

INTERPHASE CARTOGRAPH

USER MANUAL

Interactive Phase Distortion Synthesizer · Classic & Extended Architecture

Version 1.0

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1. Welcome

1.1 What Interphase Cartograph Is

Interphase Cartograph is a software synthesizer built around interactive phase distortion synthesis, generally shortened to iPD — the technique used in Casio's VZ-series hardware synthesizers from the late 1980s. Rather than mixing raw oscillator waveforms, iPD pairs two sound-generating **modules** into a **line** and lets one shape the other: bending its phase, or multiplying into it as a ring modulator. The result sits between subtractive and FM synthesis in character — often glassy, bell-like, vocal, or metallic, but equally capable of clean, simple tones when you keep the interaction subtle.

Interphase Cartograph reproduces that engine faithfully, and then extends it. Alongside the original phase and ring interactions it adds two further ways for one module to shape another — amplitude modulation, and through-zero FM — together with more lines, more modules, longer envelopes and a larger waveform bank. These are additions to the iPD concept rather than part of its history: nothing on the original hardware offered them.

The plugin ships with two engine sizes, switchable at any time from the header bar:

- **Classic** reproduces the four-line, eight-module architecture of the original VZ-10M hardware: eight iPD waveforms, four line-interaction modes, and eight-stage envelopes.
- **Extended** roughly doubles the engine: six lines, twelve modules, twelve-stage envelopes, sixteen waveforms, and two additional line-interaction modes — amplitude modulation and through-zero FM. Extended patches have no equivalent on real VZ hardware; they are a modern continuation of the same synthesis idea, built on the same routing concepts described in this manual.

Both engine sizes share the same modulation matrix, pitch envelope, arpeggiator, microtuning system, performance macros, unison engine and randomizer — everything outside the Voice editor's module grid works identically in Classic and Extended mode. Chapter 15 covers what specifically changes between the two.

1.2 How This Manual Is Organized

Chapters 2 through 14 work through the interface in the order you would naturally explore it: the overall layout, then signal routing, the Voice editor, the modulation matrix, the pitch envelope, the patch-level vibrato/tremolo/voice-mode page, the arpeggiator, tuning, the performance macros, unison, the two general-purpose LFOs, the randomizer, and preset management. Chapter 15 goes deeper into the differences between Classic and Extended mode, including how through-zero FM and amplitude modulation actually behave. The appendices at the end collect reference material you'll want to look up rather than read start to finish: the full factory preset library, a parameter range quick-reference, and a glossary.

A few conventions are used throughout:

- Control names are given exactly as they appear on screen — *the Level slider, the Mode menu, the Cross-line Mod toggle*.
- Parameter ranges appear in square brackets after a control's first mention, for example Coarse [-127 to +127 st].
- Screenshots show the plugin in both of its display themes, Cyan and Amber. The two are cosmetically different but functionally identical — see 2.2.

1.3 Installing the Plugin

Interphase Cartograph is distributed as a VST3 plug-in and as a standalone application, both for 64-bit Windows.

VST3 plug-in

Copy the complete **Interphase Cartograph.vst3** folder to:

C:\Program Files\Common Files\VST3\

Then clear your DAW's plug-in cache and rescan, or restart the DAW, so it picks up the new build. If you're upgrading from an earlier version, simply overwrite the existing .vst3 folder — the installer does not need to be run separately.

Standalone application

Interphase Cartograph.exe runs the synthesizer outside of a DAW, using your system's audio and MIDI devices directly. It's useful for auditioning presets, practising, or trying the randomizer without opening a host project.

Presets after installing or updating

The factory preset bank refreshes automatically each time you install a new build; it currently contains 43 presets (see Appendix A). Anything you've saved yourself lives separately and is never touched by an update. Presets are stored on disk under:

Documents\Interphase Cartograph\Presets\Factory\ (read-only, shipped with the plug-in)

Documents\Interphase Cartograph\Presets\User\ (anything you save)

Note

This build of the engine adds the Extended architecture (six lines, twelve modules, amplitude modulation and through-zero FM) alongside the original four-line Classic engine, plus a Weird category in the randomizer biased toward that Extended architecture. Both are covered in full in this manual — see Chapter 15 and 13.2.

2. Interface Overview

The main window is divided into five regions: a header bar, a routing panel down the left side, a tabbed content area in the centre, a column of macro, unison and LFO controls on the right, and a status bar along the bottom. The window can be resized freely between roughly 760×480 and 1280×800 pixels — the whole layout scales rather than reflowing, so nothing rearranges itself as you resize.



The main window, showing the Voice editor tab. Header bar across the top, line routing on the left, macros and LFOs on the right, status bar along the bottom.

2.1 The Header Bar

From left to right, the header bar holds:

Control	What it does
◀ / ▶	Step to the previous or next preset within the browser's current filter and sort order.
Dice icon	Quick-roll: generates a new patch immediately, using whatever flavour, mode and locks are currently set in the randomizer panel (Chapter 13).
...	Opens the randomizer's detail panel — flavour choice, Full/Mutate, section locks and Undo.
■ (stop)	Panic: immediately silences every currently sounding voice. Useful if a patch is stuck on, or after aggressive live tweaking.
Classic / Extended	Switches the engine architecture. See Chapter 15 for exactly what changes.
Patch name field	Shows the name of the currently loaded preset.
Save	Opens the save dialog: name, category and tags for the current patch.

Control	What it does
Browser	Opens the full-window preset browser overlay (Chapter 14).
Cyan / Amber	Toggles the display's colour theme between the two OLED-style palettes. Purely cosmetic — every control behaves identically in either theme.

2.2 Display Themes

Interphase Cartograph's panels are drawn in an OLED-display style borrowed from the era of hardware the synthesis engine descends from. Two colour themes are available — a cool cyan and a warm amber — switched with the button in the top-right corner of the header. This manual's screenshots show both; whichever you prefer, the layout and every control's position and behaviour are identical between them.

2.3 The Routing Panel (Left Column)

The left column lists every line — A through D in Classic mode, A through F in Extended mode — each with its Active toggle, Mode menu, Level, Pan and Cross-line Mod toggle, above a small live diagram of how the lines sum to the output. Clicking a line's name selects it for editing in the Voice editor. Full detail is in Chapter 3.

2.4 The Centre Tab Strip

Six tabs share the centre of the window:

- **Voice editor** — the sixteen-waveform oscillator bank, pitch and amplitude controls, and the per-module envelope, for whichever module is selected (Chapter 4).
- **Mod matrix** — up to sixteen freely assignable modulation routes (Chapter 5).
- **Pitch env** — one global, bipolar pitch envelope shared by the whole voice (Chapter 6).
- **Patch mod** — the patch's own vibrato and tremolo, plus voice mode, glide and total level (Chapter 7).
- **Arp** — the arpeggiator (Chapter 8).
- **Tuning** — the microtuning editor (Chapter 9).

2.5 The Right Column

The right column stays visible whichever centre tab is open, since these are the controls you tend to want reachable while working on any other page:

- **Macros** — six performance knobs (Brightness, Movement, Attack, Depth, Body, Release) that reshape the current patch without touching its programmed parameters (Chapter 10).
- **Unison** — voice count, detune spread, stereo width and the Alias-free oversampling toggle (Chapter 11).
- **LFOs** — LFO 1 and LFO 2, available anywhere in the mod matrix as modulation sources (Chapter 12).

2.6 The Status Bar

The strip along the bottom reads, left to right: the plugin name and version; the current preset's position in the browser's filtered list (for example "10 / 24"); either **Mono** or **Unison xN**; and the live sample rate with the number of voices currently sounding. That voice count is a useful sanity check when a patch has gone quiet or CPU use jumps — it tells you whether notes are reaching the voice engine at all.

3. Signal Routing and Lines

3.1 Lines and Modules

Every voice is built from a set of **lines** — four in Classic mode (A–D), six in Extended mode (A–F). Each line is a pair of **modules**: an odd module (M1, M3, M5...) and an even module (M2, M4, M6...). A module is one oscillator, one amplitude envelope and one DCA (digitally controlled amplifier) — see Chapter 4 for what's inside one. A line's Mode setting decides how its two modules interact, and the line's own Level and Pan then place the combined result in the final mix.

The routing panel on the left of the window lists every line with, for each one:

- **Active** — a toggle enabling or disabling the whole line. An inactive line contributes nothing to the output (its modules still exist and can still be edited; they simply aren't heard).
- **Mode** — the interaction mode described in 3.2 below.
- **Level [0–99]** — the line's own output level, applied after its two modules have already been mixed or interacted according to Mode.
- **Pan [-1.0 to +1.0]** — stereo placement for the line as a whole.
- **Cross-line Mod** — described in 3.3.

Click a line's name to select it; the Voice editor's module tabs then show that line's odd and even modules (labelled M1/M2 for Line A, M3/M4 for Line B, and so on). The routing panel also draws a small live signal-flow diagram showing which lines are currently active and how they sum to the output — it updates immediately as you toggle Active or Cross-line Mod.

3.2 Line Interaction Modes

Each line's Mode menu sets how its odd and even module combine:

Mode	Architecture	What happens
Single	Classic + Extended	Only the odd module (M1) is heard; the even module (M2) is silent. Use this when a line only needs one plain oscillator.
Mix	Classic + Extended	Both modules play independently and sum together, each keeping its own pitch, waveform and envelope. This is the closest thing to a conventional two-oscillator layer.
Phase	Classic + Extended	The classic iPD interaction. The odd module acts as an exciter: its output becomes a phase offset fed into the even module's own oscillator, bending the even module's waveform in real time. The even module supplies the audible carrier and its own transfer-curve shaping.
Ring	Classic + Extended	The even module supplies the dry signal; the odd module multiplies into it as a ring-modulation product. Produces inharmonic, metallic and bell-like partials that Phase mode can't reach.
TZFM	Extended only	Through-zero frequency modulation: one module's instantaneous frequency can swing through and past zero without a discontinuity, rather than folding at zero like ordinary FM. See 15.3 for detail.

Mode	Architecture	What happens
AM	Extended only	Amplitude modulation: one module's envelope-scaled output multiplies the other's amplitude, generating sidebands without the phase interaction of Phase or Ring mode. See 15.3.
Terminology "iPD" (interactive phase distortion) refers to the original synthesis method this engine is built on, in which Phase mode does the phase-bending most people associate with the VZ sound and Ring mode provides its inharmonic counterpart. TZFM and AM are this plug-in's own additions to that idea, available in Extended mode only — they use the same line and module structure but were not part of the hardware iPD engine.		

3.3 Cross-line Modulation

Beyond a line's own Mode, any line other than Line A can also read the *previous* line's finished output and feed it into its own even module as an extra phase source. Turn this on with that line's **Cross-line Mod** toggle. When enabled, the incoming signal from the previous line takes the place of that module's own internal oscillator clock; if the line is also set to Phase mode, its own odd-module exciter is applied first, and the cross-line signal from the previous line modulates on top of that.

This lets you chain phase interactions across the whole voice — Line A's output colouring Line B, Line B (already coloured) feeding into Line C, and so on — rather than keeping every line's interaction local to its own two modules. It's a good way to build the kind of layered, evolving textures used in several of the factory Pad and Choir presets (see Appendix A).

Advanced / automation only

Two related calibration parameters — a per-line Cross-mod Depth and a global Cross-Line Phase Depth — exist as host-automatable parameters but are not exposed as sliders in the plug-in's own interface. They default to values chosen by ear against original VZ-1 hardware recordings and rarely need adjustment; reach them from your DAW's generic plug-in parameter list if you need to fine-tune cross-line modulation intensity per patch.

4. The Voice Editor

The Voice editor is where each module's oscillator, pitch, amplitude and envelope live. Classic mode shows eight modules across Lines A-D (M1-M8); Extended mode shows twelve across Lines A-F (M1-M12). Select a line along the top of the tab, then a module (odd or even) beneath it, to edit that module.



The Voice editor for module M1 of Line A, showing the waveform bank, pitch and amplitude sections, and an 8-stage envelope set to a long, evenly-decaying shape (as used in “Gamelan Constellation”).

4.1 The Waveform Bank

Each module has its own waveform, chosen from a bank of icons across the top of the module panel. Classic mode shows the original eight VZ waveforms; Extended mode adds a second row of eight more. Selecting one of the eight Extended-only waveforms also reveals a **Shape** slider [0.0–1.0], which most of them use to reshape their character continuously (duty cycle, curve steepness, harmonic content, and so on — see the table below).

#	Wave	Character
1	SINE	The reference iPD carrier — a pure cosine-derived tone with no waveshaping knee, used as a clean carrier or a gentle phase-distortion exciter.
2–6	SAW1–SAW5	Five saw-family waveshapes, each with a progressively sharper transfer-curve knee (SAW1 gentlest, SAW5 sharpest). As a Phase-mode exciter, the sharper members produce more aggressive, buzzy distortion of the carrier.
7	NOIS1	White noise.
8	NOIS2	White noise amplitude-modulated by a phase-locked sine, giving a tone-coloured noise rather than flat white noise.
9	TRI	A plain triangle wave.

#	Wave	Character
10	TRAP	A trapezoid: Shape widens or narrows the flat shoulder between the rising and falling edges.
11	PULSE	A band-limited pulse/square with variable duty cycle — Shape sweeps the pulse width from narrow to wide.
12	RAMP	A band-limited ramp whose curvature Shape bends from concave to convex, from a soft rise to a sharp one.
13	BLADE	An asymmetric triangle whose peak position Shape slides across the cycle, from a sharp leading edge to a sharp trailing edge.
14	FOLD	An additive tone built from the fundamental plus 3rd and 5th harmonics; Shape raises the harmonic content, brightening the wave toward a fuller, more folded harmonic structure.
15	BLUE	Blue noise — noise energy weighted toward high frequencies, brighter and airier than the white noise of NOIS1/NOIS2.
16	RES II	A short decaying sine burst — a struck, resonant sound in itself. Shape controls both how many cycles ring out and how quickly they decay, from a tight click to a longer resonant tail.

4.2 Pitch

Control	Range	What it does
Coarse	-127 to +127 st	Semitone tuning. The range is intentionally far wider than a typical ± 24 st oscillator control — useful for pushing a module many octaves away from its line partner, e.g. to use it purely as a very low- or very high-frequency modulator.
Fine	-50 to +50 ct	Cents tuning, for fine detuning between modules or lines.
KeyFol (Key Follow)	0–100%	How much the module's pitch tracks the keyboard. 100% is standard 1-semitone-per-key tracking; lower values flatten the keyboard response, useful for modules acting as fixed-frequency modulators.
Detune	-50 to +50 ct	An additional, independent fine-tuning offset — handy for thickening unison-style layers without touching Fine.

4.3 Amplitude

Control	Range	What it does
Level	0–99	The module's output level — its contribution to the line, before the line's own Level and Mode processing.
VelSns (Velocity Sensitivity)	0–31	How strongly note velocity affects this module's level. 0 means velocity has no effect at all.
AfterT (Aftertouch)	0–7	How strongly channel aftertouch affects this module's level.
Advanced / Simple	toggle	Switches the envelope display below between the full multi-stage editor (4.4) and a simplified five-knob Attack / Hold / Decay / Sustain / Release view (4.5). Both are views onto the same underlying envelope — nothing is lost switching between them.

Control	Range	What it does
... (module extras)	popup	Opens a small panel with Vel Curve [1–8] (which of eight velocity-response contour shapes to use), Amp Sens [0–7] (how strongly this module's DCA responds to controller-driven bias/tremolo, once something is routed to it), and a Module enabled toggle — the module's hardware-level on/off state, independent of its envelope depth.

4.4 The Envelope

Each module has its own multi-stage amplitude envelope — eight stages in Classic mode, twelve in Extended mode. Every stage has a **Rate** [0–99, higher is faster] and a **Level** [0–99, the target level the stage ramps toward] and its own **Curve** shape:

Curve	Shape
Linear	A straight ramp between the stage's start and target level.
Exp	Slow to start, fast to finish — an exponential-style attack curve.
Log	Fast to start, slow to finish — an exponential-style release curve.
S-curve	Eases in and out at both ends (a smoothstep curve) — the gentlest-sounding transition of the four.

Click a stage number under the envelope graph to select it and edit its Rate, Level and Curve in the panel to the right. A few additional controls apply to the envelope as a whole:

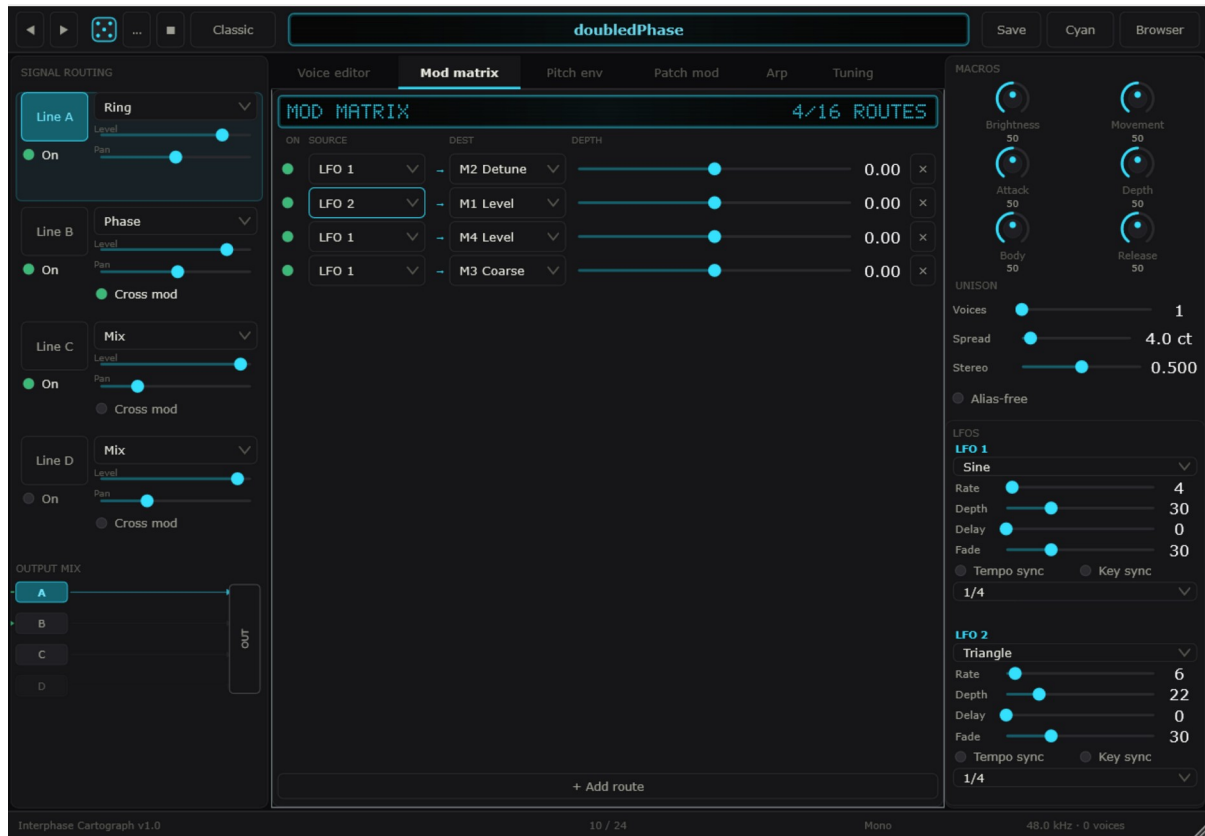
- **Sustain Stage** — one of the pill buttons beneath the graph marks which stage the envelope holds at for as long as the key is down (the stage highlighted in amber in the screenshots). Key-up sends the envelope on into the stages that follow.
- **End Behaviour** — governs what happens once playback reaches the programmed End stage while a key is still held. **VZ End** (the default, and the historically accurate hardware behaviour) holds at the End stage's level until key-up, then fades out quickly. **Zero and Stop** drops straight to silence the instant the End stage completes, whether or not the key is still down. **Hold Last** holds at that level indefinitely, ignoring key-up entirely, until the voice is stolen or the note is retriggered — useful for drones that should keep sounding through a release. **Hold Until Key Up** behaves the same as VZ End.
- **Loop** — turn on Loop and set a Loop Start and Loop End stage, and the envelope repeats that range of stages for as long as the note is held, instead of settling into a static hold — a way to build motion into the envelope shape itself rather than relying only on the LFOs. Release still plays normally once the key lifts.
- **Copy / Paste / Reset** — copy a module's entire envelope (all stages, sustain stage, end behaviour, loop and curves) to reuse on another module, or reset the selected module's envelope back to its default shape.

4.5 The Simple (AHDRS) View

Clicking **Advanced** toggles to **Simple**, replacing the multi-stage editor with five knobs: Attack, Hold, Decay, Sustain and Release. This is a genuine view onto the same envelope, not a separate simplified engine — on switching to Simple view the current multi-stage shape is read and expressed as its closest AHDRS equivalent, and moving any of the five knobs writes straight back to the full stage data. Switching back to Advanced always shows exactly the shape the five knobs describe; there's no hidden state and nothing to keep in sync.

5. The Modulation Matrix

The Mod matrix tab holds up to sixteen freely assignable modulation routes, each mapping one source to one destination at a chosen depth. It's the general-purpose complement to the fixed modulation built into the envelopes, macros and Patch mod page — use it whenever you want a source that isn't already wired to the destination you have in mind.



The modulation matrix with four active routes: both LFOs modulating module levels and detune, and LFO 1 also reaching M3's coarse tuning.

5.1 Working with Routes

Click **+ Add route** to create a new row, then set its Source, Destination and Depth. Each row also has an on/off toggle — useful for auditioning a route's effect without losing the assignment — and a small **x** to remove it entirely. Depth runs from -1.00 to +1.00; negative depths invert the source's effect on the destination. Every enabled route's contribution is added to its destination's base value, so several routes can target the same destination and their effects will sum.

5.2 Sources

Available modulation sources:

Source	What it is
Velocity	Note-on velocity, 0–1.
Aftertouch	Channel aftertouch, 0–1.
Pitch Bend	The pitch wheel's current position.
Key Track	The played MIDI note, normalised across the keyboard range.

Source	What it is
LFO 1 / LFO 2	The two general-purpose LFOs described in Chapter 12 — the same signals available as sources here regardless of what (if anything) their own Rate/Depth destinations are doing.
Env 1–8 (Env 9–12 in Extended mode)	The live amplitude-envelope output of each module, so one module's envelope shape can drive another module's parameters directly.
Macro 1–6	The six performance macros from Chapter 10, available here as raw modulation sources in addition to their own built-in effects.
Mod Wheel	MIDI CC 1.

5.3 Destinations

Available modulation destinations:

Destination	What it is
M1–M8 Level / Coarse / Fine / Detune (M1–M12 in Extended mode)	Per-module level and pitch, for every module in the current architecture.
Line A–D Level (Line A–F in Extended mode)	Per-line output level, applied alongside the line's own Level slider.
LFO 1 / LFO 2 Rate / Depth	Lets one modulation source control an LFO's own speed or intensity — for example, key-tracking an LFO's rate, or having aftertouch fade an LFO in.
Master Volume	The plug-in's overall output level.
Tip A route's Depth is evaluated continuously alongside the destination's own control — it doesn't replace what a knob is already doing, it adds to it. If a destination seems unresponsive to a new route, check that the route is enabled (the small light on the left of its row) and that its Depth isn't at or near zero.	

6. The Pitch Envelope

Alongside each module's amplitude envelope, the voice has one additional envelope dedicated to pitch — global, shared by every line and module, and bipolar: unlike an amplitude envelope, which rests at silence, the pitch envelope rests at its centre (no pitch offset) and can swing above or below it.



The Pitch env tab, showing an 8-stage bipolar shape (dipping below centre around stage 5–6 before recovering) with a sustain point at stage 4.

6.1 Controls

Control	Range	What it does
Depth	0.0–63.0 st	The overall range of the pitch envelope in semitones. At 0 (the default) the envelope is fully disabled and has no audible effect regardless of its stage shape — this keeps existing patches unaffected until you deliberately turn it on.
Vel Sns	0–31	How much note velocity scales the envelope's depth.
Curve (next to Vel Sns)	1–8	Which of eight velocity-response contour shapes is used when Vel Sns is above 0.
Rate Vel	0–31	A global engine control, surfaced on this tab, that adds to the rate of any <i>module</i> envelope stage whose individual VEL RATE flag is enabled. That per-stage flag has no on-screen toggle anywhere in the Voice editor and is off by default, so treat this as an advanced control: it has no audible effect until a stage's flag is turned on from your DAW's generic parameter list.

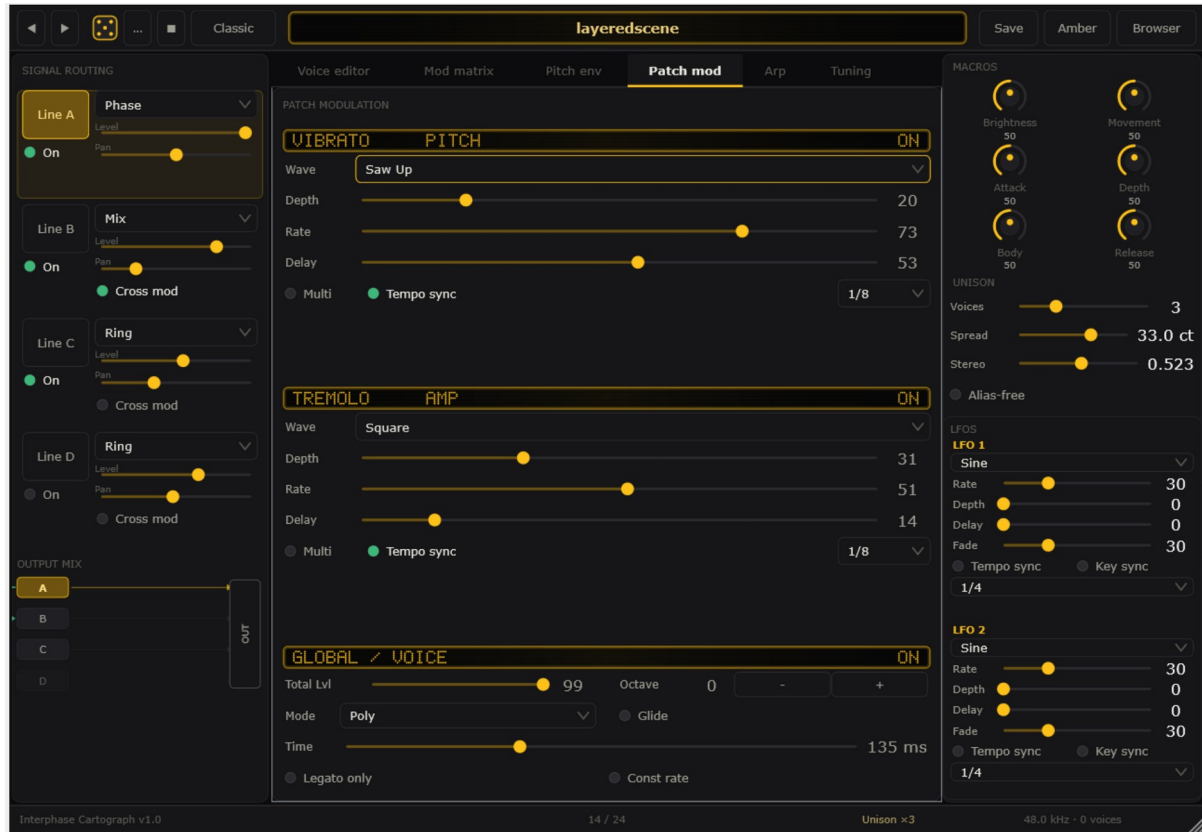
Control	Range	What it does
Stage Rate / Level	0–99 / 0–99	Each of the envelope's stages has its own rate and target level, edited the same way as a module envelope's stages (4.4). Levels here are read around the centre — a stage level of 50 is the envelope's neutral (no-shift) point, values above it push pitch up, values below push it down.
Curve	4 shapes	One curve shape (Linear / Exp / Log / S-curve) applied to every stage transition in the pitch envelope — unlike the module envelopes, which allow a different curve per stage, the pitch envelope's curve is set once for the whole shape.
Sustain Stage / End Behaviour / Loop	—	Work exactly as described for module envelopes in 4.4, applied to the shared pitch envelope instead of one module's amplitude.

6.2 Notes on Use

- Because Depth defaults to 0, adding pitch-envelope motion to a patch is always a deliberate choice — raise Depth first, then shape the stages.
- A useful starting point is a short dip below centre right after the attack (a brief downward "thud" into pitch, common on plucked and struck sounds) followed by a return to centre for the sustained portion.
- The pitch envelope sits on top of everything else affecting pitch — Coarse/Fine/Detune, glide, pitch bend, and any mod-matrix routes to Coarse or Fine — rather than replacing any of them.

7. Patch Mod: Vibrato, Tremolo and Voice Behaviour

The Patch mod tab holds three sections: the patch's own Vibrato (an LFO routed to pitch) and Tremolo (an LFO routed to amplitude), and a Global/Voice section covering overall level, octave transpose, voice mode and glide. These are separate from LFO 1 and LFO 2 (Chapter 12) and from the mod matrix — think of them as a patch's built-in, always-available pitch and amplitude wobble, present even in patches that use none of the general-purpose modulation elsewhere in the plug-in.



The Patch mod tab: Vibrato and Tremolo, each with its own waveform, depth, rate and delay, plus the Global/Voice section (Total Level, Octave, Mode, Glide).

7.1 Vibrato and Tremolo

Both sections share the same layout:

Control	Range	What it does
Wave	9 shapes	Triangle, Saw Up, Saw Down, Square, Sine, Smooth Rnd (a smoothed random/sample-and-hold), Exp Up, Exp Down, or Trapezoid.
Depth	0–99	How far the effect swings. 0 disables that section entirely.
Rate	0–99	Speed, when Tempo sync is off.
Delay	0–99	How long after a note starts before the effect fades in.
Multi	toggle	When off, one shared LFO drives Vibrato (or Tremolo) across every voice in unison. When on, each played note gets its own independent copy of the LFO, starting fresh at note-on — useful for chords where you don't want every note wobbling in lockstep.

Control	Range	What it does
Tempo sync / Division	toggle + 10 divisions	Locks the rate to host tempo instead of the free-running Rate knob, using the same division set as the arpeggiator and LFOs (1/1 down to 1/32, plus triplet and dotted variants).

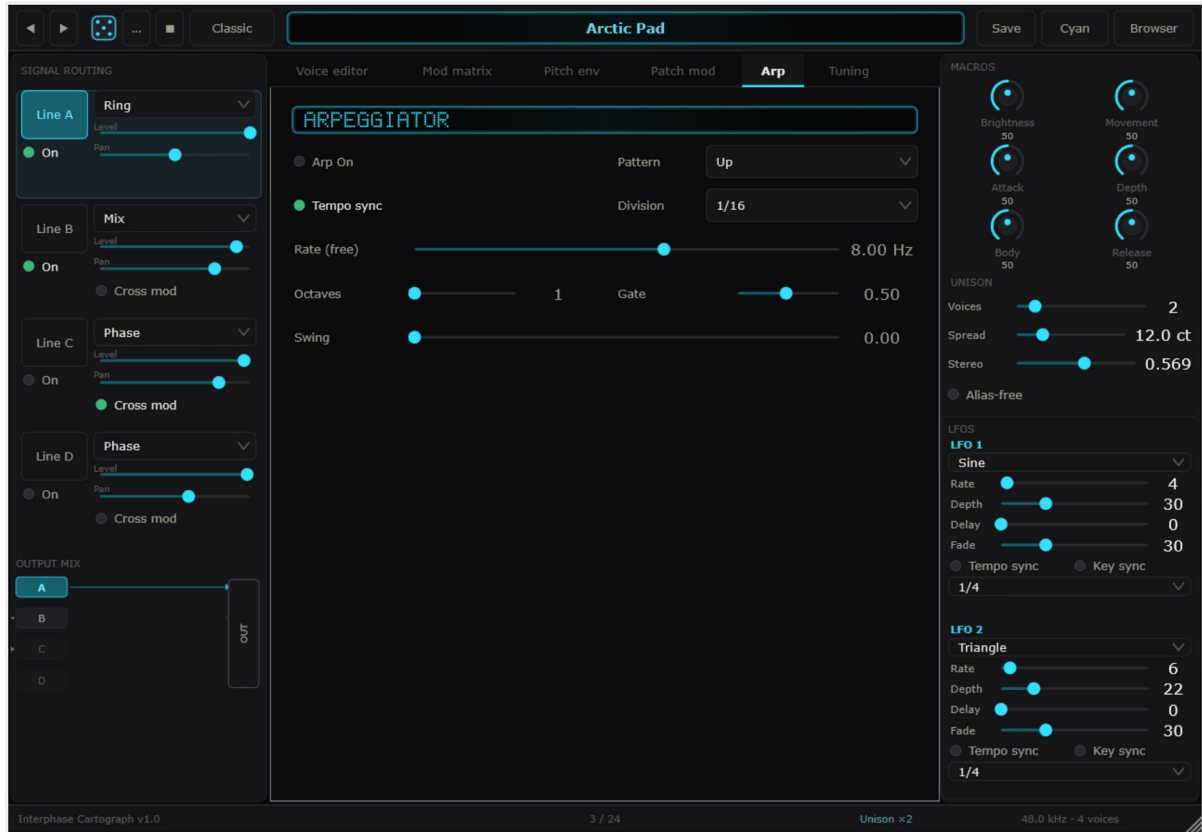
Vibrato is pitch modulation; Tremolo is amplitude modulation. Both are gated by ON/OFF as shown in their section headers, and both are independent of whatever the mod matrix or the LFO panel are doing — all of these layers add together rather than overriding one another.

7.2 Global / Voice

Control	Range	What it does
Total Lvl	0–99	An overall output-level trim for the whole patch, separate from the plug-in's Master Volume and from any individual module's Level.
Octave	-2 to +2	Transposes the entire voice by whole octaves.
Mode	Poly / Mono / Legato	Poly plays normal polyphony. Mono restricts the voice to one note at a time and retriggers its envelopes on every new note-on. Legato also restricts to one note at a time but does not retrigger envelopes when notes overlap — only the pitch changes, which is what makes glide (below) sound like a continuous slide between notes rather than a new attack each time.
Glide	toggle	Portamento: pitch slides between notes instead of jumping.
Legato only	toggle	When on, glide only occurs between overlapping (legato) notes, not on every new note-on.
Time	0–2000 ms	Glide duration. In constant-time mode (the default) this is the total time to reach the new note regardless of interval size; with Const rate enabled, it instead becomes the time per semitone, so larger intervals take proportionally longer to glide.
Const rate	toggle	Switches Time's meaning as described above.

8. The Arpeggiator

The Arp tab turns held notes into a repeating pattern. It tracks whatever keys are currently down, builds a play order from the chosen pattern, and steps through them on its own clock — either locked to host tempo or running freely in Hz.



The Arp tab: Up pattern, tempo-synced to 1/16, one octave, 50% gate, no swing.

8.1 Controls

Control	Range	What it does
Arp On	toggle	Enables the arpeggiator. While off, held notes simply play normally.
Pattern	6 choices	Up, Down, Up-Down, Down-Up, As Played (the order keys were physically pressed), or Random .
Tempo sync / Division	toggle + 10 divisions	When on, step length follows host tempo at the chosen division — 1/1 down to 1/32, plus triplet (T) and dotted (.) variants. When the host transport is playing, the arpeggiator continuously phase-locks its steps to the beat grid rather than drifting over long runs.
Rate (free)	0.10–30.00 Hz	Step rate when Tempo sync is off.
Octaves	1–4	How many octaves the held notes are repeated across before the pattern repeats.
Gate	0.05–1.00	How much of each step's duration the note actually sounds for, as a fraction of the step length. Lower values give a shorter, more staccato arpeggio; 1.00 lets each note ring for the full step.

Control	Range	What it does
Swing	0.00–0.75	Delays every other step by this fraction of a step, for a swung rather than straight feel.

8.2 Behaviour Notes

- The arpeggiator fires its first step immediately when you press the first key of a new chord, rather than waiting for the next clock tick — so it always starts promptly rather than on a delay.
- Releasing all held keys stops the pattern and lets any currently sounding arp note finish its release normally.
- Because the arpeggiator emits ordinary note-on/note-off events, it interacts with everything else exactly as manually played notes would — including Mono/Legato voice mode and glide from the Patch mod tab, unison, and the modulation matrix's Velocity and Key Track sources.

9. Tuning and Microtonality

The Tuning tab retunes individual notes away from standard 12-tone equal temperament, either by choosing a historical temperament outright or by dragging individual notes by hand. Every offset is expressed in cents relative to standard 12-TET pitch and applies independently of Coarse, Fine and Detune.



The Tuning tab set to the Pythagorean temperament, rooted on C4. Each bar shows that note's offset from standard 12-TET pitch.

9.1 Tuning Systems

System	Description
Equal Temperament	Standard 12-TET — every semitone equal, all offsets 0. The default.
Just Intonation	Pure harmonic-ratio intervals built from the chosen root note.
Pythagorean	A temperament built from stacked perfect fifths.
Quarter-comma Meantone	A Renaissance/Baroque temperament that favours pure major thirds at the cost of some fifths.
Kirnberger III	A Bach-era well temperament.
Custom	Whatever per-note offsets you've set by hand, as described below.

Choose a system from the menu at the top left, and a root note from the menu beside it — everything except Equal Temperament is built relative to that root. Selecting a preset applies it to the full keyboard instantly.

9.2 Editing by Hand

Below the ± 100 -cent bar graph, a two-and-a-half-octave on-screen keyboard lets you adjust individual notes directly:

- Click a key to select it.
- Drag up or down on a selected key to raise or lower its tuning; the bar graph and the cent readout in the header update live as you drag.
- Double-click a key to reset it to 0¢.
- Adjusting any note this way switches the tuning system to **Custom**, preserving whatever preset you started from as a set of individual offsets you can keep editing.

Every offset is per-MIDI-note across the full keyboard range, not just within the visible display octaves, so a Custom table you build is not limited to the notes shown on screen.

10. The Performance Macros

The six knobs at the top of the right column are performance macros: broad, patch-independent controls for reshaping the current sound on the fly, without touching its underlying programmed parameters. Every macro is centred at 50 and every macro's centre position is neutral — it reproduces the patch exactly as programmed. This makes macros safe to leave at default when a patch doesn't need them, and safe to automate or map to a MIDI controller for live performance, since 50 always means "as programmed" regardless of the patch loaded.

10.1 What Each Macro Does

Macro	Centred at 50 (no change). Effect as you turn it:
Brightness	Shapes the overall tone with a high-frequency shelf. Turning it up adds presence/air; turning it down darkens and rounds off the top end. The two directions aren't perfectly symmetrical — cutting highs has a stronger effect per turn than boosting them, which mirrors how darkening a sound reads more obviously to the ear than brightening it by the same amount.
Movement	Scales — and, past centre, can introduce — the patch's own Vibrato and Tremolo (Chapter 7). Below centre it reduces whatever vibrato/tremolo a patch already has programmed; above centre it both amplifies that motion and adds a small amount of movement even to a patch with none programmed, useful for bringing a static patch to life during a performance.
Attack	Lengthens or shortens every module envelope's opening stage together. Turn it down for a snappier attack than programmed; turn it up for a softer, slower one. Centre leaves every envelope's attack exactly as programmed.
Depth	Scales the intensity of Phase and Ring line-mode interaction across the whole voice. Turn it down to soften phase-distortion and ring-modulation character toward something closer to plain Mix mode; turn it up to push it further than programmed. Centre reproduces the patch's own programmed interaction depth.
Body	Adds or removes low-frequency weight, symmetrically in both directions from centre — a low-shelf companion to Brightness.
Release	Lengthens or shortens every module envelope's release portion (the stages that play after key-up) together, the same way Attack reshapes the opening stage.

10.2 Using Macros

- Double-click any macro knob to snap it back to its neutral centre.
- Because macros act globally across the whole voice rather than on one module, they're the fastest way to make a patch brighter/darker, snappier/softer, or more/less aggressive on the fly — during a performance, or just while auditioning presets in the browser — without opening the Voice editor.
- All six macros are also available as mod-matrix sources (5.2), so you can, for example, have Aftertouch drive the Depth macro directly, layering a performance gesture on top of the knob's own position.

11. Unison

Unison stacks multiple detuned copies of a voice on every note, spread across the stereo field, for a thicker sound than a single voice can produce. It's controlled from the right column, beneath the macros.

Control	Range	What it does
Voices	1–8	How many copies of the voice sound per note-on. 1 disables unison entirely.
Spread	0–50 ct	Total detune spread across all the stacked voices, symmetrical around the centre pitch.
Stereo	0.0–1.0	Stereo width of the stack: 0 collapses all voices to the centre, 1 spreads them fully across left and right.
Alias-free	toggle	Runs the voice engine at 2× oversampling for a cleaner result at higher pitches, at roughly double the CPU cost per voice. Off by default — the plug-in's characteristic phase-distortion aliasing is part of the sound this synthesizer is going for, so this is offered as an option rather than always applied.

11.1 How Voices Are Spread

With two voices, they sit at $\pm$ half the Spread value; with three, one sits at the centre and the other two at $\pm$ half; with four or more, the voices are distributed evenly across the full spread. Panning follows the same logic — with unison at 1 voice, that voice is centred; at higher counts, voices fan out toward hard left/right at the extremes, scaled by the Stereo control. Overall gain is normalised by the square root of the voice count, so adding more unison voices thickens the sound without also making it proportionally louder.

12. LFO 1 and LFO 2

Two general-purpose LFOs sit at the bottom of the right column, always visible. Unlike the patch's own Vibrato and Tremolo (Chapter 7), which are pre-wired to pitch and amplitude respectively, LFO 1 and LFO 2 have no fixed destination of their own — they exist to be routed. Both are directly assignable in the modulation matrix (Chapter 5) as sources, and each can also be a mod-matrix *destination* for its own Rate or Depth, letting one modulation source control how fast or how deep an LFO runs.

12.1 Controls

Control	Range	What it does
Shape	6 choices	Sine, Triangle, Saw Up, Saw Down, Square, or S&H (sample-and-hold — a stepped random value).
Rate	0–99	Speed, when Tempo sync is off.
Depth	0–99	Overall intensity — this is a base level that the mod matrix's own per-route Depth then scales further at each destination.
Delay	0–99	How long after note-on before the LFO starts moving.
Fade	0–99	How long the LFO takes to ramp up to full Depth once it starts, after any Delay has elapsed.
Key Sync	toggle	Resets the LFO's phase to the start of its cycle on every note-on, so each new note gets an identical, predictable LFO shape rather than an LFO that's already partway through a free-running cycle.
Tempo sync / Division	toggle + 10 divisions	Locks Rate to host tempo, using the same division set (1/1 to 1/32, plus triplet and dotted) as the arpeggiator and Patch mod sections.

12.2 Typical Uses

- Route LFO 1 or LFO 2 to a module's Coarse or Fine for classic pitch vibrato — distinct from, and stackable with, the patch's own Vibrato section.
- Route to a Line's Level for tremolo-style amplitude movement on just part of the voice, rather than the whole patch as the Patch mod Tremolo section does.
- Route to M1–M12 Detune for slow, drifting chorus-like movement across a layer.
- Set Key Sync on when an LFO needs to line up identically on every note (for example, a rhythmic gate effect); leave it off for LFOs meant to drift independently across a held chord.

13. The Randomizer

The dice icon in the header is a constrained, style-aware patch generator, not a source of uniform random values — which would give silence or atonal noise almost every time. It instead biases waveforms, line modes, pitch relationships and envelope shapes toward a recognisable class of sound, while built-in guarantees keep every result audible and in tune. Most rolls are at least interesting; a fair number are keepers.

13.1 Quick Roll vs. the Detail Panel

Clicking the **dice icon** rolls immediately, using whatever flavour, mode and locks are currently set. Clicking ... beside it opens the detail panel, where those settings live:

Control	What it does
Flavour	Which family of sound to bias toward — see 13.2.
Full	Generates a complete new patch from the flavour's profile.
Mutate	Nudges the current patch's unlocked parameters, exploring variations close to what you already have. Rolling Mutate on a Classic-mode patch also brings it into the Extended architecture with a modern-waveform module pair — a lighter-touch route into the larger engine than a full Weird reroll.
Section locks	Five toggles — Oscillators, Envelopes, Modulation, Routing, Pitch/tuning — protecting those parameters from Full and Mutate rolls. Lock Envelopes to keep a shape you like while rerolling everything else.
Undo	Reverts to the state captured just before the last roll — a single step back, so you can try a roll and back out of it.

The quick dice and the detail panel share one set of settings, so changing the flavour or locks in either place affects both — there's nothing to keep in sync.

13.2 Flavours

Flavour	Bias
Bass	Low-register, punchy or growling low end.
Keys	Electric-piano and mallet-adjacent tonal structures.
Pad	Slow-moving, sustained, evolving textures.
Lead	Single-note melodic voices, generally bright and expressive.
Bell	Inharmonic, decaying, bell- and mallet-like structures — leans on Ring mode.
Pluck	Short, plucked-decay envelope shapes.
Texture	Noisy, evolving, less tonally rooted material.
Weird	The most adventurous category: switches to Extended architecture, uses four to six lines, always includes AM and TZFM, and leans on the sixteen-waveform bank, while keeping a rooted carrier and sane gain and pitch ranges so results stay usable. Four recipe families: drones, animated tonal structures, metallic events, and one-shot effects.
Surprise	No bias — picks from across every flavour above, including Weird.

14. Presets and the Browser

14.1 Saving

Click **Save** in the header to open the save dialog: a name, a category (defaults to "User"), and comma-separated tags. Saved presets are written to your own User preset folder (see 1.3) as individual .vzpatch files, and are never overwritten or removed by a plug-in update.

14.2 The Browser

Click **Browser** to open the full-window preset browser. It has a search box and category filter across the top, a category sidebar on the left, the filtered preset list in the centre, and a save section at the bottom for saving directly from within the browser.

Feature	Detail
Search	Filters the list by name as you type.
Category filter / sidebar	Restrict the list to one category, or browse the full category list on the left — factory categories include Bass, Keys, Pads, Leads, Bells, Plucks, Brass, Textures, Drones, Percussion and Weird (see Appendix A), alongside any categories you've created for your own presets.
Sort	By name, category, date, or star rating.
Star ratings	Click the star strip on a preset's row to rate it 0–5. Ratings are stored separately from the preset files themselves, so you can rate factory presets without modifying the (read-only) shipped files.
Audition	A single click loads a preset immediately without closing the browser, so you can step through candidates and hear each one; the Up/Down arrow keys do the same. Double-click (or Load) commits the selection and closes the browser.
Delete	Removes the selected user preset. Selecting a whole category in the sidebar instead lets you delete every preset in that category in one action — useful for removing a SysEx bank you imported and no longer want.
Import	Imports an original Casio VZ-1 SysEx bank (.syx) — both tone and operation/combination data are recognised — placing the imported voices into their own category, ready to browse and audition alongside the built-in factory bank.

If a preset looks out of date after an update

Presets imported from SysEx store their fully decoded parameter values at import time, so a later fix to the SysEx parser can't retroactively reach a preset you already imported. If the browser flags a loaded preset as outdated, the fix is to re-import the original .syx file rather than expecting the existing preset to update itself.

15. Classic vs. Extended Architecture

The **Classic / Extended** button in the header switches the whole engine between two sizes. Switching is instant and non-destructive: Extended-only lines, modules and waveforms simply sit dormant (silent, but retaining whatever you last set them to) while you're in Classic mode, and reactivate the moment you switch back to Extended — nothing is discarded.



The same window in Extended mode: Lines A–F down the left, M1–M12 across the Voice editor, the full 16-waveform bank with Shape control, TZFM and AM available as line modes, and a 12-stage envelope with its loop range (top left of the graph) enabled.

15.1 What Changes

	Classic	Extended
Lines	4 (A–D)	6 (A–F)
Modules	8 (M1–M8)	12 (M1–M12)
Envelope stages per module	8	12
Waveforms	8	16
Line interaction modes	Single, Mix, Phase, Ring	Single, Mix, Phase, Ring, TZFM, AM

Everything covered in Chapters 5 through 14 — the modulation matrix, pitch envelope, patch mod, arpeggiator, tuning, macros, unison and the two LFOs — works identically in both modes; the routing panel and Voice editor simply show more rows and columns in Extended mode. Extended-mode patches are not compatible with real VZ hardware or its SysEx format — they're a modern extension of the same synthesis idea, not an emulation of a specific machine.

15.2 Choosing a Mode

- Classic mode is the direct, hardware-faithful engine — the right choice when you're after the specific, well-documented sound of the original four-line/eight-module architecture, or when importing original VZ-1 SysEx banks (Chapter 14), which are Classic-architecture data by definition.
- Extended mode is the right choice when you want more lines and modules to work with, access to the sixteen-waveform bank and its Shape control, or the AM and TZFM line-interaction modes described below.
- The randomizer's Weird flavour (13.2) automatically switches into Extended mode as part of its recipe, and Mutate can bring an existing Classic patch into Extended mode as a lighter-touch alternative to a full Weird reroll.

15.3 Through-Zero FM and Amplitude Modulation

TZFM (Through-Zero FM)

Ordinary frequency modulation reaches trouble when a modulator's instantaneous frequency would go negative — the modulator's phase either folds back on itself or the algorithm has to special-case the crossing, both of which tend to produce audible glitches. TZFM instead tracks the modulator's phase continuously through zero and into negative frequency, so the modulator can genuinely reverse direction mid-cycle without a discontinuity. In practice this means:

- Switching a line into TZFM mode live, mid-note, doesn't produce a phase jump — the carrier's phase is preserved across the mode change.
- A TZFM line that's silenced (its Active toggle off, or muted by the current routing) but still being computed in the background keeps advancing its phase along its full signed-frequency path, so bringing it back in later — or re-routing it — doesn't reintroduce a click from a phase that had effectively frozen while unheard.
- The pulse and ramp carrier waveforms (10 and 11 in the waveform bank) use direction-aware anti-aliasing, so they stay clean even while being modulated through negative frequency rather than only in the ordinary forward direction.

AM (Amplitude Modulation)

AM multiplies one module's output into the other's amplitude rather than its phase or frequency — the even module's own envelope-scaled signal is what gets modulated, and the odd module supplies the modulating amplitude. This produces sidebands around the carrier frequency, similar in spirit to Ring mode but arrived at differently, and without Ring's phase-interaction character.

Both AM and TZFM apply cross-line Depth (the same per-line modulation-intensity handling used elsewhere in the routing) consistently, so scaling a line's interaction depth — whether by hand or via the Depth macro (Chapter 10) — behaves the same way across every interaction mode, not just Phase and Ring.

Appendix A: Factory Preset Library

The factory bank ships 43 presets across eleven categories, listed here in their shipped order — roughly a progression from Classic-architecture showcases through to the Extended architecture and, at the end, the five Weird-category presets introduced alongside it. Use the Category filter in the Browser (14.2) to jump straight to one group.

Name	Category	Mode	Character
Cathedral of Glass	Pads	Classic	Slowly evolving, glassy pad built on Phase-mode lines with expressive control.
Aurora Bells	Bells	Classic	Bright, glassy bell voice driven by Ring mode, responsive to velocity.
Velvet Tines	Keys	Classic	Dynamic electric-piano tine sound built on Phase-mode interaction.
Solar Wind	Leads	Classic	Bright, expressive lead with glide, shaped by a Phase-mode exciter.
Deep Field	Bass	Classic	Sub-heavy, growling bass with velocity-responsive character.
Choir of Mirrors	Pads	Classic	Vocal-toned choir pad using cross-line phase and aftertouch.
Prism Pluck	Plucks	Classic	Clean, bright plucked tone with velocity response.
Analog Sunrise	Brass	Classic	Warm ensemble brass with aftertouch expression.
Starlight Cascade	Bells	Classic	Layered, shimmering bell cascade using cross-line phase.
Chrome Hornet	Leads	Classic	Aggressive Ring/Phase lead with strong velocity response.
Silver Meridian	Keys	Classic	Wide, digital-sounding keys voice.
Velvet Static	Textures	Classic	Soft noise-based texture with aftertouch shaping.
Luminous Current	Pads	Classic	Soft, continuously moving pad.
Low Orbit	Bass	Classic	Solid, monophonic sub-bass.
Thread of Fire	Leads	Classic	Bright, gliding lead with aftertouch expression.
Tidal Memory	Textures	Classic	Deep, slowly evolving noise texture using cross-line phase.
Rain Glass	Plucks	Classic	Delicate, glassy pluck built on Ring mode.
Gamelan Constellation	Bells	Classic	Ring-mode gamelan/bell showcase with a long percussive decay (see Ch. 4).
Electric Cathedral	Keys	Classic	Electric-piano showcase combining Ring and Phase interaction.
Event Horizon Choir	Pads	Classic	Evolving choir pad showcasing cross-line phase and aftertouch.

Name	Category	Mode	Character
Zero Point Bloom	Pads	Extended	Pad showcasing AM, TZFM and a 12-stage envelope together.
Violet Foundry	Textures	Extended	Blue-noise texture combining AM and TZFM.
Glass Vector	Bells	Extended	Resonant bell built on TZFM and AM.
Aurora Veil	Pads	Extended	Lush pad layering Phase, AM and TZFM.
Opaline Choir	Pads	Extended	Abstract, vocal-leaning pad built around the FOLD waveform.
Slow Motion Halo	Pads	Extended	Slow, resonant, evolving pad.
Ember Atlas	Pads	Extended	Warm pad built from the PULSE and BLADE waveforms.
Magnetic Rain	Textures	Extended	Percolating blue-noise texture with TZFM motion.
Fracture Garden	Textures	Extended	Abstract texture combining the BLADE waveform and Ring mode.
Ion Dust	Textures	Extended	Airy, noise-based texture shaped by AM.
Velvet Circuit	Keys	Extended	Lush electric keys voice using AM.
Prism Reed	Keys	Extended	Expressive reed-toned keys voice built on TZFM.
Black Sun Choir	Drones	Extended	Dark, evolving choir drone.
Tectonic Hymn	Drones	Extended	Massive, sub-heavy drone driven by TZFM.
Mercury Temple	Bells	Extended	Metallic, resonant bell built on TZFM.
Ice Lanterns	Bells	Extended	Delicate glass bell shaped by AM.
Gravity Coil	Bass	Extended	Powerful bass built from TZFM and the PULSE waveform.
Hollow Alloy	Percussion	Extended	Metallic percussive impact built on Ring mode.
Bent Horizon	Drones	Extended · Weird	Evolving drone combining TZFM and AM.
Glass Transmission	Weird	Extended · Weird	A struck glass/noise effect.
Unstable Geometry	Textures	Extended · Weird	A looping texture combining AM and TZFM.
Memory Reactor	Drones	Extended · Weird	A deep spectral drone shaped by AM.
Prismatic Fault	Weird	Extended · Weird	A playable keys voice built on the FOLD wave and TZFM.

Appendix B: Parameter Quick Reference

Ranges and defaults for every control covered in this manual, grouped by section, for quick lookup while programming a patch.

B.1 Per-Line (Routing Panel)

Parameter	Range	Default
Mode	Single / Mix / Phase / Ring (+ TZFM / AM in Extended)	Mix
Level	0–99	99
Pan	–1.0 to +1.0	0 (centre)
Active	on/off	on (Lines A–D); off (Lines E–F)
Cross-line Mod	on/off	off

B.2 Per-Module (Voice Editor)

Parameter	Range	Default
Waveform	16 waves (8 visible in Classic)	SINE
Shape	0.0–1.0 (Extended waves only)	0.5
Coarse	–127 to +127 st	0
Fine	–50 to +50 ct	0
Key Follow	0–100%	100%
Detune	–50 to +50 ct	0
Level	0–99	99
Vel Sns	0–31	0
Vel Curve	1–8	1
AT Sens	0–7	0
Amp Sens (Mod Sens)	0–7	0
Module enabled	on/off	on (M1–M8); off (M9–M12)

B.3 Envelope (per stage; module or pitch)

Parameter	Range	Default
Rate	0–99	99 (stage 1); 50 (others)
Level	0–99	99 (stage 1); 0 (others)

Parameter	Range	Default
Curve	Linear / Exp / Log / S-curve	Linear (per stage on modules; whole-envelope on pitch env)
Sustain Stage	0–10 (0–6 usable in Classic)	0 (stage 1)
End Stage	0–11 (0–7 usable in Classic)	7 (stage 8)
End Behaviour	VZ End / Zero and Stop / Hold Last / Hold Until Key Up	VZ End
Loop Start / Loop End	0–11	0 / 3
Loop	on/off	off

B.4 Pitch Envelope

Parameter	Range	Default
Depth	0.0–63.0 st	0.0 (disabled)
Vel Sns / Curve	0–31 / 1–8	0 / 1
Rate Vel	0–31	0

B.5 Vibrato / Tremolo (Patch Mod)

Parameter	Range	Default
Wave	9 shapes	Triangle
Depth	0–99	0 (disabled)
Rate	0–99	75
Delay	0–99	0
Multi	on/off	off
Tempo sync	on/off	off

B.6 Global / Voice

Parameter	Range	Default
Total Level	0–99	99
Octave	-2 to +2	0
Voice Mode	Poly / Mono / Legato	Poly
Glide	on/off	off
Glide Time	0–2000 ms	100 ms

B.7 Arpeggiator

Parameter	Range	Default
Pattern	Up / Down / Up-Down / Down-Up / As Played / Random	Up
Sync Division	10 divisions (1/1–1/32, T, .)	1/16
Rate (free)	0.10–30.00 Hz	8.00 Hz
Octaves	1–4	1
Gate	0.05–1.00	0.50
Swing	0.00–0.75	0.00

B.8 Macros, Unison, LFOs

Parameter	Range	Default
Macro (any of 6)	0–100 (centred display)	50 (neutral)
Unison Voices	1–8	1
Unison Spread	0–50 ct	10 ct
Unison Stereo	0.0–1.0	0.5
Alias-free	on/off	off
LFO Rate / Depth / Delay / Fade	0–99 each	30 / 0 / 0 / 30
LFO Shape	Sine / Triangle / Saw Up / Saw Down / Square / S&H	Sine

B.9 Host-Only Parameters

A handful of calibration and compatibility parameters exist for host automation but are not exposed as controls anywhere in the plug-in's own window. They're listed here for completeness — most patches never need to touch them:

- **Master Volume**, **Polyphony** [1–16 voices] and **Pitch Bend Range** [1–24 st] — overall output and voice-allocation settings.
- **Pitch Bend Dead Zone** and **Pitch Bend Affects Release** — spring-return-wheel calibration and whether bend continues to affect a note after key-up.
- **Cross-Line Phase Depth** (global) and each line's own **Cross-mod Depth** — intensity calibration for the Cross-line Mod feature described in 3.3.
- Each envelope stage's **VEL RATE** enable flag — the per-stage switch that the Rate Vel controls (6.1, and the equivalent on any module) act on.

Appendix C: Glossary

Term	Meaning
iPD	Interactive phase distortion — the synthesis method this plug-in is built on, from Casio's VZ-series hardware. One module shapes another's phase (or ring-modulates it) rather than the two simply mixing. The plug-in's Extended architecture adds AM and TZFM to that original pair of interactions.
Line	One pair of modules (odd + even) and the Mode that governs how they interact. Classic mode has Lines A-D; Extended mode adds E and F.
Module	One oscillator, envelope and DCA. Each line has two, e.g. Line A = M1 (odd) + M2 (even).
DCA	Digitally controlled amplifier — the envelope-driven gain stage that turns a module's raw oscillator output into its final level.
Line Mode	Single, Mix, Phase, Ring, TZFM or AM — how a line's two modules combine (Chapter 3).
Cross-line Mod / External Phase	A line reading the previous line's finished output as an extra phase source for its own even module (3.3).
TZFM	Through-zero frequency modulation — FM whose modulator frequency can cross zero and go negative without a phase discontinuity (15.3).
Ring modulation	Multiplying two signals together, producing sum-and-difference sidebands rather than the original tones — one of the Line Modes.
Coarse / Fine	Pitch tuning in semitones (Coarse) and cents (Fine).
Key Follow	How closely a module's pitch tracks the keyboard; 100% is normal 1 semitone per key.
Velocity Sensitivity	How strongly note velocity affects a parameter — level, pitch-envelope depth, and so on.
Aftertouch	Continuous pressure applied to a held key (or, at the channel level, any key), usable as a modulation source.
Sustain Stage	The envelope stage a note holds at for as long as the key stays down.
End Stage / End Behaviour	Which stage marks the end of the programmed envelope, and what happens once playback reaches it (4.4).
Macro	One of six broad, patch-independent performance controls — Brightness, Movement, Attack, Depth, Body, Release — centred at a neutral position (Chapter 10).
Unison	Stacking multiple detuned copies of a voice per note for a thicker sound (Chapter 11).
Mod Matrix	The assignable table of modulation Source → Destination × Depth routes (Chapter 5).
Microtuning	Retuning individual notes away from standard 12-tone equal temperament (Chapter 9).

Term	Meaning
Glide / Portamento	A slide between one note's pitch and the next, instead of an instant jump (7.2).
Legato	A voice mode in which overlapping notes change pitch without retriggering the envelope (7.2).
Classic architecture	The 4-line / 8-module / 8-waveform engine matching the original VZ-10M hardware.
Extended architecture	The 6-line / 12-module / 16-waveform engine with AM and TZFM, unique to this plug-in (Chapter 15).
SysEx import	Loading an original Casio VZ-1 patch bank (.syx) into the preset browser (14.2).