker Mallet, Space.

### Ice Droplet Echo

A short cold glass plink with staggered repeats in the stereo field. Macros: Ice Edge, Echo, Darker Mallet, Space.

### Ceramic Handpan

A mellow ceramic-like strike with a short upper octave and warm resonant body. Macros: Rim, Body, Darker Mallet, Space.

### Rubber Resonator

A short elastic mallet with a resonant filter knock and very little room. Macros: Knock Sweep, Resonance, Darker Mallet, Space.

### Iron Rail Strike

A hard industrial pitched strike with phase-modulated clang and filter grit. Macros: Clang, Grind, Darker Mallet, Space.

### Orbiting Chimes

A long bright chime moves through stereo above a steady quiet low tone. Macros: Orbit, Foundation, Darker Mallet, Space.

### Stepped Alloy

A long metallic strike changes colour in descending filter steps. Macros: Step Span, Step Rate, Darker Mallet, Space.

## **Distant Foundry Gong**

A low metallic impact opens into a softer delayed ringing cloud. Macros: Gong Edge, Cloud, Darker Mallet, Space.

## **Synth percussion - 20**

### **Deep Circuit Kick**

A deep sine kick with a fast pitch fall and clean low tail. Macros: Punch, Tail, Body Level, Room.

### **Compact Punch Kick**

A compact triangle kick with a short click and quick low-end decay. Macros: Click, Punch Time, Body Level, Room.

### **Furnace Kick**

A saturated low kick with a rough upper edge and heavy falling attack. Macros: Drive, Tail, Body Level, Room.

### **Elastic Electro Kick**

A rounded electronic kick with an exaggerated rubbery pitch descent. Macros: Drop Time, Metal Edge, Body Level, Room.

### **Paper Snap Snare**

A short pitched body under a crisp high-passed noise snap. Macros: Snap, Wire Tail, Body Level, Room.

### **Steel Room Snare**

A metallic shell strike and broad noise tail in a small room. Macros: Shell, Wire Tail, Body Level, Room.

### **Dusty Drum Machine**

A dark triangle thud with a soft pink-noise rattle and short release. Macros: Rattle, Darkness, Body Level, Room.

### **Industrial Snare Slab**

A hard driven shell punches through a coarse noise burst. Macros: Shell Grind, Noise Tail, Body Level, Room.

### **Double Palm Clap**

Two offset band-limited noise strikes create a compact synthetic handclap. Macros: Flam Spacing, Clap Tail, Body Level, Room.

### **Warehouse Clap**

A bright noise clap with a delayed second strike and a broad room tail. Macros: Second Clap, Room Tail, Body Level, Room.

### **Needle Closed Hat**

A very short bright noise tick with a clean high-pass edge. Macros: Open Length, Shade, Body Level, Room.

### Silver Open Hat

A sustained bright noise sizzle with a softer release. Macros: Sizzle Length, Shade, Body Level, Room.

### Alloy Hat Cluster

Inharmonic square-wave partials mix with noise for a sharp metallic hat. Macros: Metal, Open Length, Body Level, Room.

### Sand Shaker

A soft band-limited noise brush with a rounded onset and quick decay. Macros: Brush Length, Brightness, Body Level, Room.

### Neon Floor Tom

A deep synthetic tom with a gentle downward bend and rounded body. Macros: Bend, Tail, Body Level, Room.

### Laser Rack Tom

A higher phase-modulated tom with a quick descending laser-like attack. Macros: Laser Bend, Shell, Body Level, Room.

### Voltage Rim Click

A very short metallic rim-like click with a low wooden knock beneath. Macros: Metal Rim, Wood Body, Body Level, Room.

### Synthetic Cowbell

Two square pitches form a dry, clangorous cowbell-like hit. Macros: Second Prong, Length, Body Level, Room.

### Arcade Laser Zap

A bright electronic zap with a long pitch fall and a short stereo echo. Macros: Fall Time, Echo, Body Level, Room.

### Broken Satellite Hit

A metallic noise impact followed by a delayed hollow resonant fragment. Macros: Debris, Second Impact, Body Level, Room.

## Woodwinds - 20

### Willow Flute

A rounded flute-like sine tone with a soft breath edge. Macros: Breath, Open Tone, Vibrato, Room.

### Cedar Alto Flute

A warm low flute with a woody triangle body and gentle air. Macros: Wood, Air, Vibrato, Room.

### Silver Piccolo

A clear high flute with a small upper octave and crisp articulation. Macros: Octave Edge, Breath, Vibrato, Room.

### Bamboo Breath

A hollow triangle flute with a short breath puff at each onset. Macros: Breath Puff, Puff Length, Vibrato, Room.

### Panpipe Steps

A short breathy flute note for separated melodic figures. Macros: Length, Air, Vibrato, Room.

### Concert Whistle

A clear near-sine whistle with a small breath component and modest glide. Macros: Breath, Glide, Vibrato, Room.

### Low Penny Whistle

A soft hollow whistle with triangle warmth and a quiet octave. Macros: Overblow, Brightness, Vibrato, Room.

### Frosted Air Whistle

A pure pitched center surrounded by a separate high breath layer. Macros: Air Layer, Slow Entry, Vibrato, Room.

### Ebony Clarinet

A dark square-wave reed with restrained upper harmonics and gentle articulation. Macros: Register, Reed Pressure, Vibrato, Room.

### Bass Clarinet Shade

A deep woody square reed with a soft onset and rounded low end. Macros: Open Register, Breath, Vibrato, Room.

### Bright Chalumeau

A nimble square-and-triangle reed with a pronounced upper register. Macros: Upper Register, Tone, Vibrato, Room.

### Muted Reed Solo

A restrained narrow pulse reed with a warm, intimate tone. Macros: Reed Colour, Edge, Vibrato, Room.

### Amber Oboe

A nasal pulse reed over a quiet rounded foundation. Macros: Vowel, Body, Vibrato, Room.

### English Horn Dusk

A lower mellow reed with a broad nasal band and soft lower body. Macros: Reed Band, Warmth, Vibrato, Room.

### **Bassoon Timber**

A low buzzy reed softened by the filter, with a little breath grain. Macros: Buzz, Grain, Vibrato, Room.

### **Bold Double Reed**

A bright assertive pulse reed with light saturation and quick response. Macros: Pressure, Reed Edge, Vibrato, Room.

### **Breathing Reed Choir**

Two softly detuned reeds form a broad breathy sustained voice. Macros: Second Reed, Ensemble, Vibrato, Room.

### **Wandering Flute**

A sustained flute moves gently across stereo above a quiet stationary body. Macros: Wander, Body, Vibrato, Room.

### **Glass Reed Hybrid**

A rounded reed gains a subtle crystalline phase-modulated edge. Macros: Glass, Reed Body, Vibrato, Room.

### **Moonlit Breath Lead**

A slow airy flute voice blooms into a spacious echoing lead. Macros: Breath, Echo, Vibrato, Room.

## **Everyday basses and leads - 20**

### **Foundation Sine**

A clean sine foundation with a short release and no effects. Macros: Body, Release, Weight, Room.

### **Round Triangle Bass**

A rounded triangle bass with a little harmonic definition. Macros: Tone, Warmth, Weight, Room.

### **Everyday Saw Bass**

A single filtered saw with a modest envelope punch and steady body. Macros: Bite, Open Tone, Weight, Room.

### **Pocket Square Bass**

A compact square bass with a hollow middle and controlled upper edge. Macros: Tone, Body, Weight, Room.

### **Dry Pulse Bass**

A narrow pulse bass with a quick attack for clear rhythmic lines. Macros: Pulse Shape, Length, Weight, Room.

### **Soft Pluck Bass**

A simple rounded pluck that leaves space between notes. Macros: Pluck, Length, Weight, Room.

### **Firm Finger Bass**

A warm triangle-saw bass with a short opening transient. Macros: Attack Tone, Weight, Weight, Room.

### **Octave Support Bass**

A clean low sine supported by a quiet upper triangle octave. Macros: Upper Octave, Shade, Weight, Room.

### **Gentle Glide Bass**

A mellow saw bass with a small amount of glide for connected phrases. Macros: Glide, Tone, Weight, Room.

### **Warm Edge Bass**

A restrained driven triangle bass with a readable midrange. Macros: Edge, Shade, Weight, Room.

### **Plainspoken Saw**

A single warm saw lead with a rounded attack and no effects. Macros: Brightness, Soft Attack, Vibrato, Room.

### **Soft Square Solo**

A mellow square lead with clear note definition and a gentle release. Macros: Tone, Soft Entry, Vibrato, Room.

### **Clear Sine Lead**

A clean sine lead for simple melodic lines and understated doubling. Macros: Warmth, Release, Vibrato, Room.

### **Triangle Ribbon**

A soft triangle lead with a little glide and a smooth finish. Macros: Glide, Tone, Vibrato, Room.

### **Narrow Pulse Solo**

A dry pulse lead with a focused nasal tone and quick articulation. Macros: Pulse Shape, Tone, Vibrato, Room.

### **Subtle Twin Saw**

Two lightly detuned saws add a small amount of width without a large effect wash. Macros: Second Saw, Brightness, Vibrato, Room.

### **Clean Pluck Lead**

A short triangle-saw pluck for simple hooks and repeating figures. Macros: Pluck Edge, Length, Vibrato, Room.

### **Rounded Octave Lead**

A smooth triangle melody voice with a quiet sine octave above it. Macros: Octave, Shade, Vibrato, Room.

### **Quiet Reed Lead**

A mild pulse reed with a warm upper edge and little processing. Macros: Reed Colour, Open Tone, Vibrato, Room.

Easy Singing Lead

A rounded saw-triangle lead with gentle glide and wheel-controlled vibrato. Macros: Glide, Brightness, Vibrato, Room.

Splice & NUKE - Rupture preset notes

Twenty aggressive moving sounds. All combine Splice, NUKE, oscillator coupling and assigned performance controls.

Playing the bank

Open PRESETS > Mono > Showcase Banks > Splice & NUKE - Rupture.

Hold a note to start the programmed motion. Bass and evolving patches are demonstrated at MIDI 36; leads at MIDI 60; rhythms and metallic patches at MIDI 48. Arp presets also respond to held chords. Motion uses Free timing so it works immediately without a running DAW transport; change Motion to Host if you want tempo sync. Latch is off.

Eight named macros: **Splice, Grain speed, Jump, Violence, Open filter, Resonance, Echo, Second layer**. All have active assignments. Mod wheel adds grain jitter. Second layer brings in a separately configured octave layer, even where its initial level is zero.

In PRESETS, use **Refresh**, then **Mono > Showcase Banks > Splice & NUKE - Rupture** with the complete factory collection installed. Each patch also has its own descriptive comment.

Patch list

| Patch                 | Motion           | Main distortion | Character                                                                               |
|-----------------------|------------------|-----------------|-----------------------------------------------------------------------------------------|
| 01 - Concrete Teeth   | Sequence · 8 Hz  | NUKE Tear       | Stomping PM-chain bass; short splices and NUKE Tear chew through a syncopated sequence. |
| 02 - Rebar Guillotine | Sequence · 7 Hz  | NUKE Gated Fuzz | Gated-fuzz bass with parallel PM, clipped step accents and octave drops.                |
| 03 - Shrapnel Engine  | Sequence · 10 Hz | NUKE Wavefold   | Fast free-rate splices slash across wavefold bass; sync and ring add mechanical bite.   |
| 04 - Blacktop Crusher | Arp · 5 Hz       | NUKE Tear       | Low, wide tearing bass with slow grain movement and a distorted Sub foundation.         |

| Patch                    | Motion           | Main distortion | Character                                                                              |
|--------------------------|------------------|-----------------|----------------------------------------------------------------------------------------|
| 05 - Reactor Ratchet     | Sequence · 9 Hz  | NUKE Gated Fuzz | Ratcheted gated-fuzz sequence, key-related splices and a resonant filter jab.          |
| 06 - Faultline Stalker   | Sequence · 6 Hz  | NUKE Wavefold   | Uneven seven-step wavefold bass; the rate and filter crawl against the pattern.        |
| 07 - Arc Welder          | Sequence · 8 Hz  | NUKE Tear       | Saw-sync tearing lead with electric upper harmonics and short stereo echoes.           |
| 08 - Razor Choir         | Arp · 6 Hz       | NUKE Wavefold   | Layered detuned wavefold lead; long splices smear the edges while the arp climbs.      |
| 09 - Siren Autopsy       | Sequence · 9 Hz  | NUKE Gated Fuzz | Biting pulse lead; feedback PM and a rising sequence pull against unstable grains.     |
| 10 - Chrome Venom        | Sequence · 7 Hz  | NUKE Tear       | Key-tracked tearing lead, octave PM and sweeping stereo phaser.                        |
| 11 - Rivet Swarm         | Sequence · 12 Hz | NUKE Gated Fuzz | Rapid ring-modulated fuzz stabs with crackle noise, ratchets and hard step modulation. |
| 12 - Broken Transmission | Arp · 10 Hz      | NUKE Tear       | Stepped radio-metal chatter: NUKE Tear, asymmetric PM and unpredictable grain timing.  |
| 13 - Chainblade Ritual   | Sequence · 7 Hz  | NUKE Wavefold   | Three-oscillator wavefold chain in an eleven-step pattern with alternating accents.    |
| 14 - Hydraulic Panic     | Sequence · 8 Hz  | NUKE Gated Fuzz | Sync-driven gated fuzz with pumping filter motion and gritty stereo echoes.            |
| 15 - Scrap Cathedral     | Sequence · 4 Hz  | NUKE Wavefold   | Metallic ring-and-PM sequence through wavefold, phaser and a restrained dark reverb.   |

| Patch                 | Motion            | Main distortion | Character                                                                                                   |
|-----------------------|-------------------|-----------------|-------------------------------------------------------------------------------------------------------------|
| 16 - Ionized Wreckage | Arp · 6 Hz        | NUKE Tear       | High-rate splices and parallel PM make an unstable, tearing metallic arpeggio.                              |
| 17 - Pressure Breach  | Sequence · 1.4 Hz | NUKE Tear       | Slow, heavy tearing texture with a long grain crossfade and deep sub pressure.                              |
| 18 - Rust Storm       | Sequence · 1.8 Hz | NUKE Gated Fuzz | Noise-laced gated fuzz with irregular grains, slow ring movement and dark space.                            |
| 19 - Event Horizon    | Sequence · 1 Hz   | NUKE Wavefold   | Wavefold drone with a shifting PM loop, slow stepped filter and distant echoes.                             |
| 20 - Terminal Rupture | Arp · 11 Hz       | NUKE Tear       | The full stack: three Splice readers, three NUKE shapers, PM, sync, ring, dual layers and ratcheted motion. |

Save useful variations under a new name and compare them at a comfortable output level.

## Showcase preset notes

### Distortion - Tempered Violence

Open PRESETS > Mono > Showcase Banks > Distortion - Tempered Violence. This collection contains 30 patches. The suggested tempo is a starting point; synced Motion follows host tempo while the transport runs. Use the macros to explore each sound, then save a variation.

Each patch has eight named macros: Heat, Character (or Asymmetry), Focus, Body, Touch, Parallel, Movement and Space (or Darken). They explore drive, model color, pre-tone, clean bass/post-filter, positive-versus-negative Dynamics, wet blend, motion speed and ambience. All are saved at their starting position. Try moderate combinations as well as extremes. These original bank designs use Mono mode: hold a note for pads and textures; held chords can supply notes to an arpeggiator. Master clipping bounds the examples; it is part of their sound, not a global change to the synthesizer.

| Preset          | Style | Featured model / placement | Timing / BPM | Starting point                                          |
|-----------------|-------|----------------------------|--------------|---------------------------------------------------------|
| 01 Copper Jaw   | Bass  | Tube / Layer A             | Free / 110   | A clean sub foundation under touch-sensitive Tube grit. |
| 02 Rust Current | Bass  | Tape / Sub A               | Free / 88    | Tape wear on the sub itself, against a lean saw edge.   |

| Preset              | Style    | Featured model / placement    | Timing / BPM      | Starting point                                                             |
|---------------------|----------|-------------------------------|-------------------|----------------------------------------------------------------------------|
| 03 Iron Underbelly  | Bass     | Fuzz / Layer A                | 7 steps / 126     | Seven-step gated fuzz with a preserved bass floor.                         |
| 04 Black Teeth      | Bass     | Diode / Osc 1 A               | 5 steps / 132     | Asymmetric oscillator drive before the filter, with a five-step bite.      |
| 05 Faultline Pulse  | Bass     | Fold / Layer A                | Free / 104        | Folded phase modulation rides over a clean low band.                       |
| 06 Concrete Relay   | Bass     | Hard Clip / Layer A           | Swung / 120       | Thirteen-step hard clipping with alternating short and held gates.         |
| 07 Molten Wire      | Lead     | Tube / Osc 1 A                | Free / 108        | A pressure-sensitive tube lead with a rising drive envelope.               |
| 08 Feral Choir      | Lead     | Fuzz / Layer A                | Free / 112        | Wide gated fuzz; negative Dynamics keeps quieter tails gritty.             |
| 09 Voltage Fang     | Lead     | Diode / Osc 3 A               | Free / 140        | Distorted third oscillator and ring-modulated bite.                        |
| 10 Glass Hook       | Lead     | Rectify / Layer A             | Arpeggiated / 118 | Rectified arpeggios with moving Character and dotted echoes.               |
| 11 Velvet Circuit   | Keys     | Saturation / Master           | Free / 90         | Master saturation turns rounded keys into struck velvet.                   |
| 12 Worn Neon        | Keys     | Tape / Osc 2 A                | Arpeggiated / 94  | Tape-treated second oscillator, unequal arpeggio accents and short echoes. |
| 13 Broken Bell      | Keys     | Original Rectify / Layer A    | Free / 84         | The original full-wave Rectify curve on a phase-modulated bell.            |
| 14 Porcelain Sparks | Keys     | Fold / Osc 1 A                | Free / 116        | A plucked fold envelope reveals bright, brittle harmonics.                 |
| 15 Factory Teeth    | Sequence | Fuzz / Layer A                | 16 steps / 136    | Sixteen-step fuzz machinery with repeated accents and ratchets.            |
| 16 Stutter Quarry   | Sequence | Crush / Layer A               | 7 steps / 122     | Seven-step crushing with an independent stepped modulation rhythm.         |
| 17 Tripwire Loom    | Sequence | Diode / Layer A               | Triplet / 102     | Twelve-step triplet diode pattern, linked tilt and staggered accents.      |
| 18 Crooked Voltage  | Sequence | Fold / Layer A                | Swung / 114       | Nine-step swung folding; modulation gradually changes the emphasis.        |
| 19 Shard Conveyor   | Sequence | Original Wavefolder / Layer A | 11 steps / 128    | Eleven-step original Wavefolder with 8x reconstruction.                    |

| Preset               | Style        | Featured model / placement    | Timing / BPM       | Starting point                                                                   |
|----------------------|--------------|-------------------------------|--------------------|----------------------------------------------------------------------------------|
| 20 Rivet Code        | Sequence     | Hard Clip / Osc 1 A           | 16 steps / 144     | Sixteen hard-clipped steps with three-hit bursts and a narrow echo.              |
| 21 Ember Cathedral   | Pad          | Tube / Osc 2 A                | Slow evolving / 76 | Slow tube bloom on the second oscillator, balanced by a clean fundamental.       |
| 22 Cinder Aurora     | Pad          | Tape / Layer B                | Slow evolving / 72 | Two layers: a warm foundation and a tape-worn upper halo.                        |
| 23 Polar Fracture    | Pad          | Rectify / Layer A             | Slow evolving / 82 | Rectification adds glass to a slow phase-modulated pad.                          |
| 24 Glass Tectonics   | Pad          | Fold / Layer A                | Slow evolving / 68 | Very slow tilt movement through folded, detuned partials.                        |
| 25 Velvet Fallout    | Pad          | Saturation / Master           | Slow evolving / 64 | Softer saturation and clean lows show the restrained end of the bank.            |
| 26 Digital Scree     | Texture      | Crush / Layer A               | Free / 96          | Spliced oscillator fragments meet bit reduction and free-running motion.         |
| 27 Incinerator Teeth | Experimental | Distortion / Custom wave      | Free-running       | A custom-wave distortion texture; explore the named macros and save a variation. |
| 28 Arc Hammer        | Percussion   | Diode / Noise A               | Free / 124         | A short noise burst through asymmetric drive and a fast envelope.                |
| 29 Splinter Drum     | Percussion   | Original Wavefolder / Osc 1 A | Free / 132         | Phase-modulated low percussion with original Wavefolder splinters.               |
| 30 Terminal Violence | Experimental | Distortion / Custom wave      | Free-running       | A dense custom-wave distortion sound; increase performance controls gradually.   |

Try **01 Copper Jaw** for clean lows under Tube grit, **15 Factory Teeth** for ratcheted Fuzz, **18 Crooked Voltage** for a swung nine-step Fold pattern, **21 Ember Cathedral** for a long Tube pad, **26 Digital Scree** for Crush plus Splice, and **30 Terminal Violence** for Tape/Fold with Grain. Release notes to hear finite tails; none uses Freeze or latching.

## Dynamics - Living Pressure

Twenty factory sounds demonstrate Clean, Glue, Opto and FET, Color and Smash, gating, limiting and Dynamics modulation. Hold notes for pads and textures; play short notes for keys and percussion. Run the DAW transport for host-synced sequences and arpeggios. Begin with saved macro positions and move one control at a time.

## Living Current

Find **Mono > Showcase Banks > Motion & LFOs - Living Current**. Hold a key. Presets 01-05 step upward and downward; 06-15 evolve continuously. The first five use free-running Motion. No DAW transport is required. The Speed macro controls step rate on 01-05 and filter LFO rate on 06-15.

Eight macros: **Brightness, Motion, Speed, Weight, Heat, Width, Echo, Space**. Zero recalls the authored setting rather than silence. Begin with one macro at a time.

| Preset               | Suggested MIDI | Character                                                                    |
|----------------------|----------------|------------------------------------------------------------------------------|
| 01 Basalt Staircase  | 36             | A thick minor staircase climbs and falls over a sine sub.                    |
| 02 Copper Escalator  | 48             | Wide octave-and-fifth steps rise and descend through tape warmth.            |
| 03 Velvet Switchback | 48             | Round pulse-width movement follows a bright pentatonic rise and fall.        |
| 04 Prism Terraces    | 48             | Glassier phase-modulated minor steps reach upward and tumble down.           |
| 05 Titan Elevator    | 36             | Huge fourth-and-fifth stair steps, octave drops and a solid sub floor.       |
| 06 Continental Drift | 36             | Slow breathing double-saw bass with detuned weight and protected lows.       |
| 07 Solar Brass Tide  | 48             | A broad brass-like swell with an octave halo and moving brightness.          |
| 08 Liquid Velvet     | 48             | Silky pulse-width waves and rounded tape color flow across the stereo field. |
| 09 Magnetic Maw      | 36             | A resonant growling bass with slowly shifting asymmetric harmonics.          |
| 10 Chromatic Nebula  | 48             | A fifth-above halo moves through folded, glassy partials.                    |

| Preset             | Suggested MIDI | Character                                                                             |
|--------------------|----------------|---------------------------------------------------------------------------------------|
| 11 Furnace Bloom   | 48             | Dense detuned double saws bloom through moving tube color.                            |
| 12 Orbiting Reed   | 48             | A hollow reed-like lead with animated pulse width and circling echoes.                |
| 13 Amber Undertow  | 48             | A dark, heavy pad slowly opens beneath a warm octave layer.                           |
| 14 Ion Weather     | 48             | Sample-and-hold filter changes and phase modulation create shifting electrical color. |
| 15 Leviathan Choir | 48             | The widest sound: a massive moving saw choir with a fifth layer and deep body.        |

## Haunted Depths

Find **Mono > Showcase Banks > LFO Modulation - Haunted Depths**. Hold one low note, starting at MIDI 36, and allow 15-30 seconds for movement to unfold. Stable low fundamentals support semitone friction, tritones, phase modulation and layered swells. Release the key to let the tail decay. These are held-key drones, not latched patches.

Eight macros: **Brightness, Motion, Speed, Weight, Heat, Width, Echo, Space**. Zero recalls the authored setting rather than silence. Begin with one macro at a time.

| Preset               | Suggested MIDI | Character                                                                             |
|----------------------|----------------|---------------------------------------------------------------------------------------|
| 01 Crypt Pressure    | 36             | Deep double-saw pressure with a faint minor-second beat and slow filter breathing.    |
| 02 Drowned Cathedral | 36             | A heavy organ-like foundation beneath a semitone apparition and long dark echoes.     |
| 03 Iron Sarcophagus  | 36             | An iron tritone grinding against a stable sub, with moving phase-modulated overtones. |

| Preset                     | Suggested MIDI | Character                                                                                       |
|----------------------------|----------------|-------------------------------------------------------------------------------------------------|
| 04 Widow Choir             | 36             | A wide pulse choir with a semitone shadow and drifting high dissonance.                         |
| 05 Buried Machinery        | 36             | Uneven sample-and-hold filter motion over a grinding motor and brown-noise grit.                |
| 06 Black Tidal Mass        | 36             | A slow, dark tidal swell carrying a distant tritone halo above a weighty root.                  |
| 07 Seance Wires            | 36             | Inharmonic wire-like tones and wavering pitch above a solid sine-sub foundation.                |
| 08 Mausoleum Breath        | 36             | Air-noise breaths and hollow pulse-width motion around a close dissonant interval.              |
| 09 The Crawling Vault      | 36             | A descending filter contour exposes a rough tritone growl and independently moving upper voice. |
| 10 Frozen Bell Pit         | 36             | Cold phase-modulated bell partials and a tritone halo suspended above deep bass.                |
| 11 Hollow Procession       | 36             | A hollow drone with a regular filter pulse, semitone friction and slow internal beating.        |
| 12 Graveyard Radio         | 36             | Crackling noise and irregular filter steps through a discordant, phase-modulated radio haze.    |
| 13 Wraith Undertow         | 36             | Broad low saws with an offset semitone layer and slow overlapping swells.                       |
| 14 Fault Beneath the Altar | 36             | A resonant bass fault line with metallic tritone pressure and restless pitch drift.             |

| Preset               | Suggested MIDI | Character                                                                                 |
|----------------------|----------------|-------------------------------------------------------------------------------------------|
| 15 Leviathan Requiem | 36             | A massive layered finale: detuned low saws, a tritone halo and a crawling semitone voice. |

## Echo Atlas

Find **Mono > Showcase Banks > Stereo Delay - Echo Atlas**. Play a short note or phrase, then leave room for the echoes. Most sounds use short decaying envelopes; hold Reversing Choir or Violet Comet for one or two seconds. Some repeats stay centered, others alternate sides or use unequal stereo times. All delays initially use free millisecond timing. Chord-like patches build intervals inside one played note; These original bank designs use Mono mode.

Eight macros: **Echo, Repeats, Tone, Wobble, Character, Speed, Body, Time**. Zero recalls the authored setting rather than silence. Begin with one macro at a time.

| Preset                     | Suggested MIDI | Character                                                                            |
|----------------------------|----------------|--------------------------------------------------------------------------------------|
| 01 Submarine Morse         | 36             | Centered sine-bass pings recur as a long, clear Morse-like trail.                    |
| 02 Prismatic Bell Ladder   | 60             | Glass bells bounce left and right on unequal times, with gently changing brightness. |
| 03 Dub Chord Relic         | 48             | A minor chord stab feeds centered tape echoes that darken and compress on each pass. |
| 04 Bamboo Courtyard        | 55             | Short hollow wooden plucks form a dry, interlocking left/right echo rhythm.          |
| 05 Brass Across the Canyon | 48             | Broad brass stabs answer from opposite sides with widely separated canyon repeats.   |
| 06 Reversing Choir         | 55             | A soft choir swell returns as backward breaths with a slowly changing stereo width.  |

| Preset                 | Suggested MIDI | Character                                                                                      |
|------------------------|----------------|------------------------------------------------------------------------------------------------|
| 07 Rusted Satellite    | 48             | Metallic strikes leave cross-fed echoes whose resonant, driven tone keeps shifting.            |
| 08 Amber String Memory | 52             | Muted string-like plucks dissolve into centered, progressively mellow BBD repeats.             |
| 09 Clockwork Crystal   | 67             | Bright keyed droplets build an asymmetric three-against-four repeat pattern.                   |
| 10 Storm Drain         | 60             | A filtered noise hit scatters into gritty alternating echoes, like rain in a metal drain.      |
| 11 Rubber Room         | 36             | A resonant rubbery bass pluck trails pitch-wobbled echoes with shifting crossfeed width.       |
| 12 Chapel of Seconds   | 48             | A rounded organ chord unfolds into stately, overlapping echoes at a three-to-two ratio.        |
| 13 Violet Comet        | 60             | A bowed synth swell leaves drifting tape trails; a little diffusion softens only their edges.  |
| 14 Porcelain Ricochet  | 72             | Tiny bright clicks ricochet in a fast, tightly defined ping-pong pattern.                      |
| 15 Beacon Beyond Time  | 48             | A thick fifth-based beacon bounces clearly before a second reverse delay answers farther away. |

Echo raises the primary delay mix; Repeats lengthens feedback; Tone opens its feedback low-pass; Wobble and Speed control audible pitch instability; Character adds model-dependent color; Body opens the source filter; Time lengthens the primary left delay while the right remains independent. Patch 15 adds a quieter second reverse delay. Most patches use little or no diffusion, keeping repeats distinct. No reverb is used in this bank.

## Existing User versions

These banks retain the IDs used by their earlier separate installers. A saved User version takes priority over the factory copy, so upgrades preserve personal edits without a second visible copy. Back up the whole User folder before reorganizing your library. Preset counts shown in older screenshots may include personal additions and filters.

## Nuclear Textures - thirty factory presets

Three distinct sounds per NUKE algorithm: low foundations, moving textures and atmospheric sounds. Included in the original collection retained by the instrument.

### Play and shape

Start near each preset's suggested MIDI note. Hold notes to hear evolving modulation; the rhythmic presets pulse internally and work with the DAW transport stopped. These original bank designs use Mono mode. These are playable textures, not recorded loops or arpeggiated sequences.

Macros start at zero (the authored sound): **Radiation** raises oscillator 1 drive; **Density** increases its saturation; **Brightness** opens the filter; **Motion** speeds up LFO 1; **Space** raises delay mix; **Decay** lengthens the echo feedback; **Foundation** adds clean sub; **Edge** increases filter resonance. The mod wheel adds brightness. Some low textures remain centered, while others have stereo unison, panning, or unequal echo times.

Macro ranges start restrained. NUKE can be abrasive, especially on higher notes, so increase the range gradually and use a comfortable Master Output level. The master clipper shapes peaks, while later processing can still change the final level.

## Presets

| Preset             | Algorithm | Suggested MIDI | Character                                                                |
|--------------------|-----------|----------------|--------------------------------------------------------------------------|
| 01 Reactor Heart   | Warm      | 33             | Centered low pressure; slow drive breathing reveals the Warm supply sag. |
| 02 Molten Conveyor | Warm      | 43             | A grinding fifth pulses beneath short tape-like answers.                 |
| 03 Ember Cathedral | Warm      | 55             | Slow, broad swells of warm upper harmonics and gently separated echoes.  |
| 04 Concrete Lung   | Hard Clip | 31             | A dry, blunt bass drone with a breathing low-pass edge.                  |
| 05 Razor Turnstile | Hard Clip | 48             | Chopped pulse edges and short, uneven ricochets.                         |

| Preset                | Algorithm  | Suggested MIDI | Character                                                                   |
|-----------------------|------------|----------------|-----------------------------------------------------------------------------|
| 06 Shattered Halo     | Hard Clip  | 64             | A dissonant high halo with hard clipped ridges and spacious tails.          |
| 07 Crooked Foundation | Asymmetric | 35             | An uneven, nasal bass swell exposes asymmetric saturation.                  |
| 08 Bent Pendulum      | Asymmetric | 50             | A lopsided resonant swing that rolls across the stereo field.               |
| 09 Sickly Aurora      | Asymmetric | 59             | Close semitone beating stretches into a slowly brightening asymmetric veil. |
| 10 Folded Bedrock     | Wavefold   | 29             | Deep sine folds blossom into harmonics above a steady fundamental.          |
| 11 Origami Engine     | Wavefold   | 46             | Rising ramps repeatedly unfold a wiry, mechanical fifth.                    |
| 12 Prismatic Scar     | Wavefold   | 62             | Inharmonic folded glass drifts through a wide, slow spectral sweep.         |
| 13 Fault Pressure     | Tear       | 32             | Rough low tectonic pressure with slow tearing changes and a dry center.     |
| 14 Ripped Current     | Tear       | 45             | Falling modulation ramps pull ragged harmonics into staggered echoes.       |
| 15 Torn Firmament     | Tear       | 57             | A tense major-seventh cloud slowly frays at its edges.                      |
| 16 Black Furnace      | Fuzz       | 28             | A dense centered furnace with a clean sub beneath the root-heavy fuzz.      |
| 17 Velvet Sawblade    | Fuzz       | 47             | A blunt buzzing blade swells rhythmically through a resonant filter.        |
| 18 Ash Choir          | Fuzz       | 60             | A smoky sustained fifth opens gradually into dense, soft-edged fuzz.        |

| Preset                 | Algorithm    | Suggested MIDI | Character                                                                   |
|------------------------|--------------|----------------|-----------------------------------------------------------------------------|
| 19 Sputtering Monolith | Gated Fuzz   | 34             | A low gated mass with irregular stepped pressure changes.                   |
| 20 Geiger Waltz        | Gated Fuzz   | 53             | Stepped gates form a bright, chattering rhythm with offset repeats.         |
| 21 Broken Transmission | Gated Fuzz   | 66             | Thin, haunted transmission fragments hover over a tritone.                  |
| 22 Pixel Bunker        | Bit Crush    | 30             | A heavy, grainy digital bass with an exposed staircase edge.                |
| 23 Quantized Locusts   | Bit Crush    | 56             | Fast random changes drive a brittle swarm of coarse digital harmonics.      |
| 24 Eight Bit Eclipse   | Bit Crush    | 61             | A slow minor-third shadow with sparkling quantized upper edges.             |
| 25 Submerged Clock     | Sample Crush | 27             | Sub-bass clock debris shifts against a stable clean low foundation.         |
| 26 Skipping Relays     | Sample Crush | 49             | Descending steps expose changing sample-hold grit and jagged echoes.        |
| 27 Frozen Telemetry    | Sample Crush | 63             | High, suspended telemetry slowly splinters into shifting digital sidebands. |
| 28 Iron Octave         | Rectify      | 36             | An octave-rich rectified growl anchored by a clean fundamental.             |
| 29 Polar Switchyard    | Rectify      | 51             | Hard rhythmic switching gives the rectified fifth a metallic chatter.       |
| 30 Inverted Dawn       | Rectify      | 58             | A rising, uneasy dawn of octave overtones and broad dissonant beating.      |

## Hole in the Sky and additional factory banks

The rebuilt Hole in the Sky is an included 30-preset factory bank designed for pronounced psychedelic movement. Its families include elastic fuzz, pitch hallucinations, ritual organs, reverse fragments and time distortions. Play a held note long enough for the pitch, stereo and delay movement to unfold, then leave room for the release. The bank is already animated at zero macro values; use its named macros to explore further.

Try Velvet Black Hole, The Floor Is Breathing, Chapel of Bent Light, Backward Garden and Hole in the Sky for contrasting starting points. The factory collection contains the rebuilt versions; any existing personal same-ID User sounds still take priority. Save personal variations under new names and retain a User-folder backup before replacing a bank.

Permanent Waves and the other original banks remain in the instrument library. Keep each bank's accompanying playing notes for suggested registers and macro behavior.

## APPENDICES

# Appendix B / Compatibility and migration

## Keeping earlier projects

Mosasaur Mono 1.30.101 saves sound-state schema 129. Earlier supported sounds are migrated when loaded; older software can reject sounds saved by a newer build. Keep original presets and project copies when updating or downgrading. Sounds using an incompatible Poly mode are rejected without changing the current Mono sound.

## Reverb conversion

Schema 31-62 reverb settings copy Size and Decay to the current HQ tank. High Decay approximates the older damping loss at 8 kHz, bounded to 0.25-4x; Low Decay starts at 1x, the crossovers at 250/4,000 Hz and Build at 0. Schema 63 slots saved with Legacy receive the same conversion; those already using HQ keep their values. Schema 64 and later do not repeat it. Mix, Pre-delay and shared settings stay saved. Original files are not overwritten simply by loading them.

Older Size, Decay and Damping parameters remain as compatibility fields. Existing macro targets drive their HQ equivalents unless a route on the new field takes precedence. Layer matrix Size and Damping movement is translated. Host automation on retired fields may need reassignment to the current named controls. The old reverb-engine selector is inert.

## Trigger behavior

For states older than schema 45, Motion-active patches become Legato and retain their velocity-transition behavior at about 46.05 ms to 99%. With Motion Off, a patch becomes Retrigger only when both earlier layer trigger settings were Retrigger; otherwise it becomes Legato. Motion Off migration uses the 10 ms velocity-transition default. The current Legato/Retrigger switch is shared by both layers.

## LFO shaping

Supported schema 31-52 patches load with Curve 0% and no Curve destinations; Curve was introduced in schema 53. Older timing data loads with Symmetry 50%, Rise/Fall 0 ms and no new Rate routes. Layer Copy, Clear and Undo retain current shaping and timing settings.

## WRECK, NUKE and automation ranges

Pre-schema-74 NUKE choices on the seven subsequently expanded distortion types are converted to 10x to preserve their former sound. Wavefold, Tear and Gated Fuzz keep NUKE selected. Stored native Nasty/Saturation values are retained. Recorded normalized host automation can produce a different span after a range expansion; audition its minimum and maximum in a project copy.

## Older pitch destinations

Legacy Tune 1, Tune 2 and Tune 3 use stored destination indices 9, 15 and 21. The separate Pitch selector uses 1/3/5 for coarse and 2/4/6 for fine; 0 uses the legacy destination. Internal routing combines them as 270-275. Those internal numbers are not additional values of the older stored selector. The effective offset ranges are +/-24 semitones and +/-100 cents, independently of the base tuning knobs.

## Reserved automation parameters

Parameter identities and ordering are retained so older projects can find their controls. A retired or inert field is a compatibility record rather than an extra current feature. Use the current named parameter when recording new automation. The numeric count of internal parameters is not needed to operate the instrument.

## Preset-library storage

The User library stores metadata in Library.xml and sound states in the States folder. Back up both together, along with Backups. When migrating an earlier inline library, the first save/import creates a self-contained Before-Storage-v2-<timestamp>.xml file in User/Backups. Sounds, edits, ratings, notes and categories are retained. Older application versions cannot read the version-2 catalog. Before downgrading, export newer sounds and preserve the complete current folder, then use the matching self-contained backup with the older installation. Portable presets and DAW projects keep their own embedded sound state.

## Other earlier defaults

Older single-frame Custom waves copy their drawing into both frames with Morph at zero. Older sounds without Analog Drift load with Drift off. Earlier Delay data receives neutral Duck, Width +100%, Tilt 0 dB and the compatible timing/target choices. Review effects by ear after an update, especially reverb character and normalized automation ranges.

## APPENDICES

# Appendix C / Glossary and topic finder

| Term             | Meaning in this guide                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Monophonic       | One played-note line at a time. Two layers can combine different timbres on that line.                                                        |
| Unison           | Several detuned copies of one oscillator, rather than independent polyphonic notes.                                                           |
| PM               | Phase modulation: one oscillator changes another oscillator's phase. The routing matrix uses radians of depth.                                |
| Ring modulation  | Multiplication of two source signals, blended with their dry contribution.                                                                    |
| Envelope         | A contour triggered by note activity, typically using attack, decay, sustain and release.                                                     |
| LFO              | A low-frequency modulation generator. It needs a route to change an audible parameter.                                                        |
| Via              | A second modulation source that multiplies a matrix route's depth.                                                                            |
| Macro            | A shared performance knob that controls several assigned parameter endpoints.                                                                 |
| Host sync        | Timing derived from the DAW. Behavior when stopped depends on the module.                                                                     |
| Oversampling     | Processing selected stages at a higher internal rate to reduce artifacts, at additional CPU cost.                                             |
| Wet / dry        | Processed / unprocessed contributions to an effect blend.                                                                                     |
| Sidechain or key | The signal a dynamics detector listens to; it can differ from the audio being processed.                                                      |
| Freeze           | Holding a display trace or effect history, according to the feature. Effect history is temporary; a saved Sample recording is embedded audio. |
| Preset bank      | A collection of complete saved sounds with identities and browsing metadata.                                                                  |

## Routing and synthesis terms

**Unison copy:** one detuned/spread copy inside that path. **Carrier:** the audible destination of an interaction. **Modulator:** the source signal changing that destination, which can be muted in the mix. **Expo FM:** exponential pitch modulation displayed in semitones. **Extended PM:** a per-layer mapping reaching 12 radians on cross links. **Scatter Sync:** phase-entry variation on sync events. **Unison Scatter:** timing/gating of audible unison copies. **Dual A+B:** simultaneous custom frames inside one oscillator path. **Study:** a small comparison bank isolating a feature more directly than a performance sound bank.

**Hybrid synthesis:** combines several sound-generation or shaping methods. Mosasaur retains a subtractive oscillator/filter/envelope foundation and adds PM/FM, folding, Logic, custom waves and interaction-signal processing.

## Sampling, performance and measurement terms

| Term            | Practical meaning                                                                |
|-----------------|----------------------------------------------------------------------------------|
| Root            | MIDI reference key for a sample's natural playback rate.                         |
| Region          | Start-End span of a source recording.                                            |
| Loop            | Repeated subregion used to sustain a recording.                                  |
| Key tracking    | How strongly a parameter or playback pitch follows played note.                  |
| Resample        | Record an instrument result to use as new sound material.                        |
| Bake            | Print a layer and neutralize the processing already included in its capture.     |
| Embedded        | Audio/custom data saved inside the sound or project state.                       |
| Managed sample  | Library-owned recording plus metadata, separate from a whole preset.             |
| Prepared data   | Playback/filtering information ready in RAM; additional to disk originals.       |
| Wavetable frame | One repeating waveform in an ordered table.                                      |
| Keyframe        | Marked table anchor for filling intervening frames.                              |
| Warp            | Saved wavetable playback transformation, distinct from editing source frames.    |
| Formant         | A spectral resonance region associated with vowel color.                         |
| Phonation       | Source excitation style, such as breathy or pressed voice.                       |
| Exciter         | Impulse, pluck, noise or oscillator energy feeding a resonant body.              |
| MPE             | MIDI expression assigned to member-channel notes with zone-master contributions. |
| Tuning period   | Interval after which a scale repeats; not necessarily an octave.                 |
| KBM             | Keyboard mapping from MIDI keys to scale degrees.                                |
| Sample peak     | Largest measured digital sample amplitude.                                       |
| True peak       | Estimate of reconstructed between-sample waveform peaks, in dBTP.                |
| RMS             | Average-energy-related amplitude reading over its stated window.                 |
| Crest           | Difference between peak and RMS readings.                                        |
| LUFS            | Loudness measure; a short-term reading needs representative material/time.       |
| Correlation     | Similarity/polarity relationship of two channels.                                |

| Term        | Practical meaning                                                              |
|-------------|--------------------------------------------------------------------------------|
| Tap         | Specific internal point selected for observation or recording.                 |
| DSP Load    | Callback wall time divided by the available audio-buffer time.                 |
| Process CPU | Summed execution across process threads; may exceed one core's 100%.           |
| Dormant     | Expensive unused feature DSP is skipped after needed transitions/tails settle. |
| Latency     | Time added by buffering/processing; different from average CPU use.            |

## Topic finder

| To find                               | Go to                      |
|---------------------------------------|----------------------------|
| Welcome to Mosasaur Mono              | <a href="#">Chapter 1</a>  |
| Installation, updates and backups     | <a href="#">Chapter 2</a>  |
| Build your first patch                | <a href="#">Chapter 3</a>  |
| Finding and using controls            | <a href="#">Chapter 4</a>  |
| Follow the signal                     | <a href="#">Chapter 5</a>  |
| Oscillators, pitch and noise          | <a href="#">Chapter 6</a>  |
| Harmonic Character, WRECK and Splice  | <a href="#">Chapter 7</a>  |
| Unison, Drift, Dual and Scatter       | <a href="#">Chapter 8</a>  |
| Draw custom waves and edit harmonics  | <a href="#">Chapter 9</a>  |
| Wavetables and scanning               | <a href="#">Chapter 10</a> |
| Sample playback                       | <a href="#">Chapter 11</a> |
| Voice and Glottal sources             | <a href="#">Chapter 12</a> |
| Oscillator routing, FM, ring and sync | <a href="#">Chapter 13</a> |
| Route Damage                          | <a href="#">Chapter 14</a> |
| Filters, Filter 2 and Formant         | <a href="#">Chapter 15</a> |
| Envelopes and graphical editing       | <a href="#">Chapter 16</a> |
| Equalization and stereo placement     | <a href="#">Chapter 17</a> |
| Resonance                             | <a href="#">Chapter 18</a> |
| Effects racks and processors          | <a href="#">Chapter 19</a> |

| To find                                 | Go to                      |
|-----------------------------------------|----------------------------|
| Grain                                   | <a href="#">Chapter 20</a> |
| MosaTap                                 | <a href="#">Chapter 21</a> |
| TalkBox                                 | <a href="#">Chapter 22</a> |
| Master Multiband                        | <a href="#">Chapter 23</a> |
| Modulation Matrix and LFOs              | <a href="#">Chapter 24</a> |
| Macros                                  | <a href="#">Chapter 25</a> |
| XY Pad                                  | <a href="#">Chapter 26</a> |
| Motion modulation lanes                 | <a href="#">Chapter 27</a> |
| Arpeggiator and sequencer               | <a href="#">Chapter 28</a> |
| Layers and monophonic performance       | <a href="#">Chapter 29</a> |
| MIDI, MPE and host automation           | <a href="#">Chapter 30</a> |
| Microtuning                             | <a href="#">Chapter 31</a> |
| Presets and backups                     | <a href="#">Chapter 32</a> |
| History, comparison and workflow        | <a href="#">Chapter 33</a> |
| Resample, live capture and Bake         | <a href="#">Chapter 34</a> |
| Your sample library                     | <a href="#">Chapter 35</a> |
| Mixer and Master Output                 | <a href="#">Chapter 36</a> |
| Analyzer                                | <a href="#">Chapter 37</a> |
| Managing CPU and playing response       | <a href="#">Chapter 38</a> |
| Troubleshooting                         | <a href="#">Chapter 39</a> |
| Factory collections and patch notes     | <a href="#">Appendix A</a> |
| Earlier presets, automation and storage | <a href="#">Appendix B</a> |
| Licence, website and support            | <a href="#">Appendix D</a> |

## APPENDICES

# Appendix D / Licence and support

## Mosasaur Mono is free

Mosasaur Mono is a free instrument from Mosasaur Labs. Visit [mosasaurlabs.com](https://mosasaurlabs.com) for downloads, product information and the Contact page.

## Licence and included notices

Open LEGAL in the instrument to read the licence and third-party notices supplied with it. Keep those notices with an authorized redistribution. The licence defines the terms; this guide explains operation.

## Your presets and recordings

You can save your own synth sounds, import recordings and resample Mosasaur into a personal library. Keep source presets and original audio when you want to revise them later. Portable presets embed their sample and custom-wave data, so check the rights to those recordings before sharing a bank.

## Help and bug reports

Email [hello@mosasaurlabs.com](mailto:hello@mosasaurlabs.com) or visit the Contact page at [mosasaurlabs.com](https://mosasaurlabs.com). For a bug report, include Mosasaur Mono's version, your host and macOS versions, sample rate, buffer size and the smallest repeatable steps. An exported preset or short audio example can help explain a sound problem; send only material you are comfortable sharing.

For a performance problem, also include Play and Render quality, Audition Render state, Multicore choice, open inspection windows and whether the problem occurs during live playing, playback or bounce. See the troubleshooting chapter for ways to narrow down the cause.