zpwr-fx - Reference Manual

v0.3.0

MODULE REFERENCE

Modular patch effects — wire primitive DSP blocks into your own algorithm.

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Contents

Overview

zpwr-fx is a **modular patch-graph effects plugin** — not a fixed slot rack. A conventional multi-effect gives you a chain of slots in a fixed order: input, then effect 1, then effect 2, then output. zpwr-fx removes that assumption entirely. You are handed a bag of primitive DSP blocks (oscillators, filters, delays, reverbs, dynamics, distortion, modulation, utilities) and a patch field, and you wire them into whatever topology you want — the way the Eventide H3000 Factory let engineers build algorithms from primitives rather than pick from a menu. The interface is a cyberpunk WebView; the engine is the shared zpwr-patch-core graph, so the same patch concepts carry across zpwr-synth and zpwr-midi-fx. It runs as VST3, AU, CLAP and Standalone on macOS, Linux and Windows.

What "modular" actually buys you, in practice:

- **Any-to-any routing.** Any block's output can feed any other block's input. There is no implied order; a reverb can sit before a distortion, a filter can read another filter, and you can split one source into three parallel

chains and sum them back. The topology is yours.

- **Fan-out.** A single output can drive unlimited inputs. Split a signal to a dry path and several wet paths, process each differently, and recombine with a Mixer — true parallel processing instead of the serial-only chain of a slot rack.
- **Feedback.** Wire an output back to an earlier input and the graph resolves the loop with a one-sample delay. That single capability is the basis of combs, flangers, Karplus strings, resonators and self-oscillating reverbs — effects a strictly forward chain cannot express.
- **Modulation everywhere.** Every parameter has a modulation source and depth, and any signal in the patch — an LFO, an envelope, a macro knob, or another block's output — can be that source.
- **Layers.** Stack unlimited independent copies of the whole engine and mix them, for parallel timbres, wet/dry control or sheer thickness.

If you have never patched a modular before, start with ⚡ **EZ WIRE** (it builds a working chain for you) and rewire from there; if you have, the whole field is open.

Core concepts

Blocks (nodes). The block is the unit of the patch. Each block has a type (Filter, Delay, LFO, …), **three inputs** — In 1, In 2 and a dedicated **Mod** input — up to **six parameters**, and **one output**. Every sample, a block reads its inputs, runs its algorithm, and writes a single output value. Because there is exactly one output per block, you refer to a block by that output when you patch — "the filter's output into the delay's input."

Sources. A "source" is anything an input can read. The full list: silence (an unpatched input reads zero), the left and right audio inputs, an internal **Noise** generator, the macro **Soft Keys**, the live **MIDI/MPE** dimensions (mod wheel, aftertouch, pitch bend, velocity, expression, breath, sustain, note, and the MPE press / slide / bend), and **any block's output**. An unpatched input is not "off" — it is silence (zero), which matters when a block sums its inputs.

Signal vs control (there is no wall). The same cables carry audio and control voltage. An LFO's output is simply a signal that moves slowly; a filter's output is a signal that moves at audio rate. Patch the LFO into a Filter's Mod input and it sweeps the cutoff; patch it into a VCA and it becomes a tremolo; patch an audio-rate oscillator into the same Mod input and you get FM-style sidebands. "Modulation" and "audio" are the same kind of thing moving at different speeds — which is exactly why a modular can do things a fixed effect cannot.

The graph and ordering. On every structural edit (adding a block, drawing or cutting a cable) the patch is re-sorted into dependency order, so each block runs only after the blocks it reads. When you create a cycle — a cable from a later block back to an earlier input — the sort would be impossible, so the loop is broken with a single-sample delay at that edge; the rest of the order is preserved. This is why feedback "just works" and why a feedback patch has a one-sample latency in its loop (the basis of its tuning for combs). Editing is lock-free: turning a knob is an atomic write that the audio thread sees immediately; a structural change builds the new graph and swaps it atomically, so audio never tears.

Layers. A layer is a complete copy of the engine with its own patch. Use layers for parallel processing (a clean layer plus a crushed layer, blended), for octave or detune stacks, or for wet/dry balance, and mix them in the **Mixer** tab with per-layer gain/pan and sends to the aux FX buses. A layer is heavier than a block but lighter than a second plugin instance, and all layers share the same transport and MIDI.

Getting started

1. Open the plugin on an audio track. The **Patch** tab shows a grid of blocks, each with input jacks on one side and an output jack on the other, and a strip of macro knobs.
2. Press ⚡ **EZ WIRE**. It auto-routes the input through whatever blocks you have to the output, so you hear signal immediately — the fastest way to confirm the plugin is passing audio before you start designing. It is non-destructive to your blocks; it only lays cables.
3. Press **+ ADD BLOCK** and pick a Filter, Delay or Reverb. Drag from one block's **output** jack onto another block's **input** jack to wire them. Drag the output to a second input to fan out.
4. **Double-click** any block to open its detail panel: its parameters, a modulation source + depth for each parameter, and (for the Expr block) a code editor.
5. Tweak knobs and listen. The cable feeding each block **glows** in proportion to that block's live level, so the gain structure of the whole patch is visible while you work — a dim cable is a quiet signal, a hot glow is a stage being driven hard.

Two reset buttons let you start over without losing your layout: **INIT** unplugs every cable and modulation route but leaves all your blocks in place (ideal for re-patching a fixed set of blocks a new way), and 🗑 blanks the whole patch back to empty.

Patching cables

Wiring is direct manipulation:

- **Wire** — drag an output jack onto an input jack.
- **Disconnect** — drag an input jack away and drop on empty space; that input returns to silence.
- **Rewire** — drop an existing connection onto a different output to move it.
- **Fan out** — drag from the same output again to another input; an output feeds any number of destinations with no penalty to the original path.
- **Cable level & colour** — **right-click** a cable for a per-cable **level** (a gain on just that connection) and a **colour** swatch. Level is the main tool for balancing a patch by hand: a value of `0` mutes the connection without deleting it (useful for A/B-ing), and the cable's brightness and width track the level so you can read it at a glance. Colour is cosmetic and saved with the patch.

A subtlety worth internalising: when several cables land on the same input, they **sum**. That is how you mix without a Mixer block — fan three outputs into one input and it adds them (subject to each cable's level). And because the **Mod** input is just another input, you can treat it as a per-block modulation bus: patch a control signal there in addition to the per-parameter mod slots.

The interface

The editor is a set of tabs, each a different view of the same patch:

- **Patch** — the main workspace. The node grid with drag-to-wire cables, the macro soft-key strip, and the detail panel for the selected block. It carries ⚡ **EZ WIRE**, **INIT**, 🗑, and the **Stereo** / 🔒 **Lock** toggles. The cable glow makes gain structure visible here.
- **Synth** — a fixed-layout view that shows every block's knobs in a grid with no cables, like a Serum or Spire panel. Once your routing is set, this is the fastest surface for sound design because every control is visible at once.
- **Perform** — macros, XY pads, Morph and Orb only, with no patching. Everything here drives host-automatable parameters, so it works with the editor closed and records as automation; this is the live-performance and automation surface.
- **Clip** — draw a MIDI clip and play the patch from it, with key/scale and key-trigger, to audition a patch melodically without an external sequencer.
- **Mod Matrix** — every modulation connection in the patch gathered into one editable list, so you can audit and rebalance the whole modulation scheme without hunting through block panels.
- **Mixer** — per-layer channel strips (gain, pan, mute, solo) with sends to the aux FX buses, the aux returns and the master strip, plus peak and LUFS metering — the mixdown stage for multi-layer patches.
- **Browse** — a tagged preset browser: search, save, tag and load patches, filtering by bank, type, style and character.
- **Settings** — master in/out and bypass, **Auto Gain Stage** and its target, the brickwall limiter, scale/key quantize, UI scale and interface toggles.
- **About** — version and engine info.

Modulation in depth

Modulation is patching by another name. There are two routes:

1. **Per-parameter mod slot.** In a block's detail panel, every parameter carries a **source** and a **depth**. The effective value is `base + source × depth`, computed in the parameter's own units. This is the key to predictable modulation: the same LFO at depth `2400` on a pitch parameter sweeps two octaves (pitch is in cents), while at depth `0.2` on a mix parameter it nudges the blend by a fifth of its range. Choose depth in the units of the thing you are modulating.
2. **Mod input.** Patch a control signal straight into a block's **Mod** input for a per-block modulation bus that sums with the parameter slots.

Any source is fair game: an **LFO** block (for cyclic movement), an **Envelope** follower (for dynamics-driven movement), a **macro Soft Key** (for hand or automation control), **Noise** (for randomness, often via a sample-and-hold), a **performance controller**, or **another block's output**. That last one is the deep part: because modulators are ordinary nodes in the dependency graph, you can modulate a parameter with a processed signal — a filtered, delayed or distorted version of something else — and the engine orders it correctly like any cable. Audio-rate modulation (one oscillator into another's Mod) gives you FM and cross-modulation timbres, not just slow sweeps.

The **Mod Matrix** tab is the bird's-eye view: it lists every route as (source → destination, depth) so you can see and adjust the entire modulation design at once.

Macro soft keys

The **Soft Keys** are an expandable pool of macro knobs — 16 active by default, with + / − controls above the knob row to change the active count (saved with the patch). They exist for one structural reason and one creative reason:

- **Structural:** a plugin's host-automatable parameter list must be fixed, but a patch's blocks and routing change constantly. The soft keys are that fixed, host-facing list. The patch itself — block types, cables, parameters — is plugin state the editor changes and the plugin saves; the soft keys (plus master in/out/bypass) are what your DAW sees and automates.
- **Creative:** because a soft key is patchable anywhere as a modulation source, one knob can drive many destinations at once. Assign a single soft key to a filter cutoff, a delay mix and a drive amount, and you have a one-knob macro that opens the whole patch up — and it records as automation and appears on the Perform surfaces.

This is exactly the H3000 "soft function key" model: a small set of performance controls mapped into the guts of an algorithm.

Gain staging

Because cable levels stack and inputs sum, it is easy to drive the signal between blocks well past 0 dBFS — which would clip digitally. Two per-block settings (both **on by default**) prevent that:

- **Auto Gain Stage** rides levels. Each block's output runs through a peak follower with a fast attack and a slow release; its smoothed gain (never above 1) pulls the block down toward the **Auto-Gain Target** ceiling. The effect is gentle, automatic level-matching between stages as you build, so one hot block doesn't blow out the next.
- **Soft Clip** is the guarantee the follower can't make alone. The follower's ~2 ms attack lets a fast transient through before it ducks, and cable gains are applied downstream of the staging, so something can still exceed the ceiling momentarily. Soft Clip is an instant, sample-accurate tanh bound at the same ceiling on every block output — it catches whatever slips past, and because it is a tanh it saturates gently rather than clipping squarely.

Both are per block and independent, and the cable glow tracks each block's post-staging level. Turn either off in Settings when you want raw, intentional gain or clipping. They are separate from the master **Brickwall Limiter**, which is a single hard ceiling on the final summed output (the last line of defence, not a per-stage tool). MIDI-effect blocks carry no audio level, so neither stage applies to them.

The Expr block

The **Expr** block runs a short per-sample expression you write in its detail panel — an escape hatch for anything the fixed blocks don't cover, edited live while audio runs:

- **Variables:** `in` (In 1), `t` (running time), `sr` (sample rate), `p0`–`p7` (where `p0`–`p5` are the six knobs, `p6` is In 2 and `p7` is the Mod input), `s0`–`s3` (four state variables that persist across samples, for filters and feedback), and the constants `pi`, `tau`, `e`.
- **Functions:** trig (`sin cos tan tanh`), shaping (`floor frac wrap saw sqr tri`), math (`min max pow fmod clamp lerp`), control (`if step noise rand`), and the standout **`tap(d)`** — the block's own output `d` samples ago, with fractional interpolation, which makes combs, Karplus strings, delays and feedback trivial to express.
- **Safe by construction:** the language has no loops, allocation or arbitrary memory access in the audio path; the output is sanitised so any NaN or Inf becomes 0; and a program that exceeds the complexity limit simply fails to compile rather than glitching audio.

Worked snippets:

- **Wavefolder** — `out = sin(in * (1 + p0 * 8) * pi)`: as p0 rises the input is folded into more harmonics.
- **Bit reducer** — `out = floor(in * (1 + p0 * 32)) / (1 + p0 * 32)`: quantises amplitude to a staircase whose steps p0 controls.
- **Tuned comb / pluck** — `out = (in + tap(sr / (60 + p0 * 1000))) * p1`: adds a delayed copy of the output tuned by p0, with p1 as the feedback/decay — feed it noise and it rings at a pitch.
- **Sample-and-hold** — `s0 = if(p6 > 0.5, noise(), s0); out = s0`: holds a random value, re-sampling each time the clock on In 2 (p6) goes high.

Worked examples

Filter sweep (auto-wah). Add a Filter and an LFO. Wire In L → Filter → Out. In the Filter, set the cutoff's mod **source = LFO** with a depth of a couple of octaves and pick a band-pass mode; set the LFO Rate slow. The cutoff now sweeps

cyclically. Swap the LFO for an **Envelope** follower of the input and the sweep tracks your playing dynamics instead — a real auto-wah.

Stereo slap. Turn **Stereo** on and leave 🔒 **Lock** off so the two sides are independent. Add a Delay on each side and set slightly different Times left and right; feed each side's input straight to its output as well so the dry passes. The small L/R time difference widens the slapback across the stereo field.

Comb resonator. Add an Expr block and wire its output back to its own In 1. Use `out = (in + tap(sr / (60 + p0 * 1000))) * p1`. In 1 is the live input plus a tuned, fed-back tap, so noise or transients ring at a pitch set by p0, with p1 as the resonance/decay — a string you tuned by hand.

Parallel crush. Open the Mixer and add a second layer. Keep layer 1 clean; on layer 2 add a Crusher and a Drive. Blend the dirty layer under the clean one with the layer faders — parallel distortion that adds grit while keeping the body and transients of the dry signal intact.

Self-oscillating space. Add a Reverb and feed a little of its output back to its input through a Filter and a low cable level. Raise the feedback cable level slowly: the reverb tips toward self-oscillation, the filter shapes the resonance, and you have an evolving drone — the kind of patch a fixed reverb slot can never make.

Perform & macros

The **Perform** tab is a play-the-patch surface that drives only host-automatable parameters, so it runs with the editor closed and everything you do records as automation:

- **Preset Morph** — a 4-corner XY pad (A/B/C/D) that bilinearly interpolates between four captured patches as you move the puck. The X/Y axes are reserved host parameters, so the morph automates and recalls; 🎲 loads a random preset into all four corners for instant exploration.
- **Orb** — a radial pad where the puck's angle selects a scene and its distance sets that scene's intensity. 🎲 rolls a fresh random scene set, ⏺ records the puck's motion as you drag, and ▶ loops the recording back through the host-automatable parameters — a hands-free gesture turned into recorded, editable automation.
- **XY macro pads** — each drives a pair of soft keys, with a per-pad **HOLD** / **SPRING** toggle: HOLD leaves the dot where you drop it, SPRING snaps both axes back to centre on release for momentary moves.
- **Macro knobs** — the soft keys exposed as plain knobs.
- **Scenes** — snapshot slots for the whole macro surface: click to recall, right-click to clear.
- **Controls band** — a global randomise, an arpeggiator (mode / rate / latch), and **scale + key** quantize plus a **Chord** that stacks extra intervals on each key played on the on-screen keyboard.

The throughline: every Perform control writes to soft keys (host params), so a live performance and a recorded automation lane are the same thing.

Stereo & stereo lock

- **Stereo** (off by default) mirrors the entire patch graph to a second, right-channel copy, so each block processes the left and right channels independently. Dial a per-knob offset between the two sides for width — slightly different delay times, filter cutoffs or detune amounts left vs right.
- 🔒 **Lock** keeps the mirrored (clone) blocks tracking the left channel. It is **bidirectional and offset-preserving**: moving a left knob moves its clone, and moving a clone moves the left, each by the same delta — so the L/R offset (the width you dialled in plain Stereo) is preserved rather than collapsed. Turn Lock on with no offset for a perfect `L = R` mono-in-stereo. Both states save with the patch, and locked clone blocks render dimmed so you can see which side is following.

MIDI & MPE

The plugin accepts MIDI and MPE; MPE is parsed and aggregated to the most recently played note. Every MIDI dimension is exposed as a modulation source — mod wheel, aftertouch (channel and poly), pitch bend, velocity, expression, breath, sustain, note, and the MPE press / slide / bend — so you can play an effect expressively from a controller (mod wheel to delay mix, aftertouch to filter cutoff, and so on). Two response toggles, both **on by default**:

- **Program Change** — an incoming Program Change message selects the matching preset. Turn it off to ignore Program Change (e.g. when your controller sends it unintentionally).
- **Bank Select** — CC0 (MSB) and CC32 (LSB) are captured and combined with the next Program Change as `bank × 128 + program` for banked preset addressing. Turn it off and Program Changes address presets 0–127 directly.

Presets & browsing

Factory patches ship in code as starting points — **Stereo Slap, Filter Sweep, Comb Resonator, Wavefolder** — each a small, legible example of a different technique. Save your own from the **Browse** tab with facet tags (bank / type / style / character); the browser's filters are driven by those tags, so a well-tagged library stays searchable. The full plugin state — the patch plus every parameter and soft-key value — round-trips through your host's project file, and an incoming Program Change can recall presets live for set-based performance.

The module library

The block palette is the full shared audio pack — over a thousand module types. They fall into families you combine freely:

- **Oscillators & sources** — analog, wavetable, FM, additive, supersaw, sync, vector and physical models, plus a Noise generator. In an effect context they are carriers for ring modulation, test tones, sub-bass reinforcement, or — fed by the input — the basis of vocoder-style work.
- **Filters** — state-variable (low-pass, high-pass, band-pass, notch), Moog and diode ladders, formant filters, comb filters, and the modeled analog filters below. Each has a Mod input so the cutoff can be swept by an LFO, envelope or another signal.
- **Delays** — clean, damped-feedback, tape, ping-pong, multi-tap and granular delays. Modulating the delay time turns a delay into a chorus or flanger; long feedback turns it into a resonator.
- **Reverbs** — rooms, halls, plates, springs, and shimmer/feedback reverbs for everything from a tight ambience to an infinite wash.
- **Distortion & saturation** — soft drives, tube and diode clippers, wavefolders, bit and sample-rate crushers, and the modeled pedals below.
- **Dynamics** — compressors, limiters, gates, transient shapers, and the modeled studio units below.
- **Modulation effects** — chorus, flanger, phaser, tremolo, ring modulator and auto-pan.
- **Pitch & spectral** — pitch shift, frequency shift, harmonisers and spectral processors.
- **Utilities** — mixers, gains, math, sample-and-hold, slew limiters, logic, panners and the routing helpers that glue a patch together.

The **Module Reference** (linked from the docs hub, and the full catalogue at the back of this manual) documents every block with its inputs, parameters and a description, generated from the live registry so it never drifts from the build.

Touring the module library

This is a guided walk through the families, naming standout blocks so you know what to reach for. Every block here is real and documented in the catalogue at the back; this is the "what should I grab?" view.

Filters. Beyond the plain Filter (a state-variable LP/HP/BP/notch) the library is deep: Ladder and DiodeLadder for Moog and 303 character, MS20Filter, SteinerParker, OberheimSEM and WaspFilter for famous analog voicings, Formant and VocalFilter for vowel sounds, CombBank and FixedFilterBank (a Moog 914) for fixed resonant banks, GraphicEQ, EQ and ParaEQ for surgical tone, AutoWah and DJFilter for performance sweeps, and a whole set of **resonators** (BarReson, BellReson, GlassReson, DrumheadReson, HarpReson) that ring a struck or noisy input into tuned, physical tones. Reach for a resonator when you want a delay or noise burst to sing at a pitch.

Delays. Delay is the workhorse; DubDelay adds the filtered, saturating feedback of a tape echo, PingPong bounces L/R, Multitap and Rainmaker spray rhythmic taps, GrainDelay and Morphagene chop the buffer into grains, Looper and Freeze capture and hold, and BBDDelay models a bucket-brigade's gentle hiss and warble. The modulation effects live here too because they are short modulated delays: Chorus, Ensemble, Flanger and PeakFlanger. If you want movement, a delay is usually the root of it.

Reverbs. Reverb and Plate for bread-and-butter space, Spring for drip and boing, Shimmer and Crystals for pitched, ascending tails, Convolution for sampled spaces, ErbeVerb and Massive for modeless, ambient washes, GatedVerb for the 80s chop, ReverseVerb for swells, and Gravity / Aetherizer for unreal, infinite atmospheres. Feed a little reverb back through a filter for self-oscillating drones.

Distortion & saturation. Drive and Fuzz for the staples, Bitcrush and Decimator for digital grit, Diode and Chebyshev for specific harmonic curves, Exciter for sheen, Lofi and Erosion for degradation, CabSim / AmpSim for guitar tone, and DrumBuss for one-stop drum glue-and-grit. Pair any of them with a Filter before and after to shape what gets distorted and what survives.

Dynamics. Compressor, Limiter and Gate cover the essentials; OTT is the famous multiband upward/downward squash, MultiComp and MBDynamics give per-band control, Transient shapes attack and sustain, DeEsser tames sibilance, Maximizer

and Squash push loudness, Ducker / Pump do sidechain pumping, and EnvFollow turns any signal into a control source for your own dynamics tricks.

Modulation sources. The LFO is the start, but the library runs deep into **chaos**: strange attractors like Lorenz, Chua, Clifford, Aizawa and ChenLee give organic, never-repeating modulation, and Clock / ClockDiv / ClockMult keep things in time. Patch a chaotic source at low depth into tuning or cutoff for life an LFO can't give.

Oscillators & generators. Over three hundred of them — analog and wavetable cores, FM and additive voices, physical models (Bowed, Blown, BowedString), drums and percussion (Bongo, Agogo, Anvil, Basimilus), and sound-effect generators (Applause, Birds, AirHorn, Alarm). In an effect they are carriers for ring-mod, sub reinforcement, or test tones.

Stereo. MidSide for M/S processing, Haas for width by tiny delay, Imager / StereoWidth for spread, AutoPan and Rotate for movement, Binaural and Crossfeed for headphone realism, and MonoMaker to keep the low end centred.

Pitch. PitchShift and Harmonizer for intervals, H910 and MicroShift for the classic doubling and detune, Octaver / Octavox for sub and stacked octaves, FreqShift for inharmonic metallic shifts, and PitchCorrect for tuning.

Spectral. SpecFreeze to hold a spectrum, SpecBlur / SpecMorph for smeared evolving texture, SpecGate and Soothe for spectral cleanup, and MatchEQ to match one signal's tone to another.

Utilities. The connective tissue: Mixer, Gain, Constant, math (Clamp, Average, Compare, Counter), SampleHold and Slew for shaping control signals, ClockDiv / ClockMult for timing, and Analyzer to see what's happening. You'll use these constantly to glue a patch together.

Analog models

A large portion of the library is **component-level analog emulation** — modeled from the circuit topology rather than from impulse responses or samples — so the blocks respond to drive, bias and dynamics the way the originals do. Pushing the input harder pushes the model into its non-linear region; backing off cleans it up. They are grouped by the gear they model:

- **Filters** — Minimoog ladder, Jupiter-8, MS-20, Oberheim SEM, EMS VCS3, Wasp, TB-303.
- **Compressors & limiters** — 1176, LA-2A, LA-3A, Fairchild, dbx 160, SSL bus, API 2500, Distressor, Sta-Level.
- **EQs & front-ends** — Pultec, API 550, Neve 1073, SSL E/G, Manley, Helios, GML, plus preamp and tape stages.
- **Pedals** — Tube Screamer, RAT, Big Muff, Klon, DS-1, MXR, Octavia, OCD, Metal Zone.
- **Amps & cabs** — Fender, Marshall, Vox and Mesa voicings.
- **Time & space** — EMT 140 plate, AKG BX20 spring, Roland RE-201 Space Echo, Binson Echorec, Memory Man, plus enhancers, phaser/tremolo and chorus.

Use them like any block: feed the input, set the drive/character, and modulate the controls. Because they are real topologies you can stack them — a 1073-style pre into an 1176-style compressor into a Pultec-style EQ — and they interact the way a hardware chain would.

Tutorials

A dub delay throw. Add a Delay and a Filter. Wire In L → Delay → Filter → Out, and also feed In L → Out so the dry passes. Set the Delay Time to a musical division and its Feedback fairly high; make the Filter a band-pass after it so each repeat darkens as it trails. Assign one **soft key** to the Delay Feedback and another to its Mix, then automate them on the **Perform** tab to throw the delay in and out of the mix live — the classic dub move, built from primitives.

A flanger from scratch. Add a Delay with a very short Time and an LFO. Route the LFO into the Delay Time mod with a small depth and a slow Rate, then mix the delayed signal back with the dry — the swept short delay is a flanger. Raise the Delay Feedback for resonance, and speed the LFO up to cross into chorus territory. You now understand why flange and chorus are the same effect at different settings.

A wavefolder lead processor. Add an Expr block with `out = sin(in * (1 + p0 * 8) * pi)`. Patch an **Envelope** follower of the input into p0 so the fold amount tracks dynamics — quiet notes stay clean, loud notes bloom into harmonics. Follow with a Filter to tame the top and a touch of Reverb for space.

Sidechain-style ducking. Add an Envelope follower reading a control source (or the input) and a VCA on your main signal, then route the follower's output into the VCA so the main signal ducks when the source is loud. You have built a sidechain compressor from a follower and a VCA — and you can shape its attack/release by filtering the follower's output.

Parallel grit. Use two layers. Keep layer 1 clean. On layer 2 add a modeled pedal (RAT or Big Muff) and a Filter to carve the distorted band. Blend layer 2 under layer 1 with the layer faders, so the grit adds harmonics and presence without losing the dry signal's body and transients.

Modulation cookbook

- **Vibrato** — LFO → an oscillator's pitch mod, small depth, ~5 Hz.
- **Auto-wah** — Envelope follower of the input → Filter cutoff mod.
- **Tremolo** — LFO → a VCA, or LFO → a Gain block.
- **Stepped random** — Noise → a Sample-and-Hold clocked by an LFO → any parameter.
- **Analog drift** — a very slow LFO or smoothed Noise at tiny depth on tuning or cutoff.
- **Velocity → brightness** — MIDI velocity → Filter cutoff mod, so harder notes open up.
- **Mod-wheel macro** — mod wheel → a soft key, then that soft key → several parameters at once.
- **Cross-modulation** — an audio-rate oscillator → another oscillator's (or filter's) Mod input for metallic, FM-style timbres.

A short DSP primer

If the blocks make more sense when you know what's happening inside, here is the quick theory — just enough to patch with intent.

Filters remove or emphasise frequencies. A low-pass keeps lows and rolls off highs (darkening); a high-pass does the opposite (thinning); a band-pass keeps a slice; a notch removes one. The **cutoff** is where the rolloff begins and **resonance** is a boost right at the cutoff — push resonance high and a filter rings, even self-oscillates into a sine. A comb filter adds a signal to a short-delayed copy of itself, reinforcing some frequencies and cancelling others (the basis of flanging and tuned resonance). A formant filter parks several resonant peaks where a human voice's do, producing vowels.

Delays store the signal and play it back later. A long delay is an echo; shorten it and add **feedback** (output fed back to input) and the repeats blur into resonance; shorten it to a few milliseconds and modulate the time and you get **flanging** (a sweeping comb) or **chorus** (a detuned thickening). All three are the same mechanism at different time scales.

Reverb is what a thousand tiny delays sound like — the dense, decaying reflections of a space. **Size** sets how big the room feels, **decay** how long the tail rings, and **damping** how quickly the highs die away (a bright tiled room vs a soft carpeted one).

Distortion reshapes the waveform, adding harmonics that weren't there. A gentle soft clip rounds the peaks (warmth); a hard clip squares them (aggression); a wavefolder reflects peaks back on themselves (bright, metallic, unpredictable); a bit/sample-rate crusher quantises the signal in level or time (digital grit). More drive means more harmonics.

Modulation is a slow (or fast) signal changing a parameter over time. An **LFO** is a repeating shape (sine, triangle, square, ramp); an **envelope** is a one-shot contour triggered by an event; **noise** and **chaos** are unpredictable. Patch any of them to a parameter and that parameter moves. Move it fast enough (audio rate) and you cross from "modulation" into "synthesis" — FM, ring modulation, sidebands.

Dynamics change level based on level. A **compressor** turns down what's too loud (evening out a performance or gluing a mix); a **gate** turns down what's too quiet (removing bleed); a **limiter** is a brick wall the signal can't cross; a **transient shaper** independently scales the attack and the sustain. An **envelope follower** measures a signal's loudness and hands it to you as a control source — the seed of every sidechain trick.

More techniques

Tape-style chorus. A short Delay (10–25 ms) with its time gently swept by an LFO, mixed 50/50 with the dry. Two such delays at different LFO phases, panned left and right, give a lush Ensemble.

Frozen pad from a transient. Send a sound into Freeze (or SpecFreeze); capture a moment and hold it into an infinite bed, then filter and reverb it — an ambient pad grown from a single hit.

Rhythmic gate. Patch a square LFO (or a Clock-derived signal) into a VCA on your full signal so it chops in time — the trance gate. Vary the LFO shape for different gate envelopes.

Resonant ping. Patch a trigger or a noise burst into a high-resonance BarReson or BellReson, or a Filter with resonance near self-oscillation; each hit rings at the tuned pitch — instant tuned percussion you can play from MIDI.

Lo-fi tape bed. Chain Lofi → BBDDelay → a gentle Wow/drift LFO on the delay time → a band-pass Filter. The result is a worn, warbling, band-limited texture under anything.

Spectral wash. SpecBlur or SpecMorph on a sustained source smears it into an evolving cloud; follow with Shimmer for an ascending, pitched tail.

A cookbook of complete patches

Ten finished patches you can build start to finish. Each names real blocks; wire them in the order written and tweak to taste.

1. Vocal doubler. In L → H910 (or MicroShift) with a few cents up, In L → H910 a few cents down, pan the two copies hard left and right, mix the dry up the middle. Add a slow Chorus across both for thickness. Instant wide, natural doubling for vocals or leads.

2. Eighties gated snare. In L → Reverb (Plate, large) → GatedVerb (or a Gate keyed by the dry input's EnvFollow). The tail blooms then chops off hard — the unmistakable 80s drum ambience.

3. Dub siren. An Osc (sine) with its pitch swept by a slow LFO, into a DubDelay with high, filtered feedback, into a Spring reverb. Ride the delay feedback on a soft key for live dub throws.

4. Multiband saturator. Split In L into three Crossover bands; on each band add a different Drive/Diode/Chebyshev flavour and a Gain, then sum with a Mixer. Distort the lows gently, the mids harder, and add Exciter sheen on top — controlled, band-aware grit.

5. Shimmer pad machine. In L → Reverb (long) with a PitchShift (+12) in the reverb's feedback path, fed back through a Filter. Each pass rises an octave into an angelic, infinite Shimmer. Hold a chord and let it bloom.

6. Lo-fi tape loop. In L → Lofi → BBDDelay (medium time, moderate feedback) with a slow LFO on the delay time for wow, into a band-pass Filter, with a sprinkle of Erosion. Warbling, band-limited, nostalgic.

7. Sidechain pump on a bus. EnvFollow a kick (or a Clock-driven LFO) → a VCA (or Pump) on your full signal. The signal ducks on every beat — the house/EDM pump, built from a follower and a VCA so you control the exact shape.

8. Robot voice. In L → RingMod with a fixed-frequency Osc carrier (try 200–800 Hz), into a Formant filter for vowel character, a touch of Bitcrush. Metallic, talking-machine timbre.

9. Granular cloud. In L → GrainDelay (or Morphagene) with small grain size and high density, its position swept by an LFO, into a DiffuseDelay and Reverb. A shimmering, textural cloud from any source.

10. Self-playing drone. An Osc → Ladder filter with high resonance, the filter cutoff modulated by a slow Lorenz chaos source, into a long ErbeVerb. Patch a little of the reverb output back through a Filter to the input at a low cable level. It evolves forever, never repeating — set it and listen.

Mixing & mastering with zpwr-fx

Because the same library carries studio-grade dynamics and EQ, the plugin doubles as a channel strip or mastering chain you wire yourself:

- **Channel strip:** Gate (clean up bleed) → Compressor (even the level) → EQ/ParaEQ (tone) → a gentle Drive or modeled Tube (harmonics). Reorder to taste — EQ before or after the compressor are different sounds.
- **Bus glue:** a slow Compressor or the SSL-style bus comp at a low ratio across a group, with a touch of Exciter and StereoWidth.
- **Master chain:** DynEQ/MatchEQ for tonal balance → multiband OTT/MultiComp (gently!) → Maximizer or Limiter for loudness, with the master Brickwall Limiter as the true ceiling. Watch the **LUFS** meter in the Mixer.
- **Mid/side:** put a MidSide encoder first and a decoder last, and process the mid and side paths independently in between — widen the sides, tighten the middle.

Ten more complete patches

11. Reverse reverb swell. In L → ReverseVerb (or a Reverb into a reverse buffer), mixed ahead of the dry. The tail swells into each note — the inhaling, pre-echo sound used on ballad vocals and cinematic risers.

12. Telephone / radio. In L → ParaEQ (steep band-pass around 300–3000 Hz) → Bitcrush (light) → a touch of Lofi. Thin, distorted, distant — instant lo-fi voice or radio bed.

13. Tape stop. In L → Delay with its time and pitch swept down to a halt by a fast envelope on a soft key; trigger the key for the turntable-brake effect on a drop.

14. Octave fuzz lead. In L → Octaver (+12) mixed with dry → OctaveFuzz → Filter. The classic ring-y, octave-up guitar-fuzz lead.

15. Chorus ensemble pad. Four short Delays (or one Ensemble) at different LFO phases, panned across the field, mixed under the dry. Lush, wide, string-machine thickness.

16. Spectral de-noise. In L → Soothe (or SpecGate) to tame harsh resonances and clean the spectrum, then DynEQ to balance — a gentle restoration chain.

17. Glitch stutter. In L → BeatSlicer/Glitch gated by a Clock-derived signal, into a PingPong delay. Rhythmic, chopped, IDM-style fills from any input.

18. Drum bus. In L → Transient (add attack) → DrumBuss (grit + glue) → MultiComp → a touch of Reverb on a parallel send. Punchy, cohesive drums.

19. Vowel morph. In L → Formant with the vowel position swept by a slow LFO (A→E→I→O→U). A talking, vocal filter sweep — great on synths and pads.

20. Infinite ambient generator. Noise → Filter (band-pass, swept by a Lorenz chaos source) → GrainDelay → long ErbeVerb, with a slow AutoPan. A self-evolving ambient bed that never needs an input — set it and let it drift.

A field guide to feedback

Feedback is the capability a fixed slot rack cannot offer, and the source of the most interesting patches — so it is worth understanding on its own.

When you cable an output back to an earlier input, the engine breaks the loop with a one-sample delay so the graph can still be ordered. That tiny delay, plus whatever Delay/filter sits in the loop, sets the **loop time** — and the loop time sets the pitch or rhythm of the feedback:

- A loop just a few samples long rings at a high pitch (a tuned comb / Karplus string).
- A loop a few milliseconds long flanges.
- A loop tens of milliseconds long slaps and resonates.
- A loop of hundreds of milliseconds or more echoes and builds.

The **feedback amount** is set by the level of the cable in the loop (right-click it). Below 1.0 the loop decays; near 1.0 it sustains; at or above 1.0 it grows without bound — which is where self-oscillation lives. Three rules keep it musical:

1. **Start low, raise slowly.** A loop can run away faster than you expect; bring the feedback cable level up by hand and stop where it sings.
2. **Put something in the loop.** A Filter in the loop tames runaway highs and shapes the resonance; a Saturator/Drive softens the peaks so self-oscillation settles into a stable tone instead of clipping; a slow modulator on the loop makes it evolve.
3. **Tune by the delay.** Change the loop's Delay time to tune the pitch (shorter = higher) or the rhythm (longer = slower echoes).

Patches that live on feedback: combs and resonators, flangers, Karplus strings, dub delays, infinite reverbs, drones, and the "self-playing" patches in the cookbooks above.

Live performance setups

Because everything host-automatable lives on the **soft keys** and the **Perform** tab, the plugin is built to be played, not just programmed:

- **One-knob morph.** Map a soft key to several parameters (filter cutoff, delay mix, drive) and ride one knob to open the whole patch. Put it on a hardware controller and it records as automation.
- **Scene switching.** Use **Perform → Scenes** to snapshot whole macro states and recall them between song sections; right-click clears a slot.
- **The Orb.** Record an Orb gesture once, then loop it for hands-free, evolving movement while you do something else — and it writes to host params so it bakes into the track.
- **Preset Morph.** Capture four versions of a patch into the four corners and sweep the XY pad between them live; the X/Y are host params, so a DAW can automate the morph.
- **MIDI program changes.** Build a setlist of presets and step through them with Program Change from a pedalboard or controller (toggle in Settings).
- **Effect as instrument.** Add an oscillator driven by the MIDI **note** source and play the effect chain melodically from a keyboard — the H3000-style "play the algorithm" approach.

The effect families in depth

A closer look at the families you'll reach for most, and the controls that matter.

Filters. Every filter has a **cutoff** (where it acts) and most have **resonance** (a boost at the cutoff). Low resonance is gentle tone shaping; high resonance whistles and, near the top, self- oscillates into a sine you can play. **Mode** picks low-pass (warm), high-pass (thin), band-pass (focused) or notch (hollow). The character comes from the model: Ladder is the round, slightly- distorting Moog; DiodeLadder is the squelchy 303; MS20Filter and SteinerParker are aggressive and screaming; Formant/VocalFilter impose vowels; the resonator family (BarReson, BellReson) rings like struck metal or glass. Drive into a filter for analog grit, and modulate the cutoff (LFO, envelope, or the Mod input) to make it move.

Delays. **Time** sets the spacing, **feedback** sets how many repeats (and, high enough, resonance), **mix** sets wet/dry, and a **damp**/tone control darkens each repeat. Sync the time to tempo for rhythmic echoes; modulate it for chorus/flange. DubDelay saturates and filters its feedback like tape; PingPong alternates channels; Multitap/Rainmaker give rhythmic tap patterns; GrainDelay/Morphagene granularise the buffer; Looper/Freeze capture and sustain.

Reverbs. **Size** is the space, **decay** the tail length, **damping** how fast highs fade, and a **pre-delay** (where present) sets the gap before the tail. Small + short = a tight room; large + long + low damping = a cathedral. Plate is smooth and classic, Spring drips and boings, Shimmer pitches the tail up for angelic clouds, Convolution uses sampled spaces, and ErbeVerb/Massive morph freely between all of it. A high-pass before the reverb keeps low end clean; a low-pass after darkens the tail.

Distortion. **Drive** sets how hard you push into the non-linearity, **tone** shapes what comes out, **mix** blends with the dry (parallel distortion keeps the body). Soft clippers warm, hard clippers bite, wavefolders (Folder) go bright and metallic, and crushers (Bitcrush, Decimator) add digital grit. Filter before to choose what gets distorted, filter after to tame the harmonics.

Dynamics. A **compressor** has threshold (where it starts), ratio (how hard), attack and release (how fast it grabs and lets go), and makeup gain. Fast attack tames transients; slow attack lets them through (punch). A **gate** is the inverse — it closes below a threshold. Transient skips the threshold idea entirely and just scales attack and sustain. OTT is multiband up/down compression for that modern, loud, even sound. Use EnvFollow to turn any signal into a control source for your own dynamics.

Modulation effects. Chorus, flanger and phaser are all built on short modulated delays/all-passes: **rate** sets the sweep speed, **depth** how far, **feedback** the resonance, **mix** the intensity. Slow and shallow = subtle width; fast and deep = seasick warble. RingMod multiplies by a carrier for metallic, inharmonic tones; Tremolo/AutoPan move level and position.

Pitch & spectral. Pitch shifters have an **interval** (and often a **detune** for the doubling effect) and a dry/wet mix; FreqShift moves frequencies linearly for inharmonic, metallic results rather than musical intervals. Spectral blocks work on the frequency picture: SpecFreeze holds it, SpecBlur smears it over time, Soothe/SpecGate clean it, MatchEQ copies one signal's tone onto another.

Automation & your DAW

The plugin is built to live inside a session, not just on a screen.

- **What automates.** Your DAW sees the **soft keys** plus Master In / Out / Bypass. The patch itself (blocks, cables, parameters) is plugin state that saves with the project but isn't a per-knob automation lane — so anything you want to automate, put on a soft key and patch that key wherever it needs to go inside the graph.
- **Recording moves.** Anything you do on the **Perform** tab — macro knobs, XY pads, the Orb, the Preset Morph (its X/Y are reserved host params morphX/morphY) — writes to host parameters, so a performance you play records as automation and plays back identically with the editor closed.
- **Presets via program change.** Build a setlist and step through presets with MIDI Program Change (and Bank Select for banks beyond 128); toggle the response in Settings.
- **Bypass & gain.** Master In/Out and Bypass are host params too, for clean A/B and gain matching in the mix.
- **State recall.** The whole patch and every parameter round-trip through the host project, so reopening a session restores the exact instrument you built.

A practical pattern: design the patch, decide the three or four things you'll want to ride (cutoff, delay mix, drive, a morph), assign each to a named soft key, and from then on you work entirely from those macros and the Perform surfaces — the patch underneath stays fixed while the performance lives in automation.

Effects by genre

Different genres lean on different effect signatures. Here's where to start for each, and which blocks build the sound.

Dub / reggae. Spring reverb and tape-style delay are everything: Spring + DubDelay with high, filtered feedback. Ride the delay feedback and a band-pass Filter on soft keys for live "throws."

Shoegaze. Wash and pitch: layered Reverb/Shimmer, a Flanger or Chorus for movement, and a modeled fuzz (Big Muff-style) for the wall of guitar.

Techno / minimal. Movement and space from short tempo-synced delays, a rhythmic Filter swept by an LFO or a trance gate (LFO → VCA), and a tight Plate reverb. Subtle Bitcrush for grit.

Hip-hop / lo-fi. Character over cleanliness: Lofi, BBDDelay with wow, a band-limiting Filter, vinyl-style noise, and gentle Drive. The worn, warbling bed under the beat.

Ambient. Long, evolving space: ErbeVerb/Massive reverbs, GrainDelay/Morphagene clouds, SpecBlur for smear, chaos-modulated filters, and AutoPan for motion. Often no dry signal at all.

Pop / vocal production. Polish: a channel-strip chain (Gate → Compressor → EQ), H910/ MicroShift doubling for width, a tasteful Plate reverb and a slap Delay, DeEsser for sibilance.

Metal / rock guitar. AmpSim → CabSim is the core; add a Gate before for tightness, an EQ/ParaEQ to carve, and a short reverb. Modeled pedals (TS808 to push the amp, RAT for grind) in front.

EDM / future bass. Big and loud: OTT multiband squash, wide StereoWidth/Imager, sidechain Pump, Shimmer reverb, and pitch effects (Octavox) on leads.

Troubleshooting

No sound at all. The output jack needs an incoming cable, and the chain must trace back to the input or a source. Press ⚡ **EZ WIRE** to auto-route, or check the master Bypass in Settings.

Sound, but no effect. Check the effect's **Mix** parameter (a dry-only mix passes the input untouched), and confirm the effect is actually in the signal path between input and output, not on a dead-end branch.

It's clipping / distorting unintentionally. Turn on **Auto Gain Stage** and **Soft Clip** (Settings), lower the cable **levels** feeding the hot stages, or pull Master Out down. Watch the cable glow for the blown-out stage.

A feedback patch runs away or screams. Lower the feedback cable's **level**, and put a Filter and a Drive in the loop to tame and stabilise the resonance. Self-oscillation lives right below runaway — back off slightly.

Modulation isn't doing anything. Check the mod **depth** (zero depth = no effect) and that the mod **source** is actually moving (an LFO needs a non-zero rate; an envelope needs a trigger). Depth is in the parameter's units, so a tiny depth on a wide-range parameter can be inaudible.

The plugin sounds different after reopening the project. It shouldn't — the whole patch and all parameters save with the host project. If a preset looks wrong, check whether an incoming Program Change is switching it (toggle Program Change off in Settings).

Stereo sounds collapsed or mono. With **Stereo** on and **Lock** on at zero offset you get L = R (intentional mono-in-stereo); turn Lock off and offset the two sides for width.

High CPU. Feedback loops, many layers, granular and convolution blocks, and large reverbs are the expensive ones. Bounce a heavy patch, or move shared effects to fewer instances.

Tips & best practices

> Start with ⚡ **EZ WIRE** to get sound, then rewire piece by piece — it is faster than building from an empty field.
> Read the **cable glow** constantly. A dim cable into a block means it is being driven quietly; a blown-out glow means you are slamming the next stage. Use cable **levels** to balance instead of reaching for a Gain block every time.
> Leave **Auto Gain Stage** and **Soft Clip** on while building; switch them off only when you want raw, intentional clipping or saturation.
> Reach for **layers** when you want parallel processing — don't force a parallel idea into a serial chain.
> Put anything you will tweak live on a **soft key** so it records as automation and shows up on the Perform surfaces.
> Build feedback patches carefully: start the feedback cable **level** low and raise it gradually, since the one-sample loop can run away into self-oscillation faster than you expect.

FAQ

I get no sound. Press ⚡ **EZ WIRE**, or check that something is wired to the output jack — the output must have an incoming cable, and the chain must trace back to the input or a source.

A patch is clipping. Confirm Auto Gain Stage / Soft Clip are on (Settings), lower the cable levels feeding the hot stages, or pull Master Out down. The master Brickwall Limiter is the final ceiling but shouldn't be doing the heavy lifting.

Can I use it as an instrument? Yes — add oscillators driven by the MIDI **note** source and it plays like a synth; or use zpwr-synth, which is this same engine built for polyphony.

Where do my presets live? Saved patches appear in the **Browse** tab with their tags, and the whole patch and its parameters also save inside your host project, so a session reopens exactly as you left it.

Why does my feedback patch hum at a pitch? The one-sample (plus your delay) loop tunes the feedback to a frequency; that is the comb/Karplus mechanism. Shorten the delay for a higher pitch, lengthen it for a lower one, and lower the feedback level to shorten the ring.

Which formats and OSes? VST3, AU, CLAP and Standalone for macOS, Linux and Windows (AU is macOS only; Windows ships VST3 + CLAP).

Mouse & keyboard reference

- **Drag output → input** — wire a cable.
- **Drag input → empty** — disconnect (the input returns to silence).
- **Right-click cable** — open the level + colour editor; level `0` mutes without deleting.
- **Double-click block** — open its detail panel (parameters, mod slots, code).
- **+ ADD BLOCK** — add a block; select a block and press delete to remove it.
- ⚡ **EZ WIRE** — auto-route input → blocks → output.
- **INIT** — unplug all cables/mods, keep blocks. 🗑 — blank the patch.

Glossary

- **Block / node** — one DSP unit in the patch: three inputs (In 1, In 2, Mod), up to six parameters, one output.
- **Source** — anything an input can read (audio in, Noise, a soft key, a MIDI dimension, another block's output). An unpatched input reads silence.
- **Mod (CV)** — a control signal modulating a parameter as `base + source × depth`, in the parameter's units.
- **Soft key / macro** — a host-automatable knob, also patchable as a modulation source; the fixed host-facing parameter list.
- **Layer** — a full copy of the engine with its own patch, mixed with the other layers.
- **Feedback** — a cable from a later block back to an earlier input, resolved with a one-sample delay.
- **Fan-out** — one output feeding multiple inputs.
- **EZ Wire** — one-click auto-routing of input → blocks → output.
- **Brickwall Limiter** — the single hard ceiling on the final summed output (distinct from per-block Soft Clip).

Plugin Architecture

JUCE modular multi-effects plugin — a fully modular patch graph on the shared zpwr-patch-core engine. Paid product.

Build & Position

Metric	Value	Notes
Language	C++	JUCE audio plugin
Engine	`zpc::LayeredEngine`	shared `zpwr-patch-core` graph (`add_subdirectory libs/zpwr-patch-core`)
Formats	VST3 · AU · CLAP · Standalone	CLAP via `clap-juce-extensions`
Targets	macOS arm64/x86_64 · Linux x86_64/aarch64 · Windows x64/arm64	cross-platform, cross-arch from day one (Windows builds VST3 + CLAP via `scripts/build_win.ps1`)

Metric	Value	Notes
Build system	CMake	CMakeLists.txt at repo root
Modules	1190+ module types	shared registry (buildFxRegistry); +111 note-stream in zpwr-midi-fx = 1300+ stack-wide; parity tracked in FX_PARITY.md
Analog models	100+ named circuits	registerAnalog/registerAnalogTime: synth filters + comps/limiters (1176/LA-2A/LA-3A/Fairchild/dbx/SSL/API2500/Distressor/Sta-Level) + EQs (Pul-tec/API/Neve/SSL/Manley/Helios/GML) + preamps/tape + pedals (TS808/RAT/BigMuff/Klon/DS-1/MXR/Octavia/OCD/MetalZone) + amps (Fender/Marshall/Vox/Mesa) + enhancers + phaser/trem + chorus + reverb/echo (EMT140/BX20/RE-201/Echorec/MemoryMan) — generic topologies, no IR/sample clones
Routing	free patch graph	cables by source id, fan-out, feedback; per-param mod matrix; unlimited layers; ⚡ EZ-wire auto-routing
Status	stable	patch graph + full 1190+ module catalog incl. 100+ analog models

Signal Path

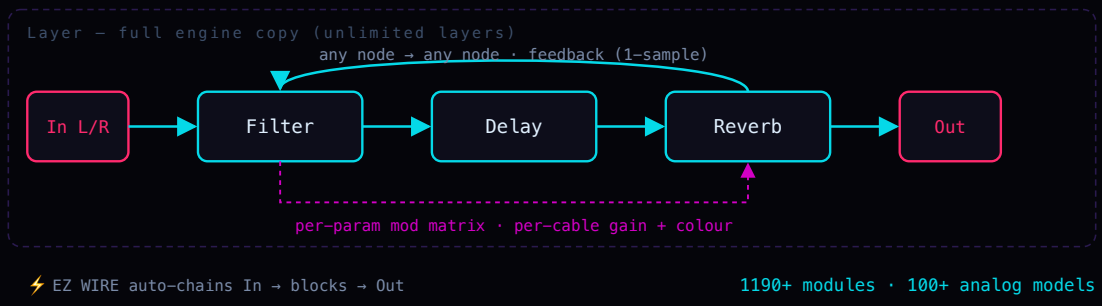

Figure 1: architecture diagram

Free-routed audio graph on zpwr-patch-core — not a fixed slot rack. Layers stack without limit.

Not a fixed slot rack: nodes are wired freely by source id, the graph rebuilds in topological order on each structural edit, and live param edits stay lock-free via an atomic graph swap. Each layer is a full engine copy.

Catalog at a glance

1290 blocks shipped by **zpwr-fx** across **17 categories**, including 166 component-level analog-circuit models and 190 control / modulation (CV-badge) sources. This is the per-plugin subset of the shared zpwr-patch-core catalog.

Registry Audio 1290

Output jack Audio 1100 MIDI 0 CV 190

By category (block count, largest first):

Reading this catalog (badge key)

An icon glyph precedes each block name; then its badges, then `in:` its input jacks and `out:` its output-jack type, then the description:

> [CAT] **category** - **AMP** Amp, **ANA** Analog, **CTL** Control, **DLY** Delay, **DST** Distortion, **DYN** Dynamics, **ENV** Envelope, **FLT** Filter, **FX** Effect, **HRM** Harmony, **MOD** Modulation, **OSC** Oscillator, **PIT** Pitch, **PRB** Probability, **REV** Reverb, **RTE** Routing, **SEQ** Sequencing, **SPC** Spectral, **STR** Stereo, **TUN** Tuning, **UTL** Utility, **VOI** Voicing.

> [CV] a **control / modulation source** (outputs CV, not audio).

> [CIRCUIT] a **component-level analog-circuit model** (per-sample nodal / Newton solve).

> [FX] [SYNTH] [MIDI] which **plugin(s)** ship the block - zpwr-fx, zpwr-synth (gets the whole audio pack) and/or zpwr-midi-fx.

> **in:** the block's input jacks, and **out:** its output-jack signal type - `out: Audio`, `out: MIDI` (note stream) or `out: CV` (control / modulation).

> **icon:** the glyph before each block name shows its kind at a glance:

Audio (zpwr-fx / shared pack) (1290 blocks)

Amp (19)

AC30 [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Vox AC30 Top Boost-style amp: two cascaded Koren 12AX7 stages into a chimey top-boost tone stack (flat ~800 Hz mid, bright treble) and a class-A EL84 push-pull power stage that compresses and sags early - the jangly British chime. EL84 (lower max current) + class-A bias distinguish it from the EL34 Marshalls.

Bass410 [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Ampeg-style 4x10 bass cabinet: a deep extended low end, a gentle low-mid bump and an early treble roll-off for a round, punchy bass tone.

Bassman [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Fender 5F6-A tweed Bassman / JTM45-lineage tube amp: two cascaded 12AX7 gain stages modeled with the Koren triode plate-current equation (real self-bias, grid-conduction asymmetry - not a tanh) into a Fender-style tone stack (wide ~650 Hz mid), then a class-AB EL34 push-pull power stage whose plate currents subtract through the output transformer (even harmonics cancel, odd-harmonic clip + supply sag emerge from the physics), 4x oversampled.

Blue212 [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Vox AC30-style 2x12 with Celestion Blue alnico voicing: an open low end, an extended top and a sweet chimey presence - the jangly British combo cab.

Bogner [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Bogner Ecstasy-style amp: three cascaded Koren 12AX7 stages into a tight, focused tone stack and a class-AB EL34 push-pull power stage - smooth, singing, high-gain modern British-voiced lead with a refined, liquid sustain.

Brit412 [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Marshall 1960A-style 4x12 with Celestion Greenback voicing: a tight low-cut, a roll-off around 4.5 kHz and a forward upper-mid presence - the definitive British rock guitar cabinet.

DeluxeRev [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Fender Deluxe Reverb-style amp: two Koren 12AX7 stages into a blackface tone stack and a class-AB 6V6 push-pull power stage - the warm, touch-sensitive American combo that breaks into a sweet, compressed overdrive when cranked. Lower headroom than the Twin.

EVH5150 [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EVH 5150III-style amp: three cascaded Koren 12AX7 stages into a scooped, aggressive tone stack and a class-AB EL34 push-pull power stage driven hard - the tight, saturated, percussive modern metal/shred standard with massive gain and a fast attack.

JCM800 [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Marshall JCM800 2203-style high-gain amp: three cascaded Koren 12AX7 stages (the extra gain stage = hot-rodded crunch) into a scooped Marshall tone stack and a class-AB EL34 push-pull power stage. The 80s rock/metal standard - tight, aggressive, harmonically rich.

JTM45 [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Marshall JTM45-style amp: the original Marshall, two cascaded Koren 12AX7 stages into a Marshall tone stack and a class-AB KT66 push-pull power stage (more headroom and a rounder break-up than the later EL34 Plexi). Bluesy British crunch with bloom.

Jubilee [AMP][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Marshall Silver Jubilee 2555-style amp: three cascaded Koren 12AX7 stages into a scooped Marshall tone stack and a class-AB EL34 push-pull power stage - a hot-rodded JCM800 with a tighter, more compressed high-gain crunch. The 80s/90s rock-lead Marshall.

MarkV [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Mesa/Boogie Mark V-style amp: three cascaded Koren 12AX7 stages into a deeply scooped Mesa tone stack and a class-AB power stage - the smooth, compressed, mid-scooped American high-gain lead (the 'Santana/Metallica' voice) with singing sustain.

Matchless [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Matchless DC30-style boutique amp: two Koren 12AX7 stages into a chimey top-boost-style tone stack and a class-A EL84 push-pull power stage - the AC30 chime with tighter low end and a more focused, hi-fi breakup. Boutique British class-A.

Orange412 [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Orange-style 4x12: a thick, dark, low-mid-forward voicing with an earlier treble roll-off - the heavy, woody stoner/doom cabinet.

Plexi [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Marshall Plexi 1959 Super Lead-style amp: two cascaded Koren 12AX7 stages into a scooped Marshall tone stack (~500 Hz mid) and a class-AB EL34 push-pull power stage - the bright, crunchy British roar, with real push-pull even-harmonic cancellation and supply sag. Same physics engine as the Bassman, Marshall voicing.

Recto412 [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Mesa/Boogie Rectifier-style 4x12 (V30 loaded): a big low end, a slightly later treble roll-off and an aggressive 3-4 kHz bite - the modern high-gain metal cab.

Rectoverb [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Mesa/Boogie Rectoverb-style amp: three cascaded Koren 12AX7 stages into a loose, scooped Recto-voiced tone stack and a class-AB EL34 push-pull power stage - thick, saturated, sagging modern high-gain with a huge low end. The nu-metal/modern-rock rhythm crush.

Twin [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Fender Twin Reverb-style amp: two Koren 12AX7 stages into a deeply scooped blackface tone stack and a big class-AB 6L6 push-pull power stage with huge clean headroom - the loud, sparkling, scooped American clean. Breaks up only when pushed hard.

Vibrolux [AMP] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Fender Vibrolux Reverb-style amp: two Koren 12AX7 stages into a blackface tone stack and a class-AB 6L6 push-pull power stage voiced bright and chimey - a smaller, livelier blackface clean that sings with pick dynamics.

Analog (137)

Acido [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

TB-303-style 4-pole diode ladder: per-stage diode soft-clip and a diode-shaped feedback stage for high-resonance acid squelch.

Ampeg [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Ampeg SVT-style bass amp: two triode stages, thick low-mid focus, power-supply sag and an output-transformer stage with a dark cab - built for bass.

Ampex [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Ampex ATR-102-style mastering tape: gentle magnetic hysteresis (B/H + remanence), a soft wide head bump and smooth head-gap HF roll-off - subtle mix-bus polish (pro deck: flutter negligible by design).

Aphex [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Aphex Aural Exciter-style enhancer: a tuned high-pass side chain into an asymmetric class-A harmonic generator (2nd+3rd) and a phase-shift network, blended back for air and presence.

API2500 [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

API 2500-style VCA bus compressor: a Thrust sidechain tilt with Old (feedback) or New (feedforward) detection, through a dB-linear VCA cell with control-port slew and gain-cell THD.

API550 [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

API 550-style 3-band EQ with proportional-Q (bands widen at low boost, tighten at high boost) and op-amp soft-clip bite.

API560 [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

API 560-style graphic EQ: fixed octave bands with proportional-Q so adjacent bands sum smoothly (4-band).

ApiPre [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

API 312-style preamp: a discrete 2520 op-amp (level-dependent knee) into an API output transformer with LF-flux iron, plus a bright top; the harmonic tilt shifts upward as level rises.

ARP2600 [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

ARP 2600-style 4072 four-pole ladder: aggressive, clean self-oscillating resonance with a brighter, wetter bite than a Moog ladder.

Avalon [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Avalon VT-737-style tube channel EQ: clean, musical bell and shelf bands with gentle tube warmth.

Baxandall [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Baxandall negative-feedback tone network: the classic hi-fi Bass/Treble - a gentle low shelf (~100 Hz) and high shelf (~10 kHz) that boost or cut smoothly and symmetrically, with none of the midrange scoop of a passive stack. Bass and Treble in dB.

BBE [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

BBE Sonic Maximizer-style processor: a phase-alignment network advances the highs ahead of the (allpass-delayed) lows and adds exciter-style HF harmonics for clarity and punch.

BiasTrem [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Tube bias tremolo: the LFO shifts the tube grid bias (operating point), so the throb modulates both amplitude and 2nd-harmonic content - a richer, harmonically-moving wobble than plain amplitude tremolo.

BigMuff [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Big Muff Pi-style fuzz: two cascaded silicon diode clipping stages (Newton-solved Shockley pairs, 4x oversampled) that square up into a wall of sustain, with a scooped-mid tone.

BiPhase [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Mu-Tron Bi-Phase dual phaser: TWO complete 6-stage OTA phasers with independent LFO rates (RateA / RateB), whose two moving notch combs beat against each other for a swirling, three-dimensional sweep no single-sweep phaser (Phase 90, Small Stone) can reach. Depth sets the sweep width, Feedback the resonant emphasis of the notches, Mix the wet blend. Six 1st-order all-pass stages per side.

Blackface [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Fender Blackface-style amp: a triode stage, scooped-mid clean headroom (~500 Hz notch), a stiff (low-sag) power section and an output-transformer stage with a bright, glassy top.

BlueBox [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

MXR Blue Box-style octave fuzz: cascaded flip-flops divide the pitch down two octaves into a gritty square sub-octave, blended with a fuzzed dry signal - the synthetic, glitchy -2-octave fuzz.

BluesDriver [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Boss BD-2 Blues Driver-style overdrive: a JFET-buffered asymmetric soft-clipper that stays bright, dynamic and amp-like - cleans up with pick attack, breaks up when pushed. Gain sets the drive, Tone the top-end tilt, Level the output.

BodeRing [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Bode / Moog 6401-style ring modulator: the input multiplied by an internal tunable sine carrier through a diode-ring nonlinearity, giving the metallic sum-and-difference sidebands of the classic sci-fi/bell sound. Freq tunes the carrier, Drive sets the diode-bridge bite, Mix blends modulated against dry.

BusSat [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

SSL bus-style VCA saturation into an output transformer: a thin 'glue' veneer for the mix bus - subtle thickening, not obvious distortion.

BX20 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

AKG BX-20-style torsional-spring reverb: a dispersive modulated all-pass tank models the spring chirp smeared smooth - long, dark, no boing.

CE1 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Boss CE-1-style BBD chorus/vibrato: a triangle-LFO chorus or a wet-only vibrato through a companded bucket-brigade line, with preamp coloration.

CEM3320 [ANA][CIRCUIT][FX][SYNTH] in: Audio, Reso Mod, Cutoff Mod out: Audio

Curtis CEM3320-style 4-pole OTA filter (Prophet-5 rev3 / SH-101 / Pro-One): four OTA integrator poles with per-stage soft clip and a bass-compensated resonance path, so it stays fat where a Moog ladder thins out - cleaner, brighter, more aggressive into self-oscillation. Cutoff, Reso to self-osc, Mod-CV depth (in 3), Drive pushes the cells.

Chamber [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Chamber reverb: higher modal density than a plate with a diffuse onset and warm, non-metallic tail - between a plate and a room.

Chandler [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Chandler Curve Bender-style EQ (EMI/Abbey Road): musical stepped bands with transformer/valve harmonic colour.

ChandlerPre [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Chandler TG2-style preamp (EMI/Abbey Road): an input stage into an iron-core transformer (LF flux saturation) - punchy with a distinctive forward presence.

CryBaby [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Dunlop Cry Baby / Vox inductor wah: a resonant inductor-cap band-pass swept by Pedal over the throaty 350 Hz - 2.2 kHz range, with the Q peaking through mid-sweep the way a real wah inductor does and falling at the heel/toe. Pedal sets the position (modulate it for auto-wah), Q the bite, Mix the blend.

CS80 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Yamaha CS-80 dual resonant filter: a 2-pole resonant high-pass in series with a 2-pole resonant low-pass, each swept independently for the lush, vocal, brass-and-strings voice (Vangelis / Blade Runner) a single multimode filter cannot make. HP Cutoff lifts the bottom, LP Cutoff closes the top, Reso peaks both corners (soft-saturated, musical - not a screaming self-oscillator), Drive pushes the input.

CultureVulture [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Thermionic Culture Vulture valve distortion: Triode mode is an asymmetric, even-harmonic soft saturation (warm, musical thickening); Pentode mode is a harder odd-harmonic clip with a push-pull crossover dip near zero for the snarling, aggressive 'P' destruction. Bias shifts the valve operating point (asymmetry / gate), Drive pushes it from fattening to full disintegration, Tone tilts the output, Level trims it. A valve character/destruction unit, not a pedal or amp.

Dbx160 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

dbx 160-style VCA compressor: true-RMS detection and an 'over-easy' soft knee through a dB-linear VCA cell with control-port slew and gain-cell THD; punchy and musical.

Diezel [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Diezel VH4-style amp: three cascaded triode stages, ultra-tight aggressive high-gain with a scooped low end, reservoir sag and an output-transformer stage.

DimensionD [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Roland Dimension D-style BBD chorus: two anti-phase bucket-brigade lines (compander + clock-tracked reconstruction filter) for a wide, 'motionless' thickening with no audible wobble.

Distressor [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Distressor-style aggressive compressor: a FET gain cell whose bite grows with gain reduction, switchable harmonic distortion (Dist2 = genuine 2nd, Dist3 = 3rd) and a British-mode all-buttons slam.

Drawmer [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Drawmer DS201-style noise gate: opens fast above Threshold and closes after Release, with hysteresis so it doesn't chatter on the edge. Range sets how far it ducks when closed (hard gate vs gentle expander), Attack the open speed - the studio-standard gate for tightening drums and killing hum between phrases.

DS1 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Boss DS-1-style distortion: a Newton-solved symmetric silicon diode pair (4x oversampled - the real shunt clipper, not a hard jlimit) with an active tilt-tone control - brash and cutting.

Dumble [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Dumble Overdrive Special amp (full circuit): smooth, singing high-gain with a spongy supply for bloom and sustain - the holy-grail boutique lead voice. Gain, Tone, Master, Level. Same cascaded-triode + voiced-tone-stack + supply-sag model, voiced for Dumble's compressed sustain.

DynaComp [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

MXR Dyna Comp-style OTA pedal compressor (CA3080): a full-wave-rectified envelope drives a high-ratio OTA gain cell for the squishy, sustaining 'country squeeze' - fast clamp, slow bloom, and the signature high-end softening. Sensitivity sets how hard it squeezes, Attack the detector speed, Output the makeup.

Echoplex [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Maestro Echoplex EP-34-style tape echo: warm, wow+flutter-modulated repeats with magnetic hysteresis (asymmetric saturation + remanence) and head gap-loss HF roll-off.

Echorec [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Binson Echorec-style magnetic drum delay: several fixed playback heads give rhythmic multi-tap echoes with rotating-drum wobble and magnetic hysteresis in the feedback.

ElectricMistress [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EHX Electric Mistress-style flanger: a swept companded bucket-brigade line forms moving comb notches; Filter Matrix freezes the sweep for a fixed metallic tone.

EMS [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EMS VCS3-style 3-pole (18 dB) diode ladder: asymmetric diode shaping gives a sharp, acidic resonance.

EMT140 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EMT 140-style plate reverb: a dispersive modulated all-pass tank (the plate shimmer where HF and LF propagate at different speeds), instant dense diffusion, bright sheen, HF decaying faster than the low tail.

EMT250 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EMT 250-style early digital reverb: a dense tank with first-generation converter quantization grain - bright and unmistakably early-digital.

ENGL [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

ENGL-style amp: three cascaded triode stages, tight scooped modern-metal high-gain, reservoir sag and an output-transformer stage with a dark cab.

EP3 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Echoplex EP-3 preamp: the Echoplex's FET preamp section, famous as an always-on tone boost (Page, Van Halen). A touch of FET saturation plus a presence bump and slightly tightened lows make whatever runs through it fuller, clearer and more present - a buffer/boost with character, not a distortion or amp. Gain sets the boost, Bright the presence bump, Level the output.

FATSO [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Empirical Labs FATSO-style warmth/comp: a soft-knee compressor into a tape-style saturation stage (a tilting HF soft-clip) that rounds transients and adds harmonic 'warmth', the way the hardware glues and thickens a mix. Comp sets the squeeze, Warmth the saturation drive, Output the makeup.

FET [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

1176-style FET compressor: ultra-fast attack, fixed high ratios, and an asymmetric FET gain cell whose harmonic bite grows with gain reduction (max ratio = all-buttons slam).

Friedman [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Friedman BE-100-style amp: hot-rodded Marshall - two cascaded triode stages, tight low end, singing mids, reservoir sag and an output-transformer stage.

Fulldrive [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Fulltone Fulldrive-style overdrive: a TS-derived circuit opened up with less mid-hump and more gain on tap, asymmetric soft clipping that stays articulate when pushed, plus a cleaner Boost stage. Gain sets the drive, Tone the brightness, Boost stacks gain, Level the output.

FuncGen [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

H3000-style function generator: a modulation source with 19 selectable waveshapes plus random sample-and-hold, smooth random and noise (no audio input).

FuzzFace [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Fuzz Face-style germanium fuzz: two cascaded germanium common-emitter transistor stages (Ebers-Moll, 4x oversampled) whose asymmetric cutoff/saturation gives the gated, spitty fuzz; Bias starves the second stage toward the splatty/gated voicing, and it cleans up as you lower Input - just like rolling back the guitar volume.

FuzzFactory [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Z.Vex Fuzz Factory-style two-transistor fuzz: massive asymmetric gain into a hard clip, with Gate choking the decay into a sputtery rip and Stab starving the bias toward a self-oscillating squeal that ducks under the note - the pinched, gated, velcro fuzz. 4x-oversampled.

FZ1 [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Maestro FZ-1 Fuzz-Tone: the first fuzz pedal (the 'Satisfaction' buzz). Three germanium stages give a thin, splatty, ripped-speaker square-wave fuzz that GATES hard as the note decays into the famous sputtering decay. Thinner, harder and more gated than the thick Tone Bender or the FuzzFace. Attack sets the gain, Bias starves the supply (more gate/sputter), Level the output.

GML [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

GML 8200-style parametric EQ: ultra-clean, transparent constant-Q bands with no saturation - the surgical reference where boost and cut cancel exactly.

Guvnor [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Marshall Guv'nor-style distortion: hard symmetric diode clipping after a Marshall-voiced mid push with an active treble tilt - the 'amp in a box' crunch-to-roar. Gain sets the clipping, Tone the brightness, Body the low-mid push, Level the output.

H3000 [ANA] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Eventide H3000-style micro-pitch doubler: two slightly detuned, short-delayed voices thicken the signal into a wide, lush double-track.

Helios [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Helios Type 69-style console EQ: a low bell, a switchable peak-or-trough mid at stepped frequencies, and a 10 kHz high shelf - punchy and musical.

HeliosPre [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Helios console-style preamp: punchy class-A transistor saturation into a console transformer (LF-flux iron) with an asymmetric Bias and a forward ~1.5 kHz midrange push. Drive sets the grit, Tone rolls the top, Mix blends dry/wet - aggressive British-console colour.

Hiwatt [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Hiwatt DR103 amp (full circuit): three could-be-cleaner cascaded triode stages with a stiff power supply and a bright, high-headroom voice - the clean-but-LOUD British military-grade tone (Townshend / Gilmour) that stays articulate where a Marshall breaks up. Gain drives the preamp, Tone tilts the stack, Master pushes the power stage, Level trims. Cascaded triode transfer + voiced tone stack + supply sag, not a single tanh + fixed EQ.

HM2 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Boss HM-2 Heavy Metal ('Swedish chainsaw'): a high-gain hard clipper into the HM-2's scooped dual-band Color EQ. Turn Color up and it guts the mids while pushing a resonant low end and a fizzy top into the unmistakable buzzsaw wall of Swedish death metal (Entombed). Dist sets the gain, Color sweeps flat -> full chainsaw scoop, Level the output. Distinct from the mid-scoop MetalZone by the dual-band buzzsaw voicing.

JC120 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Roland JC-120 Jazz Chorus (solid-state clean): the transistor clean platform - a stiff power supply (no sag), big bright headroom that stays glassy and articulate, and a harder, more brittle clip when finally pushed, unlike the soft, compressing tube amps. Drive sets the gain, Tone the brightness, Level the output. Pair with a Chorus block for the full JC stereo shimmer.

Jup-8 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Jupiter-8-style 4-pole OTA ladder: per-stage OTA transconductance saturation with smooth resonance that keeps the low end (no Moog bass loss).

Klon [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Klon Centaur-style overdrive: a Newton-solved germanium diode pair (4x oversampled) summed back with the clean signal - 'transparent' via the dual-path blend, not soft clipping.

Korg35 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Korg MS-10-style Korg35 Sallen-Key low-pass: hard diode-clipped resonance that screams and squares up at high settings - more aggressive than the later MS-20 OTA revision.

LA2A [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Teletronix LA-2A-style opto leveling amplifier: a T4 electro-optical cell compresses slowly and smoothly with the cell's two-stage, program-dependent release - fast for the first part of recovery, then a long gentle tail - so it sits musically without surgical control. Peak Reduction sets how hard it leans, Gain the makeup, Emphasis tilts the detector toward highs (de-essing).

LA3A [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Teletronix LA-3A-style optical compressor: the LA-2A photocell gain law but a fast-attack, brighter solid-state amp - punchier optical leveling with program-dependent release.

Lex224 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Lexicon 224-style digital hall: a long, lush, slowly-modulated reverb tail (chorusing avoids metallic ringing) with bright, dense diffusion.

Lex480 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Lexicon 480L-style digital reverb: a brighter, denser random-hall/plate with a modulated tail and fast build-up.

Lockhart [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Lockhart-style transistor wavefolder (west-coast): the signal reflects off the rails through several folding stages, multiplying harmonics as Fold rises - the Buchla/Serge timbre. 4x-oversampled.

Maag [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Maag EQ4-style EQ: musical low and mid bands plus the famous Air Band - a very high shelf for open, silky top.

Manley [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Manley Massive Passive-style EQ: wide bandwidth limits the available gain (opposite of proportional-Q), passive LC curves into an output transformer with LF-flux iron harmonics.

MarkIIC [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Mesa/Boogie Mark IIC+ amp (full circuit): tight, scooped, high-gain lead with a stiff supply for fast attack and a singing sustain (the 80s metal lead voice). Gain, Tone, Master, Level. Same cascaded-triode + voiced-tone-stack + supply-sag model, voiced for the Mark's tight low end and scooped mids - distinct from the looser, fatter Rectifier.

MassivePassive [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Manley Massive Passive-style EQ: broad, gentle passive-network shelf and bell curves with wide, interactive Q - boosts feel airy and musical rather than surgical, the reason it's a mastering staple. Low shelf, a wide high bell at HiFreq, and an Air shelf on top, each in dB.

Matrix12 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Oberheim Xpander / Matrix-12 multimode VCF (CEM3372): a 4-pole OTA ladder whose Mode taps a binomial mix of the four pole outputs to produce low-pass, high-pass and band-pass responses at 1-, 2- and 4-pole slopes from a single filter

– the signature Oberheim pole-mixing the SEM's 2-pole SVF cannot do. Per-stage tanh models the OTA soft clip and Reso feeds the 4-pole output back for resonance up to self-oscillation. Cutoff sweeps it, Drive pushes the stages.

MemoryMan [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EHX Memory Man-style analog BBD delay: a companded bucket-brigade line whose clock-tracked reconstruction filter darkens each repeat with delay length, gently chorused, with line-level regeneration.

MEQ5 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Pultec MEQ-5-style midrange passive EQ: a low-mid boost, a mid dip and a high-mid boost for vocal/guitar presence.

MetalZone [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Boss MT-2 Metal Zone-style high-gain distortion: two 4x-oversampled clip stages into an active dual-peak mid scoop with a sweepable parametric mid.

Mini [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Minimoog-style 4-pole transistor ladder: per-stage saturation thins the bass as resonance climbs to self-oscillation.

MS-20 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

MS-20-style 2-pole Sallen-Key low-pass: input op-amp saturation and a saturated resonance integrator plus diode clipping in the resonance path - screams and distorts at high resonance.

MuTron3 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Mu-Tron III-style envelope auto-wah: an OTA state-variable filter whose cutoff is swept by an envelope follower of the playing dynamics. Sens sets the sweep depth, Direction flips up/down, Peak sets resonance, Mode picks LP/BP/HP.

MXRDist [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

MXR Distortion+-style overdrive: a Newton-solved ASYMMETRIC germanium diode pair (4x oversampled) - mismatched diodes give the even-harmonic, woolier-than-a-DS-1 crunch - with an output low-pass.

MXRFlanger [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

MXR Flanger-style BBD flanger: a companded bucket-brigade line swept for a deep, metallic comb with line-level regeneration for jet-plane sweeps.

N1073 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Neve 1073-style EQ: fixed 12 kHz HF shelf, sweepable mid bell and LF shelf, into an iron-core transformer whose flux saturates the low frequencies first for genuine LF harmonic warmth.

Neve33609 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Neve 33609-style diode-bridge bus compressor: smooth glue through a diode-bridge gain cell with control-port slew, a dual-time-constant release and transformer saturation.

NevePre [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Neve 1073-style preamp: a class-A triode gain stage (grid conduction) into an iron-core output transformer whose LF flux saturates first - the bass 'sings' with iron warmth.

OCD [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Fulltone OCD-style overdrive: 4x-oversampled asymmetric MOSFET hard clipping (smooth-edged) with a bright/dark voicing switch.

Octavia [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Octavia-style octave-up fuzz: 4x-oversampled full-wave rectification doubles the pitch, then heavy fuzz - the ring-mod-like upper-octave scream.

Odyssey [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

ARP Odyssey 2-pole filter (4023): brighter and reedier than the 4-pole ladders, with a loud, aggressive resonance that bites and sings - the thin, vocal ARP lead voice. A soft-saturated 2-pole state-variable filter tapping LP / BP / HP via Mode. Cutoff sweeps it, Reso peaks the corner toward self-oscillation, Drive pushes the input.

Opto [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

LA-2A-style optical compressor: a T4 photocell whose photoresistor gain law gives a soft knee and a ratio that rises with level, plus program-dependent release (recovers slower after sustained compression).

OptoTrem [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Fender optical tremolo: a lamp drives a photocell whose asymmetric lag (cools slower than it warms) and sublinear I-V curve round the throb; Shape sets the cell response speed (smooth to choppy).

Orange [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Orange OR-series amp (full circuit): mid-forward, thick and woody with more preamp gain and a spongier supply than the Hiwatt - the chunky British crunch. Gain, Tone, Master, Level. Shares the cascaded-triode + voiced-tone-stack + supply-sag circuit model, voiced for Orange's mid push.

Peavey5150 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Peavey 5150 / 6505 amp (full circuit): tight, aggressive, high-gain crunch with a stiff supply for percussive attack - the metalcore / Van Halen rhythm and lead standard. Gain, Tone, Master, Level. Shares the cascaded-triode + voiced-tone-stack + supply-sag model, voiced for the 5150's tight low end and biting upper mids.

Percolator [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Interfax Harmonic Percolator-style fuzz: mixed germanium/silicon asymmetric clipping generates strong even-order harmonics for a wooly, octave-tinged thickness unlike symmetric fuzzes. Balance skews the asymmetry from even-rich to odd-rich. 4x-oversampled.

Phase90 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

MXR Phase 90-style 4-stage phaser: four JFET all-pass stages (bias-dependent frequency shift + transfer-curve saturation) give two evenly-tracking notches; Script (clean) or Block (resonant feedback).

Polivoks [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Soviet Polivoks 2-pole OTA filter: its resonance path clips like a comparator, so at high Reso it does not ring sweetly – it slams into a hard square-wave self-oscillation and screams. A 2x-oversampled two-integrator SVF whose band-pass feedback is hard-clipped (not soft tanh) gives that brutal, buzzy Eastern-bloc character no Moog/SEM filter has. Cutoff, Reso, Drive into the core, and Mode taps LP / BP / HP.

Polysix [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Korg Polysix-style SSM2044 four-pole low-pass: gentle OTA saturation gives a smooth, creamy resonance that stays musical right up to self-oscillation.

Pultec [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Pultec EQP-1A-style passive EQ: low boost and cut use offset corners so they do not cancel (the boost-with-dip trick), plus gentle tube warmth.

Rangemaster [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Dallas Rangemaster-style treble booster: a high-pass into a real germanium common-emitter transistor stage (Ebers-Moll, Newton-free closed form, 4x oversampled) - its asymmetric cutoff/saturation adds the bright, singing even+odd harmonics on top of the dry signal.

RAT [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

ProCo RAT-style distortion: an LM308-slewed gain stage into a Newton-solved silicon diode pair clamping to ground (the real shunt clipper, 4x oversampled - not a hard jlimit), tamed by a single low-pass Filter knob.

Recto [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Mesa Rectifier-style high-gain amp: three cascaded asymmetric triode stages with tight inter-stage high-passing, a deep mid scoop, selectable reservoir sag and an output-transformer stage.

RMX16 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

AMS RMX16-style digital reverb (Nonlin program): a dense, gated tail that holds then cuts off instead of decaying naturally - the classic 80s gated sound.

SansAmp [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Tech 21 SansAmp-style amp/cab DI: a Character tilt into cascaded asymmetric soft-clipping (4x oversampled) and a speaker-cabinet low-pass, giving the recorded amp tone direct with no mic. Drive sets the gain into the stages, Character tilts presence vs warmth, Level the output.

SCComp [ANA][CIRCUIT][FX][SYNTH] in: In, Sidechain out: Audio

Sidechain compressor: compresses the signal (in 0) by the level of a key input (in 1) through a dB-linear VCA cell with control-port slew and gain-cell THD - cable the host sidechain (SC L/R) to the key for ducking/pumping.

SD1 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Boss SD-1 Super Overdrive: an op-amp gain stage into an ASYMMETRIC soft clipper (two diodes one way, one the other) for a more open, even-harmonic crunch than the symmetric Tube Screamer, with the familiar mid-hump tone that cuts through a band. Drive sets the gain, Tone the mid/treble balance, Level the output.

SDD3000 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Korg SDD-3000-style delay: a characterful input preamp into a modeled converter (ADC anti-alias + 13-bit quantization) - clean and bright with subtle digital grain.

SEM [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Oberheim SEM-style 2-pole state-variable filter: VCA-transistor saturation in the resonance integrator, continuously morphing low-pass through notch to high-pass.

ShadowHills [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Shadow Hills Mastering-style compressor: a photocell opto stage (soft-knee, rising-ratio law, program-dependent release) into a discrete fixed-ratio VCA stage, with a transformer-flavour select (nickel/iron/steel).

SmallStone [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EHX Small Stone-style 4-stage OTA phaser: nonlinear OTA all-pass stages; the Color switch adds feedback, drives the OTAs harder and widens the notch sweep for a more vocal, resonant swirl.

Soldano [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Soldano SLO-100-style amp: three cascaded triode stages for a smooth, saturated lead with singing sustain, reservoir sag and an output-transformer stage.

Solina [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Solina/string-machine-style ensemble: three BBD taps on 120-degree-phased dual LFOs (slow + fast) through one companded bucket-brigade line for a lush, moving multi-voice swirl.

Sontec [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Sontec MEP-250-style mastering parametric EQ: clean Class-A bell bands with a musical, selectable Q - precise without sounding clinical, the mastering standard. Two parametric bells (Lo/Hi freq + gain) sharing the Q control.

SpaceEcho [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Roland Space Echo-style tape delay: wow+flutter-modulated tape transport with magnetic hysteresis (asymmetric saturation + remanence) and tone-shaped head gap loss in the feedback repeats.

SSLBus [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

SSL bus-style VCA glue compressor: a dual-time-constant program-dependent auto-release for pumping-free glue, through a dB-linear VCA cell with control-port slew and gain-cell THD that grows with gain reduction.

SSLE [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

SSL E-series-style 4-band parametric EQ: constant-Q (bandwidth stays put as you boost or cut) for a clean, surgical response.

SSLG [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

SSL G-series-style 4-band parametric EQ: proportional-Q (the more you boost or cut, the narrower the band) for a musical, self-limiting curve.

StaLevel [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Gates Sta-Level-style tube vari-mu limiter: a very slow program-dependent auto-release and gentle ~3:1 leveling through a remote-cutoff tube cell whose 2nd-harmonic warmth (Warmth) grows with gain reduction.

Studer [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Studer A800-style tape: magnetic hysteresis (B/H saturation + remanence), a firm low-frequency head bump and gentle head-gap HF loss - punchy track-level glue (pro deck: flutter negligible by design).

Summit [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Summit TLA-100-style tube/opto leveler: photocell gain law (soft knee, rising ratio) with program-dependent release, transformer warmth and tube makeup.

SunnModelT [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Sunn Model T amp (full circuit): fat, dark, high-headroom and loose - the wall-of-low-end doom / sludge / stoner voice, the opposite of a tight bright amp. Gain, Tone, Master, Level. Same cascaded-triode + voiced-tone-stack + supply-sag model, voiced for huge bass, dark top and a spongy, blooming low end.

SuperFuzz [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Univox Super-Fuzz-style octave fuzz: 4x-oversampled full-wave rectification for the octave-up into hard germanium square clipping, with a switchable 1 kHz mid-scoop notch.

Supro [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Supro 1624T-style octal amp: 6973 power tubes on a tube-rectifier supply with no negative feedback, so loud transients sag the rails - the amp ducks then blooms, breaking up asymmetrically and early. Sag sets how hard the supply droops.

Synthacon [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Steiner-Parker Synthacon-style diode multimode filter: an asymmetric diode-clipped resonance path gives a snarly, vocal bite, and Mode sweeps the output continuously LP -> BP -> HP - rougher than a clean SVF.

TimeCube [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Cooper Time Cube-style delay: a short, dark acoustic-tube delay (sound piped through a garden hose between transducers) for tight doubling and slapback. Time sets the short delay, Feedback the repeats and Mix the blend. Naturally band-limited and woody - characterful on vocals and snare, not a clean digital echo.

Timmy [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Paul C Timmy-style transparent overdrive: low-gain op-amp soft clipping with cut-only Bass and Treble shaped BEFORE the gain (so it tightens and de-fizzes without adding colour) - clean, dynamic, amp-like. Gain sets the drive, Bass/Treble cut, Level the output.

ToneBender [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Tone Bender MkII germanium fuzz: three cascaded germanium transistor stages, each asymmetric (germanium clips harder on one rail) with interstage coupling-cap high-pass between them, for the thick, sustaining, slightly-broken vintage fuzz. Bias starves the supply so quiet/decaying notes GATE into the famous spitty sputter; Drive sets the gain, Tone the output roll-off, Level the volume. Distinct from FuzzFace (2 transistors) and Big Muff (4 silicon stages + diodes).

Trident [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Trident A-Range-style console EQ: four fixed musical bands (LF shelf, two mid bells, HF shelf) with an aggressive, forward voicing.

TriStereo [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Dytronics Tri-Stereo Chorus-style ensemble: three bucket-brigade voices (compander + clock-tracked reconstruction) at staggered rates for a lush, wide three-dimensional chorus.

TubePre [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Vintage tube console-style preamp: two cascaded triode stages with an interstage coupling cap (2nd-harmonic-dominant asymmetric clipping) and a warm low shelf.

TubeScreamer [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Ibanez Tube Screamer-style overdrive: a real op-amp feedback diode clipper - the mid-focused clean gain is clamped by an antiparallel Shockley diode pair, Newton-solved and 4x oversampled (not a tanh) - with the famous ~720 Hz mid hump. Asym mismatches the two diodes for the asymmetric-clip mod, adding the even harmonics a symmetric clipper can't.

TubeTech [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Tube-Tech CL 1B-style opto compressor: a photocell gain law (soft knee, rising ratio) with program-dependent release and tube makeup warmth.

Tweed [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Fender Tweed 5E3-style amp: two asymmetric triode stages into a physical B+ reservoir sag (droops and blooms under pick attack) and an output-transformer stage - warm, loose, early breakup.

UA610 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Universal Audio 610 tube preamp (Bill Putnam): a 12AX7 valve gain stage between input and output transformers. Push Drive to overdrive the tube into warm asymmetric saturation while Level pads the output – the '610 move' of cranking the valve and taming the volume – with transformer low-end thickening and the 610's Low/High program EQ. Distinct from the generic tube preamp by the transformer saturation and the gain/level interaction.

UniVibe [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Uni-Vibe-style 4-stage phaser: staggered all-pass frequencies driven by an asymmetric lamp-filament LFO through a power-law photocell I-V curve, with nonlinear stages - the watery, throbbing swirl. Chorus or Vibrato.

V76 [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Telefunken V76-style tube preamp: two cascaded tube stages with interstage coupling into an output transformer - rich, warm 2nd-harmonic saturation with a low-mid body.

VactrolLPG [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Buchla 292-style low-pass gate: a vactrol (LED + photocell) opens a 2-pole low-pass and a VCA together, and the photocell's slow nonlinear light-decay gives the plucky 'bongo' ring as transients fade. Mode picks gate (VCF+VCA), filter-only, or amp-only.

VariMu [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

Fairchild/Manley-style tube vari-mu compressor: program-dependent ratio rises with level, and a remote-cutoff tube transfer whose genuine 2nd-harmonic warmth grows as gain reduction biases the tube toward cutoff.

Wasp [ANA][CIRCUIT][FX][SYNTH] in: Audio out: Audio

EDP Wasp-style 12 dB multimode filter: the CMOS-inverter gain-stage outputs hard-clip at the rails for a fizzy, gritty bite. Mode 0 LP / 1 BP / 2 HP.

Delay (36)

AlignDelay [DLY][FX][SYNTH] in: Audio out: Audio

Alignment delay (Ableton Align Delay-style): a clean dry delay used to time-align tracks or push a signal later by a precise amount - no feedback, no filtering, no colour. Time sets the delay in milliseconds; leave Mix fully wet for pure alignment, or blend for a simple slap double.

BBDDelay [DLY] [FX] [SYNTH] in: Audio out: Audio

Bucket-brigade style echo whose delayed tap is passed through a one-pole low-pass and a tanh saturation in the feedback path, so each repeat grows darker and grittier. Time sets the delay length (1-8000 ms), Feedback sets regeneration up to 0.9, Tone sets the high-frequency rolloff of the repeats, and Mix blends the filtered echo with the dry signal. Lower Tone yields the murky, decaying character of analog BBD delays.

Beatmasher [DLY] [FX] [SYNTH] in: Audio, Gate out: Audio

Beat-repeat: while the gate on in1 is held it records a slice of audio on the first pass then loops that captured slice; releasing the gate passes the dry signal through. Length sets the size of the captured/looped slice (20..1000 ms) and Mix blends the looped slice against the dry input. Hold the gate to freeze and stutter a fragment, release to drop back to live audio.

BeatSlicer [DLY] [FX] [SYNTH] in: Audio, Gate out: Audio

Captures a buffer while the gate on in1 is held, divides it into 8 slices, and replays them in one of several reorder patterns; releasing the gate passes dry audio through. Length sets the buffer/loop size (100..2000 ms), Pattern selects the slice reordering (0..4, e.g. straight, swapped pairs, doubled, reversed, interleaved), and Mix blends the sliced output against dry. Hold the gate to scramble a phrase into a rhythmic rearrangement.

Bouncer [DLY] [FX] [SYNTH] in: Audio, Gate out: Audio

A feedback delay whose delay time continually shrinks, so the echoes speed up toward a stutter like a bouncing ball; a gate on in1 re-arms the delay back to its start time. Time sets the initial delay (20..600 ms), Accel sets how fast the time shrinks, Feedback sets the echo regeneration (up to 0.95), and Mix blends wet against dry. Higher Accel collapses the repeats into a rapid buzz, while a gate retrigger resets the bounce.

Chorus [DLY] [FX] [SYNTH] in: Audio out: Audio

Single-voice chorus: an LFO (Rate, Depth) modulates a short base Delay (1-30 ms) and the detuned copy is blended back via Mix to thicken and widen the source. Short delays with light depth give subtle doubling; longer and deeper settings approach vibrato and flange. See Ensemble for a three-voice string-machine variant.

Comb [DLY] [FX] [SYNTH] in: Audio out: Audio

Tuned comb resonator: a short feedback delay set by Freq (20-2000 Hz) with a damping low-pass, which doubles as a Karplus-Strong plucked string when excited by a transient. Feedback sets resonance and sustain while Damp darkens the decay. High feedback rings at the tuned pitch; pair it with noise or an impulse for string and membrane tones.

Delay [DLY] [FX] [SYNTH] in: Audio, Feedback Mod, Time Mod out: Audio

Feedback delay line (1-8000 ms) with a damping low-pass in the feedback path that progressively darkens each repeat. Time is modulated by in 3 (scaled by Mod) for chorus and flange-style movement, Feedback sets regeneration up to 0.99, and Mix sets dry/wet. Damp at 0 gives bright digital echoes; higher values emulate tape/BBD high-frequency loss.

DiffuseDelay [DLY] [FX] [SYNTH] in: Audio out: Audio

Feedback delay whose tap is smeared through a 4-stage all-pass diffusion chain, pushing echoes toward reverb. Time sets the delay (1-1000 ms), Feedback sets regeneration up to 0.9, and Diffuse sets the all-pass coefficient that controls how much each repeat is blurred. Mix sets dry/wet; low Diffuse gives clean echoes, high Diffuse dissolves them into a diffuse wash.

▶▷▷ DubDelay [DLY][FX][SYNTH] in: Audio out: Audio

Dub-techno echo: a feedback delay whose repeats are progressively band-limited and tape-saturated inside the loop, so each echo gets darker, warmer and more degraded - the endless, dubby Basic-Channel chord-stab echo of dub techno and dub house. Time sets the delay, Feedback how many repeats (high = near-infinite), Tone darkens each repeat (low-pass in the loop), Drive the in-loop tape saturation, and Mix the wet/dry blend. Long Time + high Feedback + low Tone gives the classic sinking dub tail. Distinct from the clean Delay and the wow/flutter TapeDelay - the feedback path is filtered and saturated.

▶▷▷ DuckDelay [DLY][FX][SYNTH] in: Audio out: Audio

Feedback delay line whose wet output is attenuated by an envelope follower tracking the dry signal, so repeats drop out while you play and swell up in the gaps. Time sets the delay length (1-8000 ms), Feedback sets regeneration up to 0.9, Duck sets how hard the dry level suppresses the echoes, and Mix blends wet and dry. Keeps echoes from cluttering busy passages while letting them bloom in the silences.

▶▷▷ Ensemble [DLY][FX][SYNTH] in: Audio out: Audio

Three-voice string-machine chorus: one LFO modulates three delay taps at evenly spread phases, summing into a lush, wide thickening richer than the single-voice Chorus. Rate and Depth set the swirl and Mix the blend. Classic for pads, strings and synth-brass.

▶▷▷ FilterDelay [DLY][FX][SYNTH] in: Audio out: Audio

Filtered multi-tap delay (Ableton Filter Delay-style): three delay taps at spreading times, each band-passed at Color before feedback, so the echoes are tuned and coloured rather than full-range. Time sets the first tap, Spread the spacing of the other two, Color the band-pass centre, Feedback the regeneration, and Mix the wet blend. (Mono sum of the three taps; the device's L/C/R panning needs a stereo rack.)

▶▷▷ Flanger [DLY][FX][SYNTH] in: Audio out: Audio

Swept-comb flanger: an LFO sweeps a very short delay (0.5-10 ms) mixed with the dry signal to create moving comb notches, with bipolar Feedback resonating the peaks (negative values invert for a hollow tone). Depth sets the sweep width and Mix the blend. Short delays with high feedback give the classic metallic jet-whoosh.

▶▷▷ Freeze [DLY][FX][SYNTH] in: Audio, Freeze Gate out: Audio

Audio freeze / looper: while in1 is high it captures the recent input and loops a window of it indefinitely (an instant sustain/pad-freeze); while in1 is low it passes the dry signal and keeps recording. Size sets the loop window length, Mix the wet level.

▶▷▷ FreqEcho [DLY][FX][SYNTH] in: Audio out: Audio

Frequency-shifted echo: a delay line whose feedback is single-sideband frequency-shifted via a polyphase Hilbert pair, so every repeat slides up or down in Hz rather than in pitch. Time sets the delay (1 to 1000 ms), Shift sets the linear frequency offset (-500 to +500 Hz), Feedback (0 to 0.95) sets repeat count, and Mix blends dry/wet. Because the shift is inharmonic, the tail detunes and smears with each pass for metallic, ever-evolving echoes.

▶▷▷ Glitch [DLY][FX][SYNTH] in: Audio out: Audio

Probabilistic buffer glitcher that records the input and, at each slice boundary, randomly jumps to a captured slice and may play it forward or reversed. Slice sets the segment length in milliseconds and Chance sets the probability that a given slice is repeated or reversed rather than passed through cleanly. Mix blends the glitched playback against the dry signal for stutter, repeat and reverse artifacts.

▶▷▷ GrainDelay [DLY][FX][SYNTH] in: Audio out: Audio

Granular feedback delay that reads overlapping windowed grains from the delay line, pitch-shifting them and scattering their read positions. Time sets the base tap (10-8000 ms), Pitch transposes the grains +/-12 semitones, and Scatter randomizes each grain's offset for a smeared, diffuse cloud. Mix sets dry/wet; the shifted grains are fed back at reduced gain, so repeats drift in pitch and position.

▶▷▷ Looper [DLY][FX][SYNTH] in: Audio out: Audio

Circulating-buffer looper that re-reads a fixed-length loop and either overdubs new input onto it or recirculates it unchanged. Length sets the loop time (100-2000 ms) and Record switches between overdub (input mixed with the looped buffer at half gain) and pure recirculation when off. Mix sets dry/wet; leave Record on to layer takes, turn it off to freeze and play back the captured loop.

▶▷▷ Morphagene [DLY][FX][SYNTH] in: Audio out: Audio

Tape-splice granular (Make Noise / Soundhack Morphagene): continuously records the in0 input onto a virtual tape, then plays back a Gene (grain) from it. Slide scans the playback position along the reel, Vari sets the varispeed (pitch + direction, reverse below centre), Gene the grain length, Morph the grain overlap/smear, and Mix the blend. Scrub, stretch, reverse and granulate live audio - distinct from the fixed-loop Looper and the cloud-style granular blocks.

▶▷▷ Multitap [DLY][FX][SYNTH] in: Audio out: Audio

Multi-tap delay: the input is written into a circular buffer and read back at several time-spaced taps that are summed, averaged, and fed back into the buffer. Time sets the base delay in ms, Taps chooses 1 to 6 read points, Feedback recirculates the averaged taps for repeats, Spread pulls the taps toward the longer end for uneven echo timing, and Mix crossfades dry input against the wet sum. Low Spread gives evenly stacked echoes while high Spread spaces them out, and higher Feedback builds longer rhythmic delay trails.

▶▷▷ PeakFlanger [DLY][FX][SYNTH] in: Audio out: Audio

A comb flanger whose delay time is swept by a peak envelope follower on the input, so transients drive the flange motion (delay ranges ~0.5..9.5 ms). Soften sets the envelope release time, Feedback sets the comb regeneration (+/-0.95, negative inverts the comb), Amount scales how far each peak sweeps the delay, and Mix blends wet against dry. The Traktor Flanger Pulse character: the jet sweep follows the music's own dynamics rather than a fixed LFO.

▶▷▷ PingPong [DLY][FX][SYNTH] in: Audio out: Audio

Ping-pong delay for a mono source: a single line is read at time T or 2T so the two outputs hear staggered taps that appear to bounce between speakers, with regeneration fed back through the longer tap. Time sets the base delay, Feedback the number of repeats up to 0.9, and Mix dry/wet. Out picks L or R, where R hears T and L hears 2T to create the alternating bounce.

▶▷▷ Rainmaker [DLY][FX][SYNTH] in: Audio out: Audio

Rhythmic tapped delay (Intellijel / Cylonix Rainmaker): spreads up to Taps echoes across the delay Time in a decaying rhythm, then runs the result through a tuned Comb resonator for ringing, pitched repeats - rhythmic delays, resonant

reverbs and string-like tones in one. Time sets the span, Taps the number of echoes, Feedback the regeneration, Comb the resonator pitch/amount, and Mix the wet blend. A 16-tap rhythm engine, distinct from the fixed-tap Multitap.

Reverse [DLY] [FX] [SYNTH] in: Audio out: Audio

Reverse delay: snapshots a Window-length slice of input and plays it backward on a loop, a glitchy pre-echo/reverse texture, blended via Mix. Short windows give fluttering grains; longer windows reverse recognizable phrases. See ReverseGrain and ReverseVerb for related effects.

ReverseDelay [DLY] [FX] [SYNTH] in: Audio out: Audio

Captures the input into a delay buffer and reads it back newest-to-oldest within a repeating window, so each chunk plays in reverse. Time sets the window length (50–8000 ms) that defines how much audio is flipped per cycle, and Mix blends the reversed playback against the dry signal. Useful for backward-tape swells and disorienting rhythmic stutters.

ReverseGrain [DLY] [FX] [SYNTH] in: Audio, Gate out: Audio

Captures a buffer while the gate on in1 is held, then plays it backward at a pitch-shifted read rate for a reversed, stuttered texture; releasing the gate passes dry audio through. Length sets the captured grain size (50..1500 ms), Pitch transposes the reverse playback rate (+/-12 semitones), and Mix blends the reversed grain against dry. Hold the gate to suck a phrase into a backward swell.

Rotary [DLY] [FX] [SYNTH] in: Audio out: Audio

Leslie rotary speaker: combines a doppler pitch wobble (modulated short delay) with a phase-offset amplitude tremolo so the tone swirls as the virtual horn spins. Speed sets the rotation rate and Depth its intensity. Iconic on organ, electric piano and guitar - automate Speed for the slow-to-fast chorale ramp.

Scratch [DLY] [FX] [SYNTH] in: Audio out: Audio

Turntable-scratch effect where a raised-cosine LFO sweeps the delay read head back and forth through recent input. Rate sets the sweep speed (0.1–8 Hz) and Depth sets how far back the head travels (1–200 ms). Mix sets dry/wet; faster Rate and deeper Depth give more pronounced vinyl-scratch wobble.

Shuffler [DLY] [FX] [SYNTH] in: Audio out: Audio

Beat-shuffler that records the input and, at each segment boundary, may jump its playback to one of a few earlier segment offsets. Segment sets the slice length (50–500 ms) and Chance sets the probability that a new boundary triggers a jump to a randomly chosen prior offset. Mix sets dry/wet; low Chance plays mostly straight, high Chance stutters and rearranges the beat.

Slapback [DLY] [FX] [SYNTH] in: Audio out: Audio

Slapback echo: a single short delayed repeat (typically 60–150 ms) layered under the dry signal - the snappy rockabilly/vocal doubling slap, no feedback wash. Time sets the delay, Mix the level of the repeat.

SliceShuffler [DLY] [FX] [SYNTH] in: Audio out: Audio

Continuous buffer-shuffler (Max-for-Live Buffer-Shuffler style): records the incoming audio one bar at a time and, while recording the next bar, plays the last bar back as Steps slices re-ordered by a Seed-driven permutation, with a fraction of slices (Reverse) played backwards and a 16-step on/off Gate mask muting chosen slots. Length sets the bar

in milliseconds, Steps the slice count (4/8/16), Seed the rearrangement (every value a different reproducible shuffle), and Mix blends against dry. Unlike BeatSlicer's five fixed patterns this is a fully addressable per-slice remap that runs without a trigger.

Stutter [DLY] [FX] [SYNTH] in: Audio out: Audio

Auto-rhythmic buffer repeat: at each Rate cycle it snapshots a Grab-length window and loops it for the cycle, creating stutters and beat-repeat artefacts, with Mix blending against the live signal. Short grabs at high rates give granular buzz; longer grabs repeat recognizable slices. See Beatmasher and BeatSlicer for tempo-locked glitching.

TapeDelay [DLY] [FX] [SYNTH] in: Audio out: Audio

Vintage tape echo: a ~1.5 Hz wow modulates the delay time while a Tone low-pass and tanh tape Saturation in the feedback path darken and thicken each repeat. Feedback sets regeneration and Mix the blend. Unlike the clean Delay, repeats degrade and warble musically - raise Wow and Sat for worn-tape character.

TapeStop [DLY] [FX] [SYNTH] in: Audio, Stop Gate out: Audio

Tape-stop effect: while in1 is held the playback slows from full speed to a halt over Time, dropping the pitch and smearing into silence - the classic turntable/tape brake. Releasing in1 returns to normal speed. Mix blends against the dry. A performance effect, not a fixed pitch shift.

Vibrato [DLY] [FX] [SYNTH] in: Audio out: Audio

Pitch vibrato: an LFO modulates a short delay's read position to bend pitch, output fully wet (no dry blend) for true vibrato rather than chorus. Rate sets the wobble speed and Depth its pitch range. Gentle settings add expression; deep settings give a seasick warble.

Distortion (43)

AmpSim [DST] [FX] [SYNTH] in: Audio out: Audio

Guitar amp model chaining an asymmetric tanh preamp, a tone-tilt filter and a speaker-cabinet low-pass with output compensation. Drive sets preamp gain (0-48 dB) into the asymmetric clipper, Tone tilts between darker and brighter response, and Cab sets the cabinet cutoff (brighter at higher values). Mix blends the modeled tone against the dry; ranges from edge-of-breakup grit to saturated lead tones.

Array [DST] [FX] [SYNTH] in: Audio out: Audio

Drawable waveshaper: maps the input at in0 (folded from bipolar into a 0 to 1 index) through a transfer curve drawn in node config via linear interpolation, then back to bipolar, blended by Mix against the dry input. The drawn breakpoints define the input-to-output mapping and Mix sets the wet/dry balance. A diagonal curve is a clean pass-through while steeper or folded curves act as custom distortion and waveshaping.

BEOD [DST] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Friedman BE-OD-style high-gain overdrive: a hot op-amp gain stage into a tight asymmetric silicon diode clipper, voiced like the BE-100 amp's lead channel - saturated, focused, amp-in-a-box drive.

Bitcrush [DST] [FX] [SYNTH] in: Audio out: Audio

Digital degradation: Bits quantizes the amplitude to 2^Bits levels (quantization noise) while Downsample holds each sample for N frames (sample-rate reduction and aliasing). Mix blends against the dry signal. Low Bits gives gritty lo-fi crunch; high Downsample adds metallic aliasing for retro and 8-bit textures.

Bitwise [DST][FX][SYNTH] in: Audio out: Audio

Bitwise mangler / databender (a first as a synth block): converts each sample to a 16-bit integer and applies a raw bit operation - XOR, AND, OR or bit-rotate - against Mask, then back to audio. Where Bitcrush only quantises the amplitude, this rips into the actual bit pattern: flipping a high bit folds the waveform, toggling low bits adds fizzing digital grit. Op picks the operation, Mask the bits to act on, Mix the blend. Pure circuit-bent digital destruction with no analogue equivalent.

CabSim [DST][FX][SYNTH] in: Audio out: Audio

Generic speaker-cabinet voicing: a 90 Hz high-pass trims sub rumble, a high-frequency rolloff tames fizz, and a peak around 1.5 kHz adds cabinet body, all blended by Mix. Body sets how much of the resonant midrange peak is added and Bright raises the rolloff corner for a more open top end. A lightweight tone-shaping voicing for amp signals, not an impulse-response capture of a real cabinet.

Character [DST][FX][SYNTH] in: Audio out: Audio

Character drive with five voicings (Mode): Push (soft clip), Heat (S-clip), Soar (sine fold), Howl (triangle fold) and Shred (wrap fold), each driven by Drive and blended via Mix. One module spanning warm saturation to wild folding distortion. Modulate Mode or Drive for evolving textures.

Chebyshev [DST][FX][SYNTH] in: Audio out: Audio

Chebyshev-polynomial shaper that synthesizes a single chosen Harmonic (2nd-8th) from the input via the T_n recurrence, blended by Amount and Mix. Unlike broadband clipping it adds one targeted overtone - the 2nd for octave thickness, higher orders for metallic ring. Pairs well with a clean sine input for precise harmonic generation.

Clip [DST][FX][SYNTH] in: Audio out: Audio

Clipper that morphs from soft (tanh) to hard clipping at the Threshold via Hardness, with Output trim and dry/wet Mix. Soft adds rounded saturation harmonics; hard adds bright odd harmonics and caps peaks dead. Use as a tone shaper or a transparent peak ceiling ahead of a limiter.

Decimator [DST][FX][SYNTH] in: Audio out: Audio

Bit-crusher + sample-rate reducer: quantises the in0 signal to Bits resolution and holds each sample for Downsample steps, for everything from gentle lo-fi grit to full 8-bit / telephone destruction. Mix blends against the clean signal. Distinct from Bitcrush in adding the sample-rate-reduction (aliasing) stage.

Diode [DST][FX][SYNTH] in: Audio out: Audio

Asymmetric diode clipper that drives the input into an exponential soft-knee saturation, shaping the positive and negative halves differently. Drive sets the input gain in dB into the nonlinearity, while Bias increases the curvature of the negative half for stronger asymmetry and added even harmonics. Mix blends the clipped signal against the dry input for germanium/silicon-style warmth and grit.

Drive [DST] [FX] [SYNTH] in: Audio out: Audio

Waveshaping overdrive with three curves (Type: tanh soft-clip, sine fold, or hard clip) driven by up to 48 dB of gain plus a Bias offset for even-harmonic asymmetry. A post Tone low-pass tames fizz, Mix blends dry/wet, and Output trims the final level. Spans subtle warmth to aggressive distortion depending on Drive and curve.

DrumBuss [DST] [FX] [SYNTH] in: Audio out: Audio

Drum-bus processor (Ableton Drum Buss-style): a one-stop chain for drum groups - Transient sharpens or softens the attack, Drive adds tube grit, Crunch a harder harmonic edge, and Boom adds a tuned resonant low-end thump at BoomFreq. Mix blends it back. Glues and beefs up a drum bus in one block.

DynSat [DST] [FX] [SYNTH] in: Audio out: Audio

Dynamic saturation: the drive amount tracks the input envelope, so louder passages distort more and quiet ones stay clean (Sens sets how strongly). Adds harmonics on transients and peaks without muddying sustained low-level material. Good for program-dependent grit on drums and bus.

Erosion [DST] [FX] [SYNTH] in: Audio out: Audio

Noise-modulation distortion: sprays band-limited noise (Freq sets its colour) onto the signal by multiplying it with the input, eroding the tone into gritty granular texture. Amount sets intensity and Mix dry/wet. From subtle dirt to harsh destruction - a creative degrade rather than a clean overdrive.

Exciter [DST] [FX] [SYNTH] in: Audio out: Audio

Harmonic exciter: splits off the band above Freq, generates new upper harmonics from it with a tanh Drive, and blends them back via Amount for added air and presence. Subtle settings add sheen and intelligibility without raising broadband level. Most effective on dull vocals, drums and full mixes.

Fuzz [DST] [FX] [SYNTH] in: Audio out: Audio

High-gain fuzz: heavy drive soft-saturates then hard-clips into a square wave for a thick, sustaining buzz, with a Tone low-pass to tame the fizz and Level to set output. Mix blends dry/wet. Aggressive and compressed - see the BigMuff and FuzzFace analog models for circuit-specific fuzz voicings.

Lofi [DST] [FX] [SYNTH] in: Audio out: Audio

Lo-fi degrader: sample-rate reduction (holds each sample for Rate frames) plus a Tone low-pass and added tape Hiss, blended via Mix. Unlike Bitcrush it quantizes in time rather than bit-depth, layering filtering and noise for a warmer vintage-sampler grime. Push Rate for aliasing; lower Tone and raise Hiss for cassette/SP-style character.

MorningGlory [DST] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

JHS Morning Glory-style transparent overdrive: a low-gain symmetric LED-clipper drive that stays open, dynamic and amp-like, cleaning up with the guitar volume - a pedalboard always-on.

Mulholland [DST] [FX] [SYNTH] in: Audio out: Audio

Tanh overdrive feeding a resonant Chamberlin state-variable lowpass, with a slow internal LFO wobbling the cutoff. Drive sets the input gain into the saturator (1..30), Cutoff sets the filter frequency (~80 Hz..14 kHz), Reso sets the

filter Q, Mod sets how much the LFO modulates cutoff, and Mix blends wet against dry. Goes from gentle filtered grit to a screaming self-resonant squeal as Drive and Reso climb.

MultiDist [DST] [FX] [SYNTH] in: Audio out: Audio

Three-band distortion: one-pole filters at 300 Hz and 3 kHz split the input into low, mid and high bands, each saturated through its own tanh stage before being summed. Low, Mid and High set the drive into each band's saturator and Mix blends the result against dry. Per-band drive lets you grind the highs without muddying the lows, or add weight to bass alone.

OctaveFuzz [DST] [FX] [SYNTH] in: Audio out: Audio

Octave fuzz: blends a fuzz-distorted signal with a DC-corrected full-wave-rectified upper octave, the classic Hendrix/Octavia scream. Drive sets gain, Octave the upper-octave blend and Mix dry/wet. Tracks best on clean single notes near the 12th fret; chords intermodulate, by design.

Rectify [DST] [FX] [SYNTH] in: Audio out: Audio

Rectifier waveshaper: full-wave (Mode 0) folds the negative half upward to add strong octave-up and even harmonics, while half-wave (Mode 1) keeps only the positive half. Mix blends with the dry signal. The classic octave-fuzz colour - aggressive alone, useful in small amounts for harmonic lift.

Riot [DST] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Suhr Riot-style distortion: a high-gain asymmetric-clipper drive that nails a tight, saturated, amp-like high-gain rhythm and lead - JCM800-into-a-box aggression with a smooth top.

Roar [DST] [FX] [SYNTH] in: Audio out: Audio

Feedback waveshaper (Ableton Roar-style): drives the signal through a selectable saturation curve, but wraps it in a resonant feedback loop - the distorted output is band-passed at Color and fed back into the input, so it rings, blooms and self-oscillates into the gnarly 'roar' that plain saturation can't make. Drive sets the push into the Shape (soft sine / tube / soft clip / diode / fold), Tone tilts the spectrum before the shaper, Feedback how much output returns, Color the feedback resonance frequency, and Mix the dry/wet. (Single-shaper core; the full device's serial/parallel/multiband/mid-side routings need a rack.)

Rumble [DST] [FX] [SYNTH] in: Audio out: Audio

Techno rumble bass: the input on in0 (a kick) drives an envelope follower that swells two slightly detuned sub-sines running underneath it, so a low rolling sub locks to the kick pattern and the slow Release lets the rumble roll on between hits - the Drumcode-style rumble built by sub-under-kick rather than a reverb send. Tune sets the sub pitch, Detune beats the two oscillators against each other for movement, Release sets how long the rumble tail rolls, Drive saturates it for weight, and Mix blends the rumble under the dry input.

Saturator [DST] [FX] [SYNTH] in: Audio out: Audio

Multi-mode saturator: drives the in0 signal into one of four waveshaping curves - tanh, soft tube, sigmoid or hard clip - with Tone tilting the result darker/brighter, output-level compensation, and a dry/wet Mix. A clean, controllable distortion stage distinct from the modeled fuzz/amp circuits.

Schmitt [DST] [FX] [SYNTH] in: Audio out: Audio

Schmitt-trigger fuzz (a first as a synth block): a comparator with memory - the output snaps fully high once the driven input rises past +Hyst and stays high until it falls past -Hyst, squaring the signal into a hard two-level wave that resists chattering near zero. The hysteresis band makes it 'stick', cleaning the buzz of a raw square-up while adding a gated, brutal edge. Drive sets the gain into the trigger, Hyst the dead-band width, Level the output, Mix the blend. A hysteretic square fuzz no clipper or fold reproduces.

Shaper [DST] [FX] [SYNTH] in: Audio out: Audio

SynthMaster-style 12-mode waveshaper: Shape selects soft/hard clip, tube, diode, sine and triangle fold, full/half rectify, sine, crush, sync-wrap and Chebyshev modes, each driven by Drive with Bias for symmetry. Mix and Output blend and trim. Modulate Shape to morph between distortion characters - a one-stop tone-shaping distortion.

SlewClip [DST] [FX] [SYNTH] in: Audio out: Audio

Slew-rate distortion (a first as a synth block): limits how fast the output can move between samples, so when Drive pushes the input past that maximum slope the block cannot keep up - fast transients are sheared into ramps and the waveform is dragged toward a buzzing triangle. Where a clipper flattens the peaks, SlewClip mangles the slopes: a harsh, gritty, distinctly digital lo-fi grind that also drops level as it limits. Rate sets the maximum step per sample, Drive the input gain, Mix the blend.

SovtekMuff [DST] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Sovtek (Green Russian) Big Muff-style fuzz: cascaded transistor gain into two symmetric silicon-diode clipping stages for the thick, smooth, mid-scooped wall of sustain - darker and bassier than the US Muff.

SubEnhance [DST] [FX] [SYNTH] in: Audio out: Audio

Sub-bass enhancer: a flip-flop toggled per rising zero crossing generates a half-frequency square tracked by the input envelope and low-passed, added under the dry signal at Sub. Reinforces weak low end on kicks, bass and 808s. Monophonic by nature - best on clean low-register sources.

Subharmonic [DST] [FX] [SYNTH] in: Audio out: Audio

Subharmonic generator: zero-crossing detection on the input drives a divide-by-four flip-flop, multiplying the input's rectified amplitude to synthesize a tone two octaves below, then smooths it with a one-pole low-pass. Sub sets the level of the generated sub, Tone opens the low-pass cutoff (darker to brighter sub), and Mix sums the sub onto the dry signal. Adds weight and low-end body to bass, kicks and leads.

TapeSat [DST] [FX] [SYNTH] in: Audio out: Audio

Tape-style saturation: a soft tanh stage with a touch of linear blend emulates magnetic-tape compression, with Warmth rolling off the highs for a rounder tone and Mix blending dry/wet. Gentle glue and harmonic thickening rather than overt distortion. See the Studer and Ampex analog models for machine-specific tape.

Tube [DST] [FX] [SYNTH] in: Audio out: Audio

Tube-style saturation: an asymmetric transfer curve (offset by Bias) adds the even and odd harmonics of a valve stage, tamed by a Tone low-pass and blended via Mix. Warmer and rounder than the harder Drive/Waveshaper - subtle settings thicken and glue, higher Drive gives singing tube grit. See the TubePre and VariMu analog models for circuit-specific versions.

Tumnus [DST] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Wampler Tumnus-style transparent boost/overdrive (Klon-lineage): a clean op-amp boost summed with a mild germanium-diode clip stage for a touch of grit while keeping the dry signal intact - the famous transparent mid-push.

TurboRAT [DST] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

ProCo Turbo RAT-style distortion: a high-gain op-amp stage into hard LED clipping for a sharper, louder, more aggressive RAT with a fierce midrange bite.

VHS [DST] [FX] [SYNTH] in: Audio out: Audio

Cassette/VHS tape emulation: the input runs through a short modulated delay whose time wobbles via an internal 0.7 Hz LFO, then a one-pole low-pass rolls off highs and random pseudo-noise hiss is summed in. Wow sets the LFO delay-modulation depth (pitch wobble), Hiss scales the added noise level, and Dropout raises the probability of brief signal dropouts driven by a per-sample random envelope. Mix blends the degraded signal against the dry input for subtle aging or full lo-fi destruction.

Vinyl [DST] [FX] [SYNTH] in: Audio out: Audio

Vinyl character that reads the signal through a slowly modulated delay for wow pitch-drift, injects random impulses for surface crackle, and pushes the result through a tanh saturator for groove distortion. Wow scales the pitch-drift depth, Crackle sets how often surface pops appear, Drive sets the saturation amount, and Mix sets dry/wet. Use it to age a clean source with turntable wobble, dust noise and warm grit.

Wavefolder [DST] [FX] [SYNTH] in: Audio out: Audio

West-coast wavefolder that multiplies the signal by Fold and reflects it through triangle folding boundaries, adding bright harmonics that bloom as level rises. Bias shifts the fold symmetry for asymmetric timbres, Mix blends dry/wet and Output trims gain. Unlike clipping, folding keeps energy moving, so the tone stays lively even at extreme settings.

Wavemult [DST] [FX] [SYNTH] in: Audio out: Audio

West-coast wave multiplier (Serge/Buchla-style): cascades several triangle wavefolders so the signal is folded again and again as Drive rises, multiplying the harmonics far beyond a single Wavefolder for ringing, metallic, formant-rich timbres. Drive sets the fold depth, Stages the number of cascaded folders (more = denser), Bias the fold asymmetry, and Mix the dry/wet blend.

Waveshaper [DST] [FX] [SYNTH] in: Audio out: Audio

Memoryless waveshaper with four transfer curves (Shape: tanh, atan, cubic soft-clip, sine fold) driven by Drive and blended via Mix. Each curve adds a different harmonic signature, from smooth saturation (tanh/atan) to a foldback character (sine). Lighter-weight than Drive when you just want one fixed shaping curve.

XformerSat [DST] [FX] [SYNTH] in: Audio out: Audio

Transformer saturation: asymmetric soft-clipping knees (different for positive and negative swings) add even-harmonic colour, plus a low-passed component for iron-core low-end thickening. Subtle weight and warmth on bass, drums and the mix bus. See the NevePre analog model for a transformer-preamp variant.

Dynamics (19)

Compressor [DYN] [FX] [SYNTH] in: Audio out: Audio

Peak-following compressor: tracks the input envelope with Attack/Release ballistics and, above Threshold, reduces gain by the set Ratio, with Makeup to restore level. Fast attack tames transients while slow release glues sustained material. A clean general-purpose dynamics stage - see the analog pack (FET, Opto, VariMu) for coloured compression.

DeEsser [DYN] [FX] [SYNTH] in: Audio out: Audio

Tames sibilance by splitting off a high band with a one-pole low-pass, tracking its level with a fast-attack envelope, and applying gain reduction to that band only when it crosses the threshold before recombining it with the lows. Freq sets the sibilance band, Threshold sets where reduction begins, Amount scales how hard the high band is pulled down, and Mix sets dry/wet. Because only the highs are compressed, it removes harsh esses without dulling the rest of the signal.

Ducker [DYN] [FX] [SYNTH] in: Audio, Sidechain out: Audio

Sidechain ducker that follows the level of the key input (in 2) with a release-smoothed envelope and pulls down the main signal whenever that key exceeds the threshold. Threshold sets the key level that triggers ducking, Amount sets how far the main signal drops, and Release sets how quickly it recovers once the key falls back. Use it for music-under-voice ducking or rhythmic pumping driven by a separate trigger.

DynEQ [DYN] [FX] [SYNTH] in: Audio out: Audio

Dynamic EQ band: an SVF band-pass at Freq/Q tracks an envelope follower, and when that band's energy crosses Threshold the band is subtracted from the signal in proportion to Amount. Freq and Q place and narrow the band, Threshold sets where reduction begins, and Mix blends the result against dry. It only acts when the band gets loud, so it tames resonances and harshness without static EQ cuts.

Envelope [DYN] [FX] [SYNTH] in: Audio out: Audio

Envelope follower that rectifies the input and smooths it with independent Attack and Release times into a control signal. Gain scales the output for driving a filter cutoff, VCA or any mod input (auto-wah, ducking, dynamics). Fast attack tracks transients; a longer release gives a smoother contour.

EnvFollow [DYN] [FX] [SYNTH] in: Audio out: Audio

Envelope follower: tracks the rectified amplitude of the input with separate Attack and Release times, outputting a smooth control signal that rises quickly on transients and falls slowly back - the standard way to turn audio into a modulation source. Patch its output into any parameter's mod input so a filter, VCA or effect responds to playing dynamics; Gain scales the result. Unlike the duckers (which bury the follower inside one effect) this exposes the envelope itself.

Expander [DYN] [FX] [SYNTH] in: Audio out: Audio

Downward expander: attenuates signal that falls below Threshold by the set Ratio (the inverse of a compressor), tightening quiet passages and reducing bleed and hiss between notes. Attack/Release set the ballistics. Gentler than a gate - it fades low-level material rather than hard-muting it.

Gate [DYN] [FX] [SYNTH] in: Audio out: Audio

Noise gate: when the detected level falls below Threshold it attenuates the signal toward Range (the floor), opening and closing with Attack/Release ballistics. Range at -80 dB fully mutes between events; smaller values leave a residual for gentler ducking. Use it to silence hiss and bleed between phrases or for rhythmic gating.

Limiter [DYN] [FX] [SYNTH] in: Audio out: Audio

Brick-wall peak limiter: instantly clamps gain so peaks never exceed Threshold, then releases smoothly back to unity over Release, with Output trimming the post-limit level. Set Threshold as the ceiling and drive the input for transparent loudness. See Maximizer for loudness-optimized limiting.

Maximizer [DYN] [FX] [SYNTH] in: Audio out: Audio

Loudness maximizer that applies a gain boost, tracks the peak envelope, and divides back any sample exceeding the ceiling before hard-clamping to it, acting as a brick-wall limiter. Boost sets how hard the input is driven up and Ceiling sets the absolute output peak in dB. Push Boost while keeping Ceiling near 0 dB to raise apparent loudness without overshooting the output.

MBDynamics [DYN] [FX] [SYNTH] in: Audio out: Audio

Multiband dynamics processor that splits the input into low, mid and high bands (crossovers near 250 Hz and 2.5 kHz) and applies independent compression and gating to each. Threshold sets the level above which a band is compressed at Ratio, while Gate sets the level below which a band is attenuated downward. Mix blends the processed sum against the dry signal, useful for tightening or de-noising specific frequency regions at once.

MultiComp [DYN] [FX] [SYNTH] in: Audio out: Audio

Three-band compressor: crossovers split the signal into low, mid and high bands (Low/Mid and Mid/High), each compressed independently against a shared Threshold and Ratio with fast-attack/slow-release ballistics, then summed with Makeup. Tame a busy mix's bands separately - control boomy lows without dulling the highs. See the SSL/dbx analog models for coloured bus compression.

NoiseGate [DYN] [FX] [SYNTH] in: Audio out: Audio

Noise gate: passes the in0 audio only while its level is above Threshold, otherwise silences it - cleans up hiss, bleed and tails between notes. A peak follower with a Release time smoothly opens and closes the gate so it doesn't chatter.

Omnipressor [DYN] [FX] [SYNTH] in: Audio out: Audio

Extreme dynamics on one knob: Function sweeps from gating expansion through limiting compression to full dynamic reversal, where loud passages turn quiet and quiet turns loud.

OTT [DYN] [FX] [SYNTH] in: Audio out: Audio

Over-the-top multiband compressor (Xfer OTT-style): splits the signal into low / mid / high bands and applies BOTH downward and upward compression to each at once - loud parts are pulled down and quiet detail is pushed up - for the dense, controlled, minimal-dynamic-range sound on modern EDM / dubstep / future-bass synths and drums. Depth sets how hard the up + down compression bites (the OTT % knob), Time the attack/release across all bands (fast = tight, slow = more transient), Low / Mid / High trim each band's output in dB, and Mix blends against dry. Unlike MultiComp / MBDynamics this also compresses upward (raises the quiet parts), which is what gives OTT its signature.

Pump [DYN] [FX] [SYNTH] in: Audio out: Audio

Tempo-synced sidechain-style volume pump that ducks the input each cycle and recovers using a sample-clock phase for coherent timing. Rate sets the duck frequency in Hz, Depth sets how far the level drops, and Curve shapes the recovery ramp from snappy to gradual. Mix blends the pumped signal against the dry input for the classic EDM ducking effect without an external sidechain.

Squash [DYN] [FX] [SYNTH] in: Audio out: Audio

Aggressive parallel smash: a fast peak-following envelope drives heavy gain reduction above a fixed threshold, and the gain-reduced signal is pushed through a tanh saturator for crushed, distorted dynamics. Amount steepens the gain-reduction curve (harder squash), Tone scales the saturated output level, and Mix blends the smashed signal in parallel with the dry input. Useful for adding punch and grit to drums and bus material.

Transient [DYN] [FX] [SYNTH] in: Audio out: Audio

Transient shaper: a fast vs slow envelope follower separates the attack (fast > slow) from the sustain (fast < slow), letting Attack and Sustain each be boosted or cut independently, with Output trimming the result. Add punch to drums, or tighten/lengthen sustain - all independent of input level, unlike a compressor.

UpComp [DYN] [FX] [SYNTH] in: Audio out: Audio

Upward compressor that tracks the input envelope and, when it sits below the threshold, applies makeup gain proportional to how far below it is and to the ratio, lifting quiet passages toward the threshold. Threshold sets the level below which boosting begins, Ratio sets how aggressively the deficit is filled, Makeup adds a fixed output gain, and Mix sets dry/wet. Use it to raise low-level detail and tighten dynamic range from the bottom up rather than taming peaks.

Effect (13)

AMRadio [FX] [FX] [SYNTH] in: Audio out: Audio

AM-radio lo-fi: band-limits in0 to a tinny midrange, adds a faint carrier hum and a wash of static, the sound of a distant transistor radio. Band sets the midrange tightness, Static the noise level, Mix the blend. in0 = Audio.

DiodeClipper [FX] [FX] [SYNTH] in: Audio out: Audio

Diode clipper: a symmetric pair of clipping diodes giving a soft-knee crunch that rounds into hard saturation as it's pushed - the core of countless distortion pedals. Drive sets the gain, Bias skews the symmetry toward even harmonics, Level the output. in0 = Audio.

Foldback [FX] [FX] [SYNTH] in: Audio out: Audio

Foldback distortion: instead of clipping, any signal past the threshold is reflected back on itself, generating bright, ring-mod-like upper harmonics that grow chaotically with drive - harsher and more digital than soft clipping. Drive sets the level into the fold, Thresh the fold point, Level the output. in0 = Audio.

Megaphone [FX] [FX] [SYNTH] in: Audio out: Audio

Megaphone / bullhorn: forces in0 through a harsh, peaky midrange band and clips it, the distorted, honking voice-of-authority sound. Honk sets the resonant peak, Drive the clipping, Mix the blend. in0 = Audio.

Overdrive [FX] [FX] [SYNTH] in: Audio out: Audio

Tube-style overdrive: a smooth tanh soft-clip with a midrange-focused drive, warming and compressing the signal the way a pushed valve preamp does - the Tube Screamer voicing. Drive sets the gain into the clip, Tone the post brightness, Level the output. in0 = Audio.

PhaserStages [FX][FX][SYNTH] in: Audio out: Audio

Multi-stage phaser: a cascade of all-pass sections swept by a built-in LFO, with feedback for deeper notches - from a subtle shimmer to a vocal, resonant sweep. Rate sets the LFO, Stages the notch count, Feedback the resonance, Mix the depth. in0 = Audio.

RatDist [FX][FX][SYNTH] in: Audio out: Audio

RAT-style distortion: a hard op-amp clip into a sweepable lowpass 'filter' control, giving the aggressive, fuzzy-yet-focused ProCo RAT grind. Drive sets the gain into the clip, Filter rolls off the top (counter-clockwise = darker), Level the output. in0 = Audio.

Robotize [FX][FX][SYNTH] in: Audio out: Audio

Robot voice: ring-modulates the input against a fixed carrier and imposes a vowel formant, turning speech or any signal into the classic talking-robot timbre. Pitch sets the carrier, Vowel the formant, Mix the wet. in0 = Audio.

RotarySpeaker [FX][FX][SYNTH] in: Audio out: Audio

Rotary speaker (Leslie): a spinning-horn cabinet that adds pitch-doppler vibrato and amplitude tremolo, sweeping between slow (chorale) and fast (tremolo) - the swirling organ and guitar cabinet. Speed morphs slow to fast, Depth the swirl, Mix the wet. in0 = Audio.

SubBass [FX][FX][SYNTH] in: Audio out: Audio

Sub-octave generator: tracks the in0 signal and synthesises a clean sine/square one octave below, fattening basslines and kicks with weight a normal octaver can't. Tone shapes the sub from pure sine to growl, Mix blends it under the dry signal.

ToneStack [FX][FX][SYNTH] in: Audio out: Audio

Passive guitar-amp tone stack: the interacting Bass / Mid / Treble shelving network of a Fender/Marshall preamp, with the characteristic mid scoop when the controls interact. Bass boosts the lows, Treble the highs, Mid cuts or boosts the middle. in0 = Audio.

VinylSim [FX][FX][SYNTH] in: Audio out: Audio

Vinyl record emulation: passes in0 through a wow/flutter pitch wobble (a slowly-modulated delay), a band-limiting filter and added surface crackle - the warm, worn character of a played record. Wow sets the pitch wobble, Crackle the surface noise, Mix the blend.

Warps [FX][FX][SYNTH] in: Carrier, Modulator out: Audio

Cross-modulator (meta): blends two inputs through one of four cross-modulation algorithms - crossfade, amplitude mod, ring mod, or sine wavefold of in0 by in1 - with Amount morphing from the clean carrier into the modulated signal. One knob from subtle movement to clangorous metallic timbres.

Envelope (4)

AD [ENV] [CV] [FX] [SYNTH] in: Gate out: CV

Attack-Decay envelope: a rising edge on the in0 gate fires a one-shot ramp up over Attack then back down over Decay, ignoring how long the gate is held - the classic percussive/pluck envelope. Patch its CV output into a VCA, filter cutoff or any param.

ADSR [ENV] [CV] [FX] [SYNTH] in: Gate out: CV

Full ADSR envelope: a held in0 gate ramps up over Attack, falls to the Sustain level over Decay and holds there; releasing the gate fades to zero over Release - the standard four-stage envelope for any voice or modulation.

AR [ENV] [CV] [FX] [SYNTH] in: Gate out: CV

Attack-Release (ASR) envelope: while the in0 gate is high the output ramps up to full over Attack and holds; when the gate falls it ramps back to zero over Release - a smooth sustaining envelope for pads and swells.

DADSR [ENV] [CV] [FX] [SYNTH] in: Gate out: CV

Delayed ADSR: like ADSR but with a Delay stage before the attack - the gate opens, nothing happens for Delay, then the four-stage envelope runs. Useful for staggered swells and per-voice timing offsets.

Filter (77)

Acid303 [FLT] [FX] [SYNTH] in: Audio, Cutoff CV out: Audio

TB-303-style acid filter: a smooth, squelchy 18 dB resonant lowpass that screams and 'wows' as Reso climbs - the liquid, rubbery acid-bassline character. Drive overdrives the input for grit, Reso self-oscillates near max. in1 modulates cutoff for that classic envelope-swept squelch.

AllpassFilter [FLT] [FX] [SYNTH] in: Audio out: Audio

Cascaded allpass: passes all frequencies at unity gain but shifts their phase, building the swirling notches of a phaser when mixed with the dry signal or smearing transients on its own. Freq sets the centre, Stages the number of allpass sections (steeper phase), Mix the dry/wet for phasing.

AutoWah [FLT] [FX] [SYNTH] in: Audio out: Audio

Envelope-following resonant band-pass (auto-wah): the input level sweeps a band-pass from Base upward by Range, with Sens setting how strongly playing dynamics open it and Attack the follow speed. Reso sets the peak sharpness and Mix the blend. Funky on guitar, clav and bass; raise Reso for a vocal quack.

BarReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Bar resonator (a first as a synth block): rings the input through the modes of a free-free metal or wooden BAR - the widely-stretched overtones (1, 2.76, 5.40, 8.93…) of a marimba, glockenspiel or music-box tine. Because the partials leap apart so fast it imposes a clear, bright, struck-mallet pitch on whatever passes through, turning drums or noise into tuned-percussion tones. Freq sets the bar's pitch, Sharpness the ring time, Mix the wet/dry blend.

BellReson [FLT][FX][SYNTH] in: Audio out: Audio

Bell resonator (a first as a synth block): rings the input through the partials of a cast BELL - the hum, prime, tierce, quint and nominal tones (0.5, 1, 1.2, 1.5, 2, 2.5, 3) whose deliberately-tuned MINOR THIRD gives a bell its dark, mournful clang. Feeding a source through it casts that bronze, struck-bell colour over it. Freq sets the strike tone, Sharpness the ring time, Mix the wet/dry blend. A tuned-bell spectrum distinct from the bar and plate resonators.

Buchla292 [FLT][FX][SYNTH] in: Audio, Gate CV out: Audio

Buchla 292-style vactrol lowpass gate: a combined lowpass filter + VCA where a control voltage on in1 opens both together through a slow, organic vactrol response - the soft, bongo-like 'bonk' and gentle plucks of West Coast synthesis. Response sets the vactrol attack/decay sluggishness.

ChromaticReson [FLT][FX][SYNTH] in: Audio out: Audio

Chromatic resonator (a first as a synth block): rings the input through resonators tuned to all twelve equal-tempered SEMITONES of the octave - a comb of every chromatic pitch, so it imposes a fixed twelve-tone pitch grid on whatever passes through, quantising noise or percussion toward an equal-tempered cluster. Root sets the lowest note, Sharpness the ring time, Mix the wet/dry blend. The densest scale resonator, a chromatic pitch-grid distinct from the consonant major/minor/pentatonic banks.

Cluster [FLT][FX][SYNTH] in: Audio out: Audio

Cluster filter (Pigments-style): places up to five resonant band-pass filters around a single Cutoff, fanned outward by Spread, and sums them into one animated, vowel-like comb of peaks. Sweeping Cutoff glides the whole cluster; widening Spread pulls the peaks apart from a single resonance into a chord of formants; Reso sharpens each peak toward self-oscillation; Mix blends against dry. Distinct from the harmonic SMR bank (whose bands track a fundamental's overtones) - here the peaks are symmetric octave-spread satellites of one cutoff.

CombBank [FLT][FX][SYNTH] in: Audio out: Audio

Tuned comb filter: feeds the input through a short delay with feedback so it resonates at a pitch (and its harmonics), turning noise into tuned tones and adding a metallic, flange-like comb colour to audio. Freq sets the pitch, Feedback the resonance/ring length, Mix the wet. Distinct from the single Comb in its long-feedback resonant tuning.

Crossover [FLT][FX][SYNTH] in: Audio out: Audio

Two-band splitter that derives a low band from two cascaded one-pole low-passes (an LR2 response) and forms the high band by subtracting it from the input, outputting one band at a time. Freq sets the split frequency and Band chooses whether the low band or the high band is passed. Use it to route or isolate a frequency region, or to feed separate processing chains per band.

CryWah [FLT][FX][SYNTH] in: Audio, Pedal CV out: Audio

Wah pedal: a resonant bandpass swept by the Pedal control, the vocal 'wah' of a guitar pedal - rock the pedal (or in1) for the talking sweep. Pedal sweeps the peak, Reso the sharpness, Mix the wet. in1 = Pedal CV.

DJFilter [FLT][FX][SYNTH] in: Audio, Reso Mod, Cutoff Mod out: Audio

One-knob DJ filter: with Cutoff at centre the signal is open, turning down sweeps in a low-pass and turning up sweeps in a high-pass, while Reso adds bite at the corner. The Mod input (in 3) offsets the knob for automation. The classic build-and-drop sweep on a single control.

DrumheadReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Drumhead resonator (a first as a synth block): rings the input through a bank tuned to the modes of a circular DRUM MEMBRANE - the inharmonic Bessel-function overtones (1, 1.59, 2.14, 2.30, 2.65…) that give a struck skin its pitch-ambiguous, tom-like 'boing' rather than a clear note. Drop a drum loop, voice or noise through it and the source takes on the body of a tuned membrane. Freq sets the membrane pitch, Sharpness the ring time, Mix the wet/dry blend.

EQ [FLT] [FX] [SYNTH] in: Audio out: Audio

Single parametric peaking EQ band (RBJ biquad): Gain boosts or cuts a bell centred at Freq, with Q setting its width - narrow for surgical notches, wide for broad tone shaping. Chain several for a full parametric EQ. See GraphicEQ for fixed bands and the analog pack (Pultec/Neve/SSL) for coloured curves.

FibResonator [FLT] [FX] [SYNTH] in: Audio out: Audio

Fibonacci-tuned resonator bank (a first as a synth block): rings the input through resonators tuned to the Fibonacci harmonics of Base (Base1, 2, 3, 5, 8, 13…), so any source is recoloured into a drone whose overtones widen by the golden ratio - the warm, glassy Fibonacci spectrum imposed on whatever passes through. Sharpness sets the resonance Q and Mix the wet/dry blend. A golden-spaced resonator distinct from the prime-tuned and harmonic resonators.

Filter [FLT] [FX] [SYNTH] in: Audio, Reso Mod, Cutoff Mod out: Audio

Multimode state-variable (TPT) filter switchable between low-pass, high-pass and band-pass via Mode. Cutoff tracks an exponential mod input (in 3) scaled by Mod in octaves, while Reso sets the Q up to self-oscillation and an optional pre-Drive (tanh) dirties the resonance. Mix blends the filtered result back against the dry signal.

FilterFM [FLT] [FX] [SYNTH] in: Audio, FM CV out: Audio

Audio-rate filter FM: a resonant lowpass whose cutoff is frequency-modulated at audio rate by in1, producing metallic, bell-like and clangorous timbres that slow filter sweeps can't reach - the filter becomes a sound source. Cutoff sets the centre, Depth the FM amount in octaves, Reso the resonance.

FilterLFO [FLT] [FX] [SYNTH] in: Audio out: Audio

A 4-pole resonant ladder lowpass swept by an internal LFO that morphs between triangle and sawtooth shapes. Rate sets the LFO speed (Hz), Range sets the sweep depth around the cutoff (~60 Hz..15.6 kHz), Reso sets the resonant feedback, Shape morphs the LFO from triangle to saw, and Mix blends wet against dry. High Reso adds squelch while Shape changes the sweep from symmetric to ramped.

FixedFilterBank [FLT] [FX] [SYNTH] in: Audio out: Audio

Fixed filter bank (Moog 914): three parallel fixed bandpass bands - low, mid and high - each with its own level, a graphic-EQ-style spectral sculptor for formant and tonal shaping. Low / Mid / High set the band gains. in0 = Audio.

Fizz [FLT] [FX] [SYNTH] in: Audio out: Audio

Resonant TPT band-pass filter whose output is mixed with a rectified copy of itself, adding fizzy upper harmonics that grow with resonance. Cutoff sets the band centre (100–12000 Hz), Reso sets both the filter Q and the amount of rectified harmonic content, and Mix blends the result against the dry signal. Use it to add bright, buzzy edge and emphasis to a narrow frequency band.

Formant [FLT] [FX] [SYNTH] in: Audio out: Audio

Morphing vowel filter: three parallel band-pass resonators tuned to formant frequencies are swept continuously across the A-E-I-O-U vowels by Vowel, with Q setting the formant sharpness and Mix the blend. Produces talking, vocal timbres. Sweep Vowel with an LFO or envelope for a wah-like vowel morph.

GlassReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Glass resonator (a first as a synth block): rings the input through the sparse, nearly-pure modes of a rubbed wine GLASS or glass-harmonica bowl (about 1, 2.32, 4.25, 6.63, 9.38) - a few widely-spaced, slow-decaying partials that give glass its clear, singing, almost-sine voice. Passing a source through it lends that fragile crystalline ring. Freq sets the glass pitch, Sharpness the (long) ring time, Mix the wet/dry blend. A glassy sparse spectrum distinct from the dense plate and bell resonators.

GoldenResonator [FLT] [FX] [SYNTH] in: Audio out: Audio

Golden-ratio resonator bank (a first as a synth block): rings the input through resonators spaced by powers of the golden ratio (Base, Base1.618, Base2.618, Base*4.236…) - an INHARMONIC bank, so no resonance is a simple multiple of another and the source is recoloured into a shimmering, metallic, bell-like resonance that hangs between a pitch and a clangour. Sharpness sets the resonance Q and Mix the wet/dry blend. The inharmonic counterpart of the prime and octave resonators, ideal for turning drums or noise into struck-metal textures.

GraphicEQ [FLT] [FX] [SYNTH] in: Audio out: Audio

Three-band graphic EQ: one-pole filters at 250 Hz and 4 kHz split the input into low, mid and high bands, each scaled by its own +/-12 dB gain and summed back. Low, Mid and High set the per-band gain in dB and Mix blends against dry. A simple tonal shaping tool for broad low/mid/high balance rather than surgical correction.

HarpReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Harp-string bank (a first as a synth block): rings the input through eight plucked-string loops tuned to a full DIATONIC scale (a whole octave of harp strings), so any source ripples across the strings and rings back as cascading, scale-tuned harp resonance - feed it transients and it answers in glissando-like washes. Root sets the key, Decay the string sustain, Damp the brightness, Mix the wet/dry blend. A diatonic string bank distinct from the chordal and drone banks.

KotoReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Koto-string bank (a first as a synth block): rings the input through nine plucked-string loops tuned to a PENTATONIC scale across two octaves, the open, gap-toothed tuning of a Japanese koto or a guzheng. Because the pentatonic scale has no dissonant intervals, any source - even noise - comes back as a consonant, bright, plucked-string cascade. Root sets the key, Decay the string sustain, Damp the brightness, Mix the wet/dry blend. A pentatonic string bank distinct from the diatonic harp and chordal banks.

Ladder [FLT] [CIRCUIT] [FX] [SYNTH] in: Audio, Reso Mod, Cutoff Mod out: Audio

Moog-style 4-pole transistor-ladder low-pass: four cascaded one-poles with a tanh input Drive and global resonance feedback that self-oscillates near maximum Reso. Cutoff tracks an exponential mod input (in 3) in octaves. Warmer and more characterful than the clean Filter - push Drive into the ladder for growl; see the Mini analog model for a Minimoog-voiced variant.

LoFi [FLT][FX][SYNTH] in: Audio out: Audio

Lo-fi filter (Pigments-style): degrades the signal by undersampling (Downsample sample-and-holds the input at a reduced rate for aliasing grit), bit-reducing (Bits quantises the amplitude for digital crunch), injecting Noise (a hiss/dirt floor), then smoothing with a Cutoff low-pass - from subtle vintage-sampler warmth to extreme broken-converter mangling. Mix blends against dry. A degradation filter rather than a resonant one: use it to age pads, crush drums or add converter character.

LowPassGate [FLT][FX][SYNTH] in: Audio, Ping (CV) out: Audio

Buchla west-coast low-pass gate: a vactrol couples a VCA and VCF so a ping opens both with the characteristic nonlinear ringing decay. Mode picks VCA / VCF / both.

LPG [FLT][FX][SYNTH] in: Audio, Gate (CV) out: Audio

Vactrol-style low-pass gate: the control input (in 2) simultaneously opens a low-pass filter and a VCA, so brightness and level rise together as the control climbs. Response curves the control law from snappy to sluggish, emulating the vactrol's lag, and Mix blends against dry. Driven by an envelope or trigger it gives the plucky, organic dynamics of Buchla-style patches.

MajorReson [FLT][FX][SYNTH] in: Audio out: Audio

Major-scale resonator (a first as a synth block): rings the input through a bank of resonators tuned to the seven notes of a MAJOR scale (plus the octave), so any source - a drum loop, noise, a voice - is pulled into a bright, consonant, major-key wash, an instant ambient pad. Root sets the key, Sharpness the ring time (turn it up for a sustaining drone), and Mix the wet/dry blend. A scale-tuned resonator distinct from the harmonic and object resonators.

MinorReson [FLT][FX][SYNTH] in: Audio out: Audio

Minor-scale resonator (a first as a synth block): rings the input through resonators tuned to the seven notes of a NATURAL MINOR scale (plus the octave), recolouring any source into a darker, melancholic, minor-key drone. Root sets the key, Sharpness the ring time, Mix the wet/dry blend. The minor counterpart of the major resonator, ideal for turning drums or noise into a brooding ambient pad.

MorphFilter [FLT][FX][SYNTH] in: Audio, Cutoff CV out: Audio

Continuously-morphing state-variable filter: one Morph knob sweeps smoothly from lowpass through bandpass to highpass on a single resonant Chamberlin core, so the filter type itself can be automated - dark to open to thin - without switching blocks. Cutoff sets the corner, Reso the resonance, and in1 modulates the cutoff.

MS20Filter [FLT][FX][SYNTH] in: Audio, Cutoff CV, Reso CV out: Audio

Korg MS-20-style Sallen-Key lowpass: a screaming, aggressive resonant filter. Drive pushes the input into a tanh stage before the filter and Reso climbs into self-oscillation - the gritty, acidic MS-20 squelch. in1 modulates cutoff, in2 modulates resonance.

Notch [FLT] [FX] [SYNTH] in: Audio out: Audio

Band-reject (notch) filter that removes a narrow band around Freq, with Q setting its width and Mix the blend. Use it to kill hum, a resonance or a feedback frequency, or sweep it for phaser-like effects. Narrow Q for surgical removal, wider for broad scooping.

OberheimSEM [FLT] [FX] [SYNTH] in: Audio, Cutoff CV out: Audio

Oberheim SEM-style state-variable filter: a smooth, creamy 12 dB multimode (lowpass / bandpass / highpass via Mode) with gentle resonance and the warm, rounded SEM character - the classic fat, musical filter for pads and leads. in1 modulates cutoff.

OctaveResonator [FLT] [FX] [SYNTH] in: Audio out: Audio

Octave-stack resonator bank (a first as a synth block): rings the input through resonators tuned to pure octaves of Base (Base1, 2, 4, 8, *16…), so any source is pulled toward a single strongly-reinforced pitch with the bright, hollow body of an organ stop - every resonance an octave of the last, nothing in between. Sharpness sets the resonance Q and Mix the wet/dry blend. A pure-octave resonator distinct from the dense harmonic and prime banks.

OddResonator [FLT] [FX] [SYNTH] in: Audio out: Audio

Odd-harmonic resonator bank (a first as a synth block): rings the input through resonators on the ODD harmonics of Base only (Base1, 3, 5, 7, *9…), the spectrum of a square wave or a stopped pipe, so any source takes on a hollow, woody, clarinet-like resonance with no even overtones. Sharpness sets the resonance Q and Mix the wet/dry blend. An odd-harmonic resonator distinct from the prime and Fibonacci banks.

ParaEQ [FLT] [FX] [SYNTH] in: L, R out: Audio

Fully-parametric EQ band with stereo / mid-side / L / R processing - stack several for an Ableton EQ-Eight-style mid-side parametric EQ. Type selects the RBJ filter shape (low cut, low shelf, bell, high shelf, high cut, notch), Freq the centre/corner, Gain the boost or cut (shelf/bell), Q the width, and Mode whether the band acts on the full Stereo signal, only the Mid, only the Side, or one channel (L/R). Out picks L or R. Reads in0 = L, in1 = R; place two instances (Out=L and Out=R) for a stereo band.

PeakFilter [FLT] [FX] [SYNTH] in: Audio out: Audio

A biquad peaking EQ band that boosts a single frequency region, followed by a tanh soft limiter to tame the boosted peaks. Freq sets the center frequency (40..16000 Hz), Gain sets the boost amount (0..18 dB), Edge sets the band Q/sharpness, and Mix blends the filtered signal against dry. Useful for emphasizing a resonant frequency without hard clipping when pushed.

PentatonicReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Pentatonic resonator (a first as a synth block): rings the input through resonators tuned to the five notes of a MAJOR PENTATONIC scale (across two octaves) - the gap-toothed, no-semitone scale of folk and gamelan that has no dissonant intervals, so ANYTHING fed through it comes out consonant and open. Root sets the key, Sharpness the ring time, Mix the wet/dry blend. The most foolproof scale resonator for instant harmonious drones from any source.

PingFilter [FLT] [FX] [SYNTH] in: Ping, Pitch CV out: Audio

Pinged resonant filter: a high-resonance bandpass struck by triggers on in0, ringing out a tuned, decaying tone - the classic 'pinged filter' tuned-percussion / pluck trick. Freq sets the pitch, Reso the ring length, Level the output. Trigger on in0, in1 = Pitch CV.

Pipe [FLT] [FX] [SYNTH] in: Audio out: Audio

Waveguide pipe resonator (Absynth Pipe-style): a tuned feedback comb that rings at the Tune frequency, switchable between an Open pipe (full harmonic series, positive feedback) and a Closed pipe (only odd harmonics, inverted feedback) for a hollow, clarinet-like colour. Feedback sets the resonance and ring time, Damp rolls off the highs in the loop for a softer pipe, and Mix blends the resonated signal against the dry input. Excite it with a transient or noise burst for plucked/blown-tube tones.

PlateReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Plate resonator (a first as a synth block): rings the input through the dense, inharmonic modes of a vibrating METAL PLATE (about 1, 2.08, 3.41, 3.89, 5.00, 6.45) - the crowded overtone field behind plate reverbs and the shimmer of a cymbal or gong. Its many close, non-integer partials smear any source into a bright metallic wash. Freq sets the plate's tuning, Sharpness the ring time, Mix the wet/dry blend. A 2-D plate spectrum distinct from the 1-D bar and string resonators.

PluckReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Single-string resonator (a first as a synth block): rings the input through ONE tuned plucked-string loop (Karplus-Strong), turning any source into a sustained, pitched, plucked-string resonance at the Root note - a string reverb. Transients excite the string into a clear plucked ring; sustained input drives it like a bowed or e-bowed string. Root sets the pitch, Decay the sustain (toward infinite at the top), Damp the brightness, Mix the wet/dry blend. The single-string core of the sympathetic banks, a tuned string-reverb distinct from the multi-string drones.

PolivoksFilter [FLT] [FX] [SYNTH] in: Audio, Cutoff CV out: Audio

Polivoks filter: the harsh, screaming Soviet 2-pole resonant filter (Vladimir Kuzmin's design), whose resonance distorts into a raw, biting howl unlike any Western filter. Cutoff, Reso, Mode picks lowpass or bandpass. in1 modulates cutoff.

PrimeResonator [FLT] [FX] [SYNTH] in: Audio out: Audio

Prime-tuned resonator bank (a first as a synth block): runs the input through a bank of sharp resonators tuned to the PRIME harmonics of Base (Base2, 3, 5, 7, *11…), so whatever you feed it - noise, a drum loop, a voice - rings out as a pitched drone whose overtones are the primes, the hollow bell-organ colour of the prime spectrum imposed on any source. Sharpness sets the resonance Q (how long each prime rings), and Mix blends the resonated tone against the dry. A number-tuned resonator distinct from a plain comb or formant filter.

PZFilter [FLT] [FX] [SYNTH] in: Audio out: Audio

Drawable magnitude-response filter: samples a frequency-to-gain curve drawn in node config at 16 log-spaced bands and bakes one peaking-EQ biquad per band, passing the input at in0 through the series to reproduce the drawn shape. Amount morphs between the dry input and the fully filtered output. Draw boosts and cuts across the spectrum to build custom EQ curves or resonant filter shapes.

Rasp [FLT] [FX] [SYNTH] in: Audio out: Audio

Resonant TPT band-pass filter followed by an asymmetric tanh waveshaper that drives positive half-cycles harder than negative ones, producing a rasping, lopsided distortion. Cutoff sets the band centre (100-12000 Hz), Reso sets the Q and scales the drive so higher resonance increases the snarl, and Mix blends against the dry signal. Ranges from a soft growl at low settings to an aggressive scream at high resonance.

ResonantEQ [FLT] [FX] [SYNTH] in: Audio out: Audio

Resonant EQ band: a single sharp, high-Q peak added to the signal - a surgical resonant filter for ringing out or carving one frequency. Freq sets the band, Gain boosts (+) or cuts (-), Q the sharpness.

Resonator [FLT] [FX] [SYNTH] in: Audio out: Audio

High-Q band-pass tuned to a musical pitch, converting the Pitch parameter in semitones to a centre frequency and ringing the input through it like a struck body. Pitch sets the resonant note, Reso sets the Q (sharpness and ring length), and Mix blends the doubled resonant output against the dry signal. Drive it with transients or noise for tuned percussion, pinged-body and comb-resonance textures.

Rings [FLT] [FX] [SYNTH] in: Audio out: Audio

Modal resonator bank: three TPT band-pass resonators tuned around a base pitch are excited by the input, summed to produce a struck/plucked resonant body. Pitch sets the fundamental in semitones, Structure morphs the partial spacing from harmonic (1, 2, 3) to inharmonic (1, 2.76, 5.40), Decay sets the resonator Q (ring length), and Bright scales the summed output level. Mix blends the resonant tone with the dry signal for physical-modeling and bell/string textures.

Ripple [FLT] [FX] [SYNTH] in: Audio out: Audio

Tuned comb resonator built from a short delay line whose length tracks a musical pitch, with a low-passed feedback path that makes it ring at that frequency. Pitch sets the resonant note as a MIDI value (24-108 st), Reso sets the feedback amount up to 0.98 for longer, sharper ringing, Damp sets the high-frequency damping in the feedback path (a darker, woodier ring as it rises), and Mix blends the resonant tone against the dry signal. Pushes input toward a pitched, metallic ring keyed to the chosen note.

Sallen [FLT] [FX] [SYNTH] in: Audio, Cutoff CV out: Audio

Sallen-Key 2-pole resonant lowpass: the smooth, gently-saturating 12 dB filter of the Korg MS-10/MS-20 and Wasp lineage, growling as Reso climbs into self-oscillation. Cutoff sets the corner, Reso the resonance, Drive the input saturation. in1 modulates cutoff.

SallenKey [FLT] [CIRCUIT] [FX] [SYNTH] in: Audio, Reso Mod, Cutoff Mod out: Audio

Resonant low-pass built on a TPT state-variable core taking the low-pass output, with the cutoff frequency exponentially modulated by in 3 scaled by Mod in octaves. Cutoff sets the corner, Reso raises the Q toward self-oscillation, and Mix blends the filtered low-pass back against the dry input. The Sallen-Key topology gives a smooth, gentle resonance suited to warm synth and bass filtering.

Shelf [FLT] [FX] [SYNTH] in: Audio out: Audio

Low- or high-shelf EQ (RBJ shelving biquad; Type selects low or high): boosts or cuts everything below/above Freq by Gain at a fixed slope. Use for broad tonal tilt - warming the lows or adding air to the highs. Pair two for a tilt curve, or see TiltEQ for a single-knob version.

Sherman [FLT] [FX] [SYNTH] in: Audio, Cutoff Mod out: Audio

Sherman Filterbank (circuit model): a faithful model of the Belgian dual analog filter / distortion box. The input hits a VCA-overdrive stage (asymmetric soft clip -> even-harmonic grind, hotter Drive = more distortion and a stronger envelope), then TWO two-integrator (Chamberlin) state-variable filters whose resonance feedback path is saturated, so high Reso screams and self-oscillates instead of blowing up - the Sherman's signature. A rectifier + RC envelope follower tracks the (hot) input and sweeps the cutoff by Env, Freq sets filter 1's base cutoff, Harmonics offsets

filter 2 in semitones, and Mode routes the pair Serial (1->2 LP/BP/HP), Parallel (LP+HP or BP+BP) or Ring (the two band-passes ring-modulated). in1 is the FM input (patch an LFO/envelope/audio to frequency-modulate the cutoff). Mix is the Bypass/Effect blend.

SMR [FLT] [FX] [SYNTH] in: Audio out: Audio

Spectral multiband resonator (4ms SMR): six resonant band-pass filters tuned in a harmonic series excite the in0 input into a ringing, vocal chord - an oscillator bank, resonator and vocoder-like effect in one. Tune sets the lowest band, Spread the spacing of the six bands (harmonic to stretched), Reso the resonance/ring time of each band, and Mix the wet blend. Feed it drums or noise for struck metallic chords, or audio for formant/vocoder colour. Distinct from the single-band Resonator and the modal Rings.

SplitEQ [FLT] [FX] [SYNTH] in: Audio out: Audio

A peaking EQ that knows transients from tone: a fast/slow envelope split weighs the band gain toward the attack or the sustain, so you can brighten transients without harshening the body.

Steiner [FLT] [CIRCUIT] [FX] [SYNTH] in: Audio out: Audio

Steiner-Parker style multimode filter whose TPT core derives low-pass, high-pass, band-pass and notch responses simultaneously, with Mode selecting which one is output. Cutoff sets the corner frequency, Reso controls the Q toward self-oscillation, and Mix crossfades the selected response against the dry signal. Switching modes covers everything from dark sweeps to hollow notch tones for synth and effect duty.

SteinerParker [FLT] [FX] [SYNTH] in: Audio, Cutoff CV out: Audio

Steiner-Parker / Synthacon-style multimode filter: a snappy, vocal-sounding 12 dB filter with lowpass, bandpass, highpass and notch modes (Mode), diode-asymmetric soft clipping in the path. Distinct, reedy character versus the ladder filters. in1 modulates cutoff.

Sweep [FLT] [FX] [SYNTH] in: Audio out: Audio

Onset-triggered filter sweep: an amplitude envelope detects input onsets and restarts a ramp that drives a TPT low-pass cutoff from 100 Hz upward for riser/faller effects. Time sets the ramp duration, Range scales how far the cutoff travels, Reso sets the filter resonance, and Dir flips the ramp between rising and falling. Mix blends the swept output with the dry signal.

SympatheticStrings [FLT] [FX] [SYNTH] in: Audio out: Audio

Sympathetic-string bank (a first as a synth block): rings the input through a bank of tuned, plucked-string loops (Karplus-Strong) set to a major chord, so any source - a drum hit, a breath, a noise burst - excites the strings into a rich, sustaining sympathetic resonance, the way the undamped tarab strings of a sitar or sarangi shimmer behind every note. Unlike the thin 2-pole resonators each string rings its WHOLE harmonic series, giving a dense, lively, plucked-metal sustain. Root sets the chord, Decay the sustain, Damp the brightness, Mix the wet/dry blend.

Talkbox [FLT] [FX] [SYNTH] in: Audio out: Audio

Vowel formant filter (talkbox-style): passes the input through three resonant formant band-passes whose centre frequencies morph across the A-E-I-O-U vowels, imposing a singing/talking vocal colour on any sound so a guitar, synth or drum loop 'speaks' a vowel. Vowel selects and morphs the formant, Res sets the formant sharpness, and Mix blends against the dry. Single-input (unlike the Vocoder, which needs a separate modulator) and it resonates the formants rather than shifting existing ones.

Tanpura [FLT] [FX] [SYNTH] in: Audio out: Audio

Tanpura-drone string bank (a first as a synth block): rings the input through four sympathetic strings tuned to the classic Indian tanpura drone (Sa, Sa, Pa, high Sa), so any source sets off the endless, buzzing, overtone-rich Sa-Pa-Sa drone that underpins all Hindustani music. The long feedback loops and gentle damping give the characteristic shimmering, never-quite-decaying jivari sustain. Root sets the tonic, Decay the (long) drone length, Damp the brightness, Mix the wet/dry blend. A specific drone tuning distinct from the chordal sympathetic bank.

Telephone [FLT] [FX] [SYNTH] in: Audio out: Audio

Band-limits the input to roughly 300 Hz–3.4 kHz by cascading a one-pole low-pass at 3.4 kHz into a one-pole high-pass at 300 Hz, leaving only the narrow midrange band that survives a phone line. Mix crossfades between the dry signal and the band-passed result. Use it for lo-fi telephone, intercom and AM-radio voice effects.

ThreeSisters [FLT] [FX] [SYNTH] in: Audio out: Audio

Triple resonant filter (Mannequins Three Sisters): three filters - Low, Centre, High - move together by Freq while Span spreads their cutoffs apart. Quality sweeps from a gentle resonant emphasis up to self-oscillating ringing sine tones (a three-voice resonance choir); Mode switches between the spread filter and a Formant voicing. Feed it audio for sweepable formants and resonant drones. Distinct from the single-band filters and the SMR resonator bank.

TiltEQ [FLT] [FX] [SYNTH] in: Audio out: Audio

One-knob spectral tilt that splits the signal at a pivot frequency with a one-pole low-pass and rocks the low and high halves in opposite directions. Tilt sets the slope from -1 (low band up, high band down) through 0 (flat) to +1 (high band up, low band down), Freq places the pivot the split happens around, and Range scales the maximum boost/cut in dB applied to each half. Useful as a fast tone balancer for brightening or warming a source without reaching for a full EQ.

TripleComb [FLT] [FX] [SYNTH] in: Audio out: Audio

Triple comb resonator: three tuned feedback combs in parallel, ringing the input at three pitches at once for a chordal, metallic resonance - feed it noise for a struck chord. Root sets the base pitch, Chord the interval spread, Feedback the ring. in0 = Audio.

TripleResonator [FLT] [FX] [SYNTH] in: Audio out: Audio

Triple resonator (Polymoog/Serge): three sharply-tuned resonant peaks laid over the input, ringing out formant-like tones from any source - feed it noise for vowels, audio for metallic body. F1 / F2 / F3 set the three resonance pitches. in0 = Audio.

Vocoder [FLT] [FX] [SYNTH] in: Carrier, Modulator out: Audio

Analysis/synthesis vocoder (Pigments-style): splits the carrier at in0 and modulator at in1 into log-spaced bandpass bands, tracks each modulator band envelope, and multiplies the matching carrier band by it before summing, all blended by Mix against the dry carrier. Bands sets the number of analysis bands (4 to 40 - more bands give more intelligible speech imprinting), Q sets band sharpness, Attack sets the envelope follower attack time in ms (shorter tracks transients tighter), Mode picks the band character (Vintage soft to 6 kHz / Modern bright to 10 kHz / Dirty saturated), and Shift formant-shifts the carrier synthesis bands against the modulator analysis bands for chipmunk or deep-throat colours.

VowelBank [FLT] [FX] [SYNTH] in: Audio out: Audio

Vowel formant bank: three resonant peaks that morph through the A-E-I-O-U vowels as Vowel sweeps, turning any source into a talking, singing voice. Vowel selects the vowel, Q the sharpness, Mix the wet. in0 = Audio.

Wah [FLT] [FX] [SYNTH] in: Audio, Reso Mod, Sweep Mod out: Audio

Manually-swept resonant band-pass: Pedal sweeps the peak across Range, with Reso setting the quack and Mix the blend. Drive Pedal from the mod input (in 3) - an LFO, envelope or mod wheel - for auto-wah, talk-box or pedal-wah effects. See AutoWah for a built-in envelope follower.

WaspFilter [FLT] [FX] [SYNTH] in: Audio, Cutoff CV out: Audio

EDP Wasp-style CMOS filter: a digital-gate lowpass that distorts hard and dirty as it is driven - the buzzy, gnarly, lo-fi Wasp grind. Drive sets how viciously the CMOS stage clips; Reso adds a sharp, edgy peak. in1 modulates cutoff.

WholeToneReson [FLT] [FX] [SYNTH] in: Audio out: Audio

Whole-tone resonator (a first as a synth block): rings the input through resonators tuned to the six equal WHOLE-TONE steps (plus the octave) - the symmetrical, rootless scale of Debussy and dream sequences, with no perfect fifths to anchor it. Any source takes on a floating, ambiguous, shimmering quality with no clear home note. Root sets the centre, Sharpness the ring time, Mix the wet/dry blend. A symmetrical scale resonator distinct from the major and minor banks.

Wobble [FLT] [FX] [SYNTH] in: Audio out: Audio

Tempo-coherent resonant low-pass wobble: an LFO phased from c.time sweeps a TPT low-pass cutoff between 150 Hz and roughly 6 kHz for dubstep-style movement. Rate sets the LFO frequency, Depth scales the cutoff sweep range, Reso sets the filter resonance, and Shape selects sine, ramp or square LFO contour. Mix blends the wobbled output with the dry signal.

XMF [FLT] [FX] [SYNTH] in: Audio out: Audio

Cross-modulation filter (u-he Zebra XMF-style): two resonant state-variable filters run in parallel, but each one's cutoff is modulated by the OTHER filter's output, so they chase each other into FM-like sidebands, growl and screaming resonant textures a single filter cannot make. Cutoff sets the base frequency, Spread offsets the two filters, XMod the cross-modulation depth, Reso the resonance, and Mix the wet blend. At high XMod and Reso it self-oscillates into metallic, vocal, clangorous tones.

Modulation (193)

Aizawa [MOD] [FX] [SYNTH] in: – out: Audio

Aizawa attractor (a first as a synth block): integrates a six-parameter forced system whose trajectory wraps around a sphere while a hole opens through its top axis, producing a shape unlike any other strange attractor - a knotted ball with a drilled core. It free-runs at Rate, outputting x as a smooth bipolar CV that orbits the sphere and dips through the hole, giving rich circular motion with sudden axial excursions. A visually and sonically distinct chaos from the butterfly and spiral attractors.

Allpass [MOD] [FX] [SYNTH] in: Audio out: Audio

All-pass diffuser: a cascade of 1-8 first-order all-pass sections (Stages) that rotate phase while leaving magnitude flat, set by Coef. A building block for reverb diffusion, phasers and stereo de-correlation rather than an audible filter on its own. More stages and higher Coef smear transients harder.

Astroid [MOD] [FX] [SYNTH] in: – out: Audio

Astroid LFO (a first as a synth block): traces the four-cusped star curve x = cos-cubed(angle) and outputs it directly - a cosine with FLATTENED peaks and steepened zero-crossings, so it lingers at the extremes and snaps quickly through the middle, the inverse of a sine's rounded shape. A gentle, plateau-topped modulation good for slow holds with fast transitions. Rate sets the speed. A cubed-cosine star curve distinct from the sine and triangle shapes.

Barberpole [MOD] [FX] [SYNTH] in: Audio out: Audio

Infinite (barberpole) phaser: two 4-stage allpass banks a half-cycle apart, each amplitude-windowed so one fades in as the other wraps, giving an endless rising or falling sweep. Rate sets the sweep speed (Hz), Depth scales the allpass coefficient swing, Dir flips between rising and falling, and Mix blends wet against dry. A Shepard-tone style effect that seems to climb or descend forever.

Bass [MOD] [FX] [SYNTH] in: – out: Audio

Bass-diffusion source (a first as a synth block): the marketing model of how a new product spreads - a few INNOVATORS adopt on their own, then a wave of IMITATORS follows as they see others using it, giving the classic S-shaped adoption curve. Here the market saturates and resets, so the output is a repeating slow swell from zero to full adoption: a smooth, asymmetric ramp that starts slow, accelerates through the tipping point, then levels off. Innovate sets the spontaneous-adoption rate, Imitate the word-of-mouth strength. A technology-adoption curve distinct from the oscillating dynamical sources. Needs no input.

Bedhead [MOD] [FX] [SYNTH] in: – out: Audio

Bedhead-map source (a first as a synth block): iterates the trigonometric map x <- sin(xy/b)y + cos(ax - y), y <- x + sin(y)/b, one of the 'bedhead' attractors whose orbit tangles into a soft, hair-like snarl of overlapping loops. The product term xy inside the sine couples the two coordinates nonlinearly, giving a dense, organic, woven motion. It free-runs at Rate, outputting x as a bipolar CV. A coupled-trig chaos distinct from the additive De Jong and Clifford maps.

Billow [MOD] [FX] [SYNTH] in: – out: Audio

Billow-noise source (a first as a synth block): a fractal noise that takes the absolute value of each octave (2|noise| - 1), turning the gentle zero-crossings of fBm into rounded, puffy lobes - the look of cumulus clouds, rolling smoke and bubbling foam in procedural textures. The output swells up in soft billows with creased troughs where it folds back on itself, the rounded opposite of the sharp Ridged. Rate sets the base speed and Octaves the detail. A billowy coherent-noise modulator distinct from fBm and Ridged. Needs no input.

BirthDeath [MOD] [FX] [SYNTH] in: – out: Audio

Birth-death (queue) source (a first as a synth block): a population (or a queue of waiting jobs) where new arrivals appear at a steady Birth rate while each member already present has a Death chance of leaving, so the more there are the faster they go - a self-limiting balance that settles around Birth/Death. The output is the population, an ASYMMETRIC mean-reverting wander: it drifts up on a run of arrivals then thins out faster the higher it climbs, the Poisson-occupancy shape of a busy queue. Distinct from the symmetric Ehrenfest diffusion. Rate sets the event speed. Needs no input.

Bloom [MOD] [FX] [SYNTH] in: – out: Audio

Fractal sequencer (Qu-Bit Bloom): grows a melody from a short Trunk seed sequence by recursively grafting variations onto it. Length sets the trunk length; Branch adds fractal sub-sequences derived from the trunk (0 = play the plain trunk, up = ever more elaborate variations); Path chooses which route through the recursive tree is traversed; Scale

sets the output range. Self-clocks at Rate. A generative stepped-CV source - quantize for pitch. Distinct from Turing (shift register) and StepSeq (fixed).

Bouali [MOD] [FX] [SYNTH] in: – out: Audio

Bouali attractor (a first as a synth block): integrates a three-variable system devised to model fluctuating economic and predator-prey-like quantities - x' = x(4 - y) + 0.3z, y' = -y(1 - x^2), z' = -x(1.5 - 0.05z) - 0.05z - whose trajectory winds onto a broad, layered, sheet-like strange attractor. It free-runs at Rate, outputting x as a smooth bipolar CV with a strong slow sway under faster folds. A sheet-like chaos distinct from the scroll attractors. Needs no input.

BrownianBridge [MOD] [FX] [SYNTH] in: – out: Audio

Brownian-bridge source (a first as a synth block): a random walk that is tied down at both ends - it wanders freely in the middle but is mathematically guaranteed to arrive back at zero exactly at the end of each cycle, then starts a fresh bridge. This is the conditioned Brownian motion used to interpolate between fixed points and to model paths with a known destination. Length sets the cycle in steps. A pinned, self-resetting drift distinct from the open random walk. Needs no input.

Brusselator [MOD] [FX] [SYNTH] in: – out: Audio

Brusselator chemical oscillator (a first as a synth block): the textbook model of an autocatalytic chemical clock, where a reactant feeds a loop that periodically builds up and consumes an intermediate, so the concentration pulses up and down on its own - the kind of self-organising rhythm seen in real oscillating reactions. Above the critical feed it locks into a stable limit cycle. Rate sets the speed and B the feed parameter (raise it past 2 to start the oscillation). The output is the concentration x. A chemistry-born oscillation distinct from the biological and chaotic sources.

BurkeShaw [MOD] [FX] [SYNTH] in: – out: Audio

Burke-Shaw attractor (a first as a synth block): integrates x' = -s(x+y), y' = -y - sxz, z' = sxy + V - a tightly-coiled variant of the Lorenz system that winds into a dense, near-toroidal spiral rather than two separate wings, spinning rapidly around a doughnut of trajectories. It free-runs at Rate, outputting x as a smooth, fast-cycling bipolar CV with a strong underlying rotation. A coiled, rotation-dominated chaos distinct from the wing-flipping Lorenz and Chen.

BurningShip [MOD] [FX] [SYNTH] in: – out: Audio

Burning-Ship source (a first as a synth block): iterates z <- (|Re z| + i|Im z|)^2 + c, the Burning Ship fractal's map, where taking the ABSOLUTE VALUE of each part before squaring breaks the usual symmetry and produces the jagged, flame-and-mast shape it is named for. The folding makes its bounded orbits sharper and more angular than a Julia set; escapes reseed near the centre. CReal and CImag pick the region. It free-runs at Rate, outputting the real part. An absolute-value complex map distinct from the Julia and Tricorn sources.

Cardioid [MOD] [FX] [SYNTH] in: – out: Audio

Cardioid LFO (a first as a synth block): traces the heart-shaped curve r = 1 - cos(angle) and outputs its horizontal sweep, a strongly ASYMMETRIC modulation - a slow, lingering dwell near one extreme and a quick sweep through the other, the single-cusped 'heart' contour. Its lopsided shape makes it good for envelope-like swells that rise gently and fall fast (or vice versa). Rate sets the speed. A heart-curve LFO distinct from the symmetric sine and the multi-lobe Rose.

Chaos [MOD] [FX] [SYNTH] in: – out: Audio

Chaos modulator driven by the logistic map (x = rx(1-x)): at each Rate tick it iterates the map, and Chaos raises r from the periodic into the chaotic regime for unpredictable-but-deterministic motion. Smooth slews between values for a flowing control source rather than hard steps. Use it for evolving, never-quite-repeating modulation.

Chen [MOD] [FX] [SYNTH] in: – out: Audio

Chen attractor (a first as a synth block): integrates Chen's system x' = a(y-x), y' = (c-a)x - xz + cy, z' = xy - bz - a close relative of the Lorenz butterfly discovered by feedback control, but with a more tightly wound double scroll whose two lobes are pulled closer and spun faster. It free-runs at Rate, outputting x as a smooth bipolar CV that loops within one lobe then flips chaotically to the other. A wound-up cousin of Lorenz distinct from the Rossler and Thomas flows.

ChenLee [MOD] [FX] [SYNTH] in: – out: Audio

Chen-Lee attractor (a first as a synth block): integrates x' = ax - yz, y' = by + xz, z' = cz + xy/3, a model of a rigid body rotating under feedback torque, derived from Euler's equations for a gyroscope. Its trajectory traces a pair of stacked, twisted rings (a double-scroll that loops rather than wings), wandering chaotically between them. It free-runs at Rate, outputting x as a smooth bipolar CV with wide swings. A rotational-dynamics chaos distinct from the Lorenz and Rossler families.

Chua [MOD] [FX] [SYNTH] in: – out: Audio

Chua's-circuit chaos source (a first as a synth block): integrates the dimensionless Chua equations - the simplest electronic circuit that is provably chaotic, a real analog oscillator built from an op-amp, two capacitors, an inductor and the piecewise-linear 'Chua diode'. The trajectory winds around two attracting loops and flips unpredictably between them (the famous double-scroll), giving a smooth bipolar CV that meanders forever without repeating. Rate sets the integration speed. A circuit-born chaos, smoother than a map and distinct from the mechanical DoublePendulum or the Lorenz LFO.

ChuaOsc [MOD] [FX] [SYNTH] in: – out: Audio

Chua's-circuit chaos oscillator: a self-running analog-chaos modulation source - a strange attractor that wanders unpredictably yet stays bounded, never repeating. Rate sets the speed of evolution, Shape the attractor regime. A textured, organic chaos for evolving modulation. Needs no input.

CircleMap [MOD] [FX] [SYNTH] in: – out: Audio

Sine-circle-map source (a first as a synth block): iterates theta <- theta + Omega - (K/2pi) sin(2pi theta) on a circle - the model of an oscillator being kicked once per turn, and the textbook route to MODE-LOCKING. For bands of settings (the Arnold tongues) it locks onto a rational rhythm and repeats exactly; between them it runs quasi-periodically or, at high K, chaotically - so sweeping Omega walks a devil's-staircase of locked and unlocked ratios. It free-runs at Rate, outputting the angle as a 0..1 CV. K sets the kick strength, Omega the bare turn rate. A locking oscillator distinct from the dissipative attractors.

Clifford [MOD] [FX] [SYNTH] in: – out: Audio

Clifford-attractor source (a first as a synth block): iterates the strange-attractor map x <- sin(Ay) + cos(Ax), y <- sin(1.6x) + 0.7cos(1.6*y), whose orbit is forever drawn toward a delicate folded-ribbon fractal. It free-runs at Rate, stepping the map and outputting x as a smooth bipolar CV that traces the attractor's swirls. A sets the warp of the figure - small changes redraw the whole attractor - giving a rich family of organic, never-repeating motions distinct from the scrolls of Chua or the kicks of the standard map.

Clock [MOD][FX][SYNTH] in: – out: Audio

Tempo-synced clock generator: emits a gate-pulse train locked to the host tempo (or a free Hz Rate). Sync picks the note division (0=free Hz, 1=1/1 .. 8=1/16T), Rate is the free-running frequency when Sync is 0, and Width sets the pulse length as a fraction of the step. Patch its output into envelopes, sample-and-holds, ClockDiv or any gate input to drive rhythmic movement from the host transport.

CML [MOD][FX][SYNTH] in: – out: Audio

Coupled-map-lattice source (a first as a synth block): eight logistic maps sit in a ring, each iterating its own chaos while a Coupling term shares a fraction of each cell with its neighbours. The competition between local chaos and diffusive smoothing produces spatiotemporal chaos - travelling fronts, frozen-random patches and turbulent bursts that no single attractor shows. The output is the lattice average, a richly textured wandering CV. R sets each map's chaos and Coupling the diffusion. A whole field of coupled chaos rather than one oscillator. Needs no input.

Cobweb [MOD][FX][SYNTH] in: – out: Audio

Cobweb-market source (a first as a synth block): models the boom-bust price cycle of a market where producers decide TODAY'S supply based on YESTERDAY'S price - the cobweb theorem behind hog and crop cycles. High prices trigger overproduction, which crashes prices, which triggers underproduction, and so on. With a realistic exponential (Ricker) supply response the price never settles: it oscillates and, when producers over-react (high R), tips into genuine chaos. The output is the price. R sets how strongly supply reacts. A lagged-market chaos distinct from the smooth predator-prey and the logistic map. Needs no input.

Combinate [MOD][FX][SYNTH] in: A, B out: Audio

Combines two modulation or audio inputs (Pigments-style): Mode selects sum, ring (multiply), max, min, difference or sign-XOR, scaled by Mix. A math/logic node for the mod matrix - build complex modulators from simpler ones, or use it as a flexible ring/AM stage. Complements the Expr script node for inline math.

CoupledPendula [MOD][FX][SYNTH] in: – out: Audio

Coupled-pendulum-chain source (a first as a synth block): a ring of sixteen pendulums, each linked by a spring to its neighbours - the classic lecture-hall wave machine. Give one a push and the swing travels along the chain as a wave, reflecting and interfering with itself (this is the sine-Gordon system, famous for its solitons). With almost no friction the energy sloshes around the ring forever. The output is one pendulum's swing, rising and falling as the waves pass through it. A mechanical wave source distinct from the electronic and chemical oscillators. Needs no input.

Cubic [MOD][FX][SYNTH] in: – out: Audio

Cubic-map source (a first as a synth block): iterates x <- A*x - x^3, an ODD-symmetric map (it treats positive and negative x as mirror images) unlike the lopsided logistic. That symmetry gives it a distinctive bifurcation diagram with two mirrored chaotic bands that can suddenly merge, and orbits that swing through both signs. It free-runs at Rate, stepping the map and outputting x as a bipolar CV. A sets the gain on the road to chaos. A symmetric cubic chaos distinct from the asymmetric quadratic maps. Needs no input.

Cusp [MOD][FX][SYNTH] in: – out: Audio

Cusp-map source (a first as a synth block): iterates x <- 1 - 2*sqrt(|x|), a map with a sharp cusp at the origin instead of a smooth parabola. The square-root gives it an infinitely steep peak, so it stretches and folds the line more violently near zero than the polynomial maps, producing fully-developed chaos with a characteristic spiky density. It free-runs at Rate, stepping the map and outputting x as a bipolar CV that hops sharply across [-1, 1]. A non-smooth chaos distinct from the parabolic logistic and the piecewise tent.

DAHDSR [MOD] [FX] [SYNTH] in: Audio out: Audio

Six-stage modulation envelope driven by the gate at in0: on gate-on it runs Delay, Attack, Hold, Decay then holds at Sustain, and on gate-off it enters Release, outputting a 0 to 1 level. Delay/Attack/Hold/Decay/Release are times in seconds and Sustain is the held level. The extra Delay and Hold stages over a plain ADSR let it shape slow swells or gated bursts as a modulation source.

Deffuant [MOD] [FX] [SYNTH] in: – out: Audio

Deffuant opinion-dynamics source (a first as a synth block): models twelve people each holding an opinion between 0 and 1; at each step two meet at random and, only if their views are already within Tolerance of each other, they compromise and move closer - if they are too far apart they simply ignore one another. This 'bounded confidence' makes the crowd settle into one consensus (narrow Tolerance gives several rival camps), occasionally shaken up when someone changes their mind. The output is the SPREAD of opinion (wide = divided, near zero = agreed), drifting as clusters form and dissolve. A social-dynamics source distinct from the physical models. Needs no input.

DeJong [MOD] [FX] [SYNTH] in: – out: Audio

De-Jong attractor source (a first as a synth block): iterates Peter de Jong's map x <- sin(Ay) - cos(Bx), y <- sin(Cx) - cos(Dy), whose orbit weaves into a dense web of looping filaments - one of the most varied strange-attractor families, redrawing completely with the smallest change of constants. It free-runs at Rate, stepping the map and outputting x as a smooth bipolar CV that wanders the web. A warps the figure. A four-sine attractor distinct from the two-sine Clifford. Needs no input.

Deltoid [MOD] [FX] [SYNTH] in: – out: Audio

Deltoid LFO (a first as a synth block): traces the three-cusped hypocycloid (a circle rolling inside one three times its size), outputting (2cos(angle) + cos(2angle)) / 3 - a smooth modulation with a strong main swell and a smaller secondary bump, the triangular cousin of the astroid. Its three-fold asymmetry gives a lopsided, gently galloping motion. Rate sets the speed. A three-cusp curve distinct from the four-cusp astroid and the rolling-circle epicycloid.

Dequan [MOD] [FX] [SYNTH] in: – out: Audio

Dequan-Li attractor (a first as a synth block): integrates a five-term unified chaotic system x' = a(y - x) + dxz, y' = kx + fy - xz, z' = cz + xy - ex*x with large coefficients that drive very energetic, wide-ranging orbits forming a dense double scroll. It free-runs at Rate, outputting x as a smooth bipolar CV with broad excursions. A high-energy unified chaos distinct from the gentler classical attractors.

Dimension [MOD] [FX] [SYNTH] in: Audio out: Audio

Dimension-D-style BBD chorus: a slow ~0.5 Hz LFO modulates a short delay around 8 ms, with the right channel running anti-phase, and the wet copy is blended with the dry at a fixed ratio. Depth scales how far the delay time is swept. Out picks L or R for the per-channel modulation phase, giving the lush stereo movement of the classic unit rather than a deep vibrato.

DoublePendulum [MOD] [FX] [SYNTH] in: – out: Audio

Double-pendulum chaos source (a first as a synth block): integrates the real equations of motion of two jointed pendulums - the textbook deterministic-chaos system - and outputs the lower bob's swing as a smooth, never-repeating CV. Tiny differences in motion explode into wholly different trajectories, so it wanders organically forever without an LFO's repetition or a noise source's harshness. Rate sets the simulation speed; the output stays bounded in +/-1 however wildly the arms tumble. A different, smoother chaos than the logistic Chaos or Lorenz blocks.

Drift [MOD] [FX] [SYNTH] in: – out: Audio

Slow smoothed random-walk modulator centred on 0.5, emulating vintage analog drift. Rate sets how often it picks a new target and Depth the deviation. Patch a little into pitch, cutoff or level to take the static, too-perfect edge off a patch.

Dropout [MOD] [FX] [SYNTH] in: Audio out: Audio

Random rhythmic muting: a clock at Rate decides per cycle whether to drop the signal to silence (Amount sets the drop probability), smoothed by Smooth to avoid clicks. Emulates a bad cable, dying battery or stuttery transmission. Subtle for movement, extreme for glitch and IDM textures.

DrunkLFO [MOD] [FX] [SYNTH] in: – out: Audio

Drunk-walk modulation: a random source that takes small random steps up or down at a set rate, wandering smoothly within +/-1 and reflecting off the rails - a bounded random walk (the drunk walk) for organic, slowly-drifting modulation, unlike sample-and-hold's independent jumps. Step sets the stride size, Rate the step interval, Depth the output level.

Duffing [MOD] [FX] [SYNTH] in: – out: Audio

Driven-Duffing chaos source (a first as a synth block): integrates the forced double-well Duffing oscillator x'' + dx' - x + x^3 = Drivecos(w t) - a mass in a twin-valley potential shaken by a periodic drive. At chaotic settings it jumps erratically between the two wells, never locking to the drive's period, yielding a smooth bipolar CV with a rhythmic pulse running under the chaos. Rate sets the speed, Drive the forcing amplitude (raise it to push from periodic motion into chaos). A forced-oscillator chaos distinct from the autonomous Chua or DoublePendulum.

Ehrenfest [MOD] [FX] [SYNTH] in: – out: Audio

Ehrenfest-urn source (a first as a synth block): the textbook model of diffusion and the arrow of time - Balls are split between two boxes and at each step ONE random ball is moved to the other box. Whichever box has more balls is more likely to lose one, so the split is gently pulled back toward 50/50 and then jiggles around it forever. The output is the fraction in one box: a mean-reverting random wander that, unlike a free random walk, never strays far - a statistical-mechanics restoring force rather than the spring of Ornstein-Uhlenbeck. Rate sets the step speed. Needs no input.

ElFarol [MOD] [FX] [SYNTH] in: – out: Audio

El-Farol-bar source (a first as a synth block): models Brian Arthur's famous bar problem - twelve regulars each decide whether to go out, wanting to go only if the bar will NOT be too crowded. Since everyone is second-guessing everyone else, no fixed rule works, yet through trial-and-error adjustment the crowd self-organises so attendance hovers right around Capacity, never settling. The output is the attendance, fluctuating around the comfort threshold - the founding model of bounded-rationality economics and inductive reasoning. A self-defeating-prediction source distinct from the consensus-seeking opinion models. Needs no input.

Epicycloid [MOD] [FX] [SYNTH] in: – out: Audio

Epicycloid LFO (a first as a synth block): traces the curve a point on a small circle draws as it rolls around the OUTSIDE of a larger one - the path of a planet in a geocentric sky - and outputs its sweep. With Cusps points it forms a star-like loop of sharp, evenly-spaced cusps, so the LFO sweeps smoothly then snaps at each cusp, a spiky repeating contour. Rate sets the speed. A rolling-circle modulation distinct from the inner-rolling Spirograph.

Euclid [MOD] [FX] [SYNTH] in: – out: Audio

Euclidean rhythm generator: distributes Pulses hits as evenly as possible across Steps positions (the algorithm behind countless drum patterns) and clocks them at the tempo-synced step Rate. Steps is the pattern length, Pulses the number of hits, Rotate shifts the pattern start, Rate the per-step note division (1=1/1 .. 8=1/16T), and Width the gate length. Outputs a gate on each active step - feed a drum/pluck envelope for generative rhythm that locks to the host.

Excitable [MOD] [FX] [SYNTH] in: – out: Audio

Excitable-medium source (a first as a synth block): a ring of sixteen FitzHugh-Nagumo cells coupled by diffusion, the model of an excitable tissue like heart muscle or a nerve sheet. A pulse, once lit, travels around the ring re-igniting each cell as it passes - a self-sustaining wave of excitation, the same mechanism behind a heartbeat and the spiral waves of a fibrillating heart. The output is one cell's voltage, spiking each time the wave sweeps by. Drive sets the excitability. A travelling-wave source distinct from the single-cell oscillators. Needs no input.

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fBm [MOD] [FX] [SYNTH] in: – out: Audio

Fractal-Brownian-motion source (a first as a synth block): stacks several octaves of Perlin noise - each one twice as fast and half as loud as the last - into the rich, self-similar randomness of natural terrain, coastlines and mountain skylines. The low octaves give the slow overall drift while the high ones add fine detail, so the motion is organic at every timescale at once. Rate sets the base speed and Octaves how many layers (more = finer, rougher detail). A multi-scale coherent-noise modulator distinct from the single-octave Perlin. Needs no input.

FinanceChaos [MOD] [FX] [SYNTH] in: – out: Audio

Financial-chaos attractor (a first as a synth block): integrates a model of a chaotic macroeconomy x' = z + (y - a)x, y' = 1 - by - x^2, z' = -x - cz, where x is the interest rate, y the investment demand and z the price index. It shows how a deterministic economy with no outside shocks can still wander unpredictably between booms and busts. It free-runs at Rate, outputting x as a smooth bipolar CV. An econophysics chaos distinct from the mechanical and climate attractors.

Firefly [MOD] [FX] [SYNTH] in: – out: Audio

Firefly-synchronisation source (a first as a synth block): models a swarm of twelve fireflies, each charging toward its flash; when one fires it nudges all the others a little closer to firing too. Through this pulse coupling they spontaneously fall into rhythm - the real mechanism behind fields of fireflies flashing in unison. The output is the swarm's phase COHERENCE (0 = scattered, 1 = all flashing together), which rises as they sync and breaks up again, breathing in and out. Couple sets how strongly each flash pulls the others. A self-organising sync source distinct from the chaos oscillators. Needs no input.

FitzHughNagumo [MOD] [FX] [SYNTH] in: – out: Audio

FitzHugh-Nagumo neuron (a first as a synth block): integrates the two-variable simplification of the Hodgkin-Huxley nerve-impulse equations, v' = v - v^3/3 - w + Drive, w' = 0.08(v + 0.7 - 0.8w). It is the textbook EXCITABLE system: a fast voltage v that fires and a slow recovery w that resets it. With enough Drive it spikes over and over - a sharp upstroke, a refractory dip, a slow recharge - the canonical shape of a firing neuron. Rate sets the speed, Drive the injected current (turn it up to cross from silent into repetitive spiking). A spiking oscillator distinct from the smooth chaos sources.

ForestFire [MOD] [FX] [SYNTH] in: – out: Audio

Forest-fire CA (a first as a synth block): a 4x4 grid of cells that are empty, growing a tree, or burning. Each sample a tree sprouts on an empty cell with chance Growth, a stray tree catches fire by Lightning, and fire spreads to neighbouring trees then burns out - the Drossel-Schwabl model of self-organised criticality. The output is the

burning density: quiet while the forest regrows, then sudden sweeping fire-fronts, with the avalanche statistics of real wildfires. A different criticality than the Sandpile. Needs no input.

FourWing [MOD] [FX] [SYNTH] in: – out: Audio

Four-wing attractor (a first as a synth block): integrates x' = ax + yz, y' = bx + cy - xz, z' = -z - xy, a system whose trajectory visits FOUR separate wings instead of the usual two, wandering chaotically between all four quadrants in a butterfly with double the lobes. It free-runs at Rate, outputting x as a smooth bipolar CV that jumps unpredictably between the four wings. A four-lobed chaos distinct from the two-winged Lorenz, Chen and Lu attractors.

FractalDream [MOD] [FX] [SYNTH] in: – out: Audio

Fractal-dream-map source (a first as a synth block): iterates Clifford Pickover's 'fractal dream' map x <- sin(By) + Csin(Bx), y <- sin(Ax) + Dsin(Ay), a four-term sine system whose orbit settles into soft, dreamlike clouds of nested filaments. It free-runs at Rate, stepping the map and outputting x as a smooth bipolar CV that drifts through the dream. A four-sine attractor distinct from the De Jong and Svensson maps. Needs no input.

Frames [MOD] [FX] [SYNTH] in: A, B, C, D out: Audio

Keyframe morphing mixer (Mutable Instruments Frames): blends its four inputs (A-D) by sweeping one Frame knob through a chain of keyframes, crossfading from A toward D as Frame moves 0 to 1 - the modular take on animation keyframing. Frame sets the position and Anim, when above zero, animates it automatically at that rate (an evolving 4-source morph). Patch four oscillators or modulators in for smooth timbral or CV morphs. Distinct from the static Mixer and the XY-plane Vector.

Galam [MOD] [FX] [SYNTH] in: – out: Audio

Galam majority-rule source (a first as a synth block): models twelve people on a ring each holding a yes/no opinion; at each step a small group is picked and EVERYONE in it adopts the local MAJORITY view - the mechanism Galam used to model how rumours, fashions and political opinions sweep through a crowd toward unanimity. A trickle of independent mind-changing keeps it from freezing forever. The output is the fraction holding 'yes', which lurches toward total consensus (all-yes or all-no) and then gets knocked back. A majority-driven opinion source distinct from the pairwise Deffuant model. Needs no input.

GamblersRuin [MOD] [FX] [SYNTH] in: – out: Audio

Gambler's-ruin source (a first as a synth block): a fortune that takes a coin-flip step up or down each turn between two walls - bankruptcy at the bottom, the jackpot at the top. The path is a pure random walk, but the moment it touches either wall the game restarts from the middle, so the output is a stream of random excursions: long meandering climbs and slides that always end in a sudden reset to centre. Rate sets the bet speed and Wall the playing-field size (wider walls = longer, rarer excursions). An absorbing-barrier walk distinct from the mean-reverting urns. Needs no input.

Gater [MOD] [FX] [SYNTH] in: Audio out: Audio

Step-sequenced tremolo gate that reads a per-step on/off pattern from a 16-bit mask, advancing through the steps on a sample-clock phase for tempo coherence. Rate sets the cycle frequency, Pattern is the bitmask of active steps, Steps sets how many steps are used, and Smooth softens the transitions between open and closed. Mix sets how deeply the gate cuts the signal, from subtle pulsing to full rhythmic chopping.

GaussMap [MOD] [FX] [SYNTH] in: – out: Audio

Gauss-map (mouse-map) source (a first as a synth block): iterates x <- exp(-Alpha x^2) + Beta, a bell-shaped map named for the Gaussian in it. Sweeping Beta marches it through a remarkable cascade - fixed points, period-doubling, and period-ADDING windows where the cycle length grows by one - drawing the 'mouse' shape in its bifurcation diagram. It free-runs at Rate, stepping the map and outputting x as a bipolar CV that ranges from steady to multi-step periodic to chaotic as Alpha and Beta move. A bell-curve map distinct from the parabolic logistic and tent maps.

Gingerbread [MOD][FX][SYNTH] in: – out: Audio

Gingerbreadman-map source (a first as a synth block): iterates the piecewise-linear chaotic map x <- 1 - y + |x|, y <- x - an area-preserving map whose orbits fill a strange six-sided 'gingerbread man' region of interleaved chaotic seas and stable islands. It free-runs at Rate, stepping the map and emitting x as a bipolar stepped CV that hops around the figure forever without repeating. Built from only an absolute value and a subtraction, it is a different, more angular chaos than the trig-based attractors.

Glide [MOD][FX][SYNTH] in: Pitch (CV), Gate out: Audio

Portamento: one-pole smooths the pitch/control signal at in0 toward each new value over Time, gated by in1. Time sets the glide duration in seconds (zero snaps instantly), and Mode chooses Always (glide on every note change) or Legato (snap on an isolated note, glide only between overlapping notes). Drop it between a note source and an oscillator for per-layer portamento.

Goodwin [MOD][FX][SYNTH] in: – out: Audio

Goodwin growth-cycle source (a first as a synth block): Richard Goodwin's model of the capitalist business cycle, which borrows the predator-prey equations from ecology - here EMPLOYMENT plays the prey and the WORKERS' WAGE SHARE the predator. High employment lets workers win higher wages, which squeezes profits and investment, which raises unemployment, which weakens wages, which restores profits, and round it goes. The output is the employment rate, cycling endlessly like a boom-and-bust. A class-struggle oscillation, integrated symplectically so the cycle never winds down, distinct from the biological predator-prey. Needs no input.

Grids [MOD][FX][SYNTH] in: – out: Audio

Topographic drum trigger generator (Mutable Instruments Grids): walks a 32-step groove map and fires a gate when the selected Voice's pattern density at the current step beats the Density threshold, so turning Density up adds hits and down thins them out. Map morphs the rhythm between two feels, Chaos sprays in random hits/drops, and Voice picks Kick, Snare or Hat (run three Grids off the same patch for a full kit). Self-clocks at Rate. Distinct from Euclid's evenly-spread Euclidean rhythms - these are curated grooves.

GumowskiMira [MOD][FX][SYNTH] in: – out: Audio

Gumowski-Mira attractor source (a first as a synth block): iterates a map built around the recursive nonlinearity f(x) = A*x + 2(1-A)$x^{2/(1+x2)}$), devised at CERN to model the chaotic drift of particles in an accelerator beam. It is famous for the astonishing variety of shapes it draws - rings, swirls, lattices and creatures - from tiny parameter changes. It free-runs at Rate, stepping the map and outputting x as a bipolar CV. A particle-physics attractor distinct from the trigonometric and quadratic maps. Needs no input.

Halvorsen [MOD][FX][SYNTH] in: – out: Audio

Halvorsen attractor (a first as a synth block): integrates the cyclically-symmetric system x' = -a*x - 4y - 4z - y^2 (and its x->y->z rotations), whose quadratic cross-terms wind the trajectory into a tight three-armed spiral knot. It free-runs at Rate, outputting x as a smooth bipolar CV that loops and lurches around the attractor's arms. A denser, more wound-up chaos than the open Lorenz butterfly, distinct from the trig-based Thomas. Internally 3 small Euler sub-steps keep the stiff dynamics stable.

Harmonograph [MOD] [FX] [SYNTH] in: – out: Audio

Harmonograph LFO (a first as a synth block): models the Victorian drawing machine where two pendulums swinging at slightly-detuned frequencies trace a slowly-evolving figure. It sums two sinusoids at the FreqA and FreqB harmonics with a tiny detuning, so the shape drifts and precesses cycle after cycle, never quite repeating - an organic, breathing modulation rather than a fixed loop. Rate sets the base speed, FreqA and FreqB the two pendulum rates. A quasi-periodic curve distinct from the exactly-repeating Rose and Spirograph.

HarmTremolo [MOD] [FX] [SYNTH] in: Audio out: Audio

Harmonic tremolo that splits the signal into low and high bands with a one-pole low-pass and amplitude-modulates them in opposition with a sine LFO, so as the lows swell the highs dip and back again. Rate sets the LFO speed, Depth sets the modulation intensity, Freq places the band split, and Mix sets dry/wet. The opposing band motion gives a richer, more vocal sweep than amplitude tremolo.

Hawkes [MOD] [FX] [SYNTH] in: – out: Audio

Self-exciting (Hawkes) trigger (a first as a synth block): a point process where every event briefly RAISES the chance of another - so triggers arrive in bursts and clusters rather than evenly, the model for earthquake aftershocks, neuron avalanches and viral cascades. Rate sets the background event rate, Excite how strongly each firing kicks the intensity up, and Decay how fast that excitement fades. With low Excite it behaves like a plain Poisson source; raise it and the output clumps into flurries of activity separated by lulls. The branching is kept sub-critical so it can never run away. Needs no input.

Henon [MOD] [FX] [SYNTH] in: Clock, Reset out: Audio

Henon-map chaos sequencer (a first as a synth block): iterates the classic 2-D strange-attractor map x' = 1 - Ax^2 + y, y' = Bx on every rising edge of the in0 clock, outputting x as a stepped CV that hops chaotically across the attractor. At the textbook A=1.4, B=0.3 it traces the famous folded Henon curve - deterministic yet never repeating, a sharper, more angular chaos than the smooth DoublePendulum or the logistic Chaos. A rising edge on in1 reseeds to the origin.

HindmarshRose [MOD] [FX] [SYNTH] in: – out: Audio

Hindmarsh-Rose bursting neuron (a first as a synth block): integrates a three-variable neuron model with a slow adaptation current that makes it BURST - it fires a rapid cluster of spikes, then falls quiet while the slow variable recovers, then bursts again, often chaotically so no two bursts match. This spike-then-rest-then-spike rhythm is exactly how many real neurons fire. The output is the membrane voltage: fast spiking riding on a slow up-and-down envelope. Rate sets the speed. A bursting chaos distinct from the steady spiking of FitzHugh-Nagumo and the smooth attractors.

Hopalong [MOD] [FX] [SYNTH] in: – out: Audio

Hopalong-map source (a first as a synth block): iterates Barry Martin's 'hopalong' map x <- y - sign(x)*sqrt(|x|), y <- A - x, which hurls the orbit back and forth across the origin, the point hopping along an intricate web of nested arcs and swirls. The square-root fold keeps it from running away while letting it explore a wide, lacy attractor. It free-runs at Rate, stepping the map and outputting x as a bipolar CV that leaps across the figure. An orbital, root-folded chaos distinct from the trigonometric and polynomial maps.

Ising [MOD] [FX] [SYNTH] in: – out: Audio

Ising-model magnetisation source (a first as a synth block): a 4x4 lattice of up/down spins evolves by the Metropolis rule - a spin flips if it lowers the energy, or randomly with a chance set by Temperature - the textbook model of a magnet. The output is the net magnetisation: cold, the spins align into one domain and it drifts toward +/-1; hot, they

tumble and it jitters around zero; near the critical temperature it swings in large, slow, self-similar fluctuations. A statistical-physics modulation source. Needs no input.

Julia [MOD] [FX] [SYNTH] in: – out: Audio

Julia-set source (a first as a synth block): iterates the complex map z <- z*z + c, the equation behind the Julia fractals - a point in the complex plane is squared and shifted again and again. For points inside the set it wanders forever in an intricate bounded orbit; when one escapes to infinity the source reseeds near the centre and sets off again, so the output is a restless, fractal-flavoured CV. CReal and CImag pick which Julia set (its shape and dynamics) to explore. It free-runs at Rate, outputting the real part. A complex-dynamics source unlike any real-valued chaos.

JustFriends [MOD] [FX] [SYNTH] in: – out: Audio

Manifold function generator (Mannequins Just Friends): one shape, six harmonically-related copies summed into a rich evolving wave. Time sets the base rate (slow LFO up to audio pitch); Intone spreads the six harmonics from a tight integer series toward stretched, detuned ratios; Curve bends every slope from a linear ramp toward a smooth sine; Level trims output. A function generator and harmonic oscillator in one - drones, organ-ish tones and undulating modulation. Distinct from the partial-summing Additive (pure sines, spectral tilt).

KeyTrack [MOD] [FX] [SYNTH] in: Note out: Audio

Keyboard-tracking mod source: turns the note pitch into a centered, scalable modulation - the classic filter keytrack. Patch the Note source into in0; the output is (note - Center) x Amount around the midpoint, so notes above Center push the modulation up and notes below push it down (Amount 1 = full 1:1 tracking across the keyboard, 0.5 = half, negative inverts). Patch the output into a filter cutoff (or any param) so the timbre follows the keyboard. Center sets the pivot note (0-127), Amount the bipolar tracking depth. Unlike the raw Note source this is centered and scalable, so the modulation is zero at the pivot.

Kirman [MOD] [FX] [SYNTH] in: – out: Audio

Kirman-herding source (a first as a synth block): Alan Kirman's 'ants' model of why crowds and markets swing between extremes - twelve agents each hold one of two views, and at each step one agent either switches by IMITATING a random other (herding) or changes its mind spontaneously. With strong herding the population does not settle in the middle but lurches as a herd, swinging to nearly all-one-way, lingering, then stampeding to the other - the bimodal switching behind fads, bank runs and market bubbles. The output is the fraction holding one view. Herd sets the imitation strength. A herding-instability source distinct from the consensus-seeking opinion models. Needs no input.

Kuramoto [MOD] [FX] [SYNTH] in: – out: Audio

Kuramoto synchronisation source (a first as a synth block): eight phase oscillators, each at its own natural frequency, are nudged toward each other by Coupling - the model of how fireflies, neurons and metronomes spontaneously fall into step. The output is their combined mean field: with low Coupling the eight detuned waves smear into a restless wobble, and as Coupling rises they lock into one coherent oscillation that swells in amplitude. Rate sets the centre frequency and Spread the detuning. A self-organising motion no LFO or noise source produces. Needs no input.

KuramotoRing [MOD] [FX] [SYNTH] in: – out: Audio

Kuramoto-ring source (a first as a synth block): sixteen phase oscillators arranged in a circle, each pulled toward the phase of its two NEIGHBOURS only (not the whole crowd as in the classic Kuramoto model). Local coupling lets waves of synchrony travel around the ring - bands of in-step oscillators sweeping past out-of-step ones, the metachronal waves seen in beating cilia and centipede legs. The output is one oscillator's value, beating as the synchrony waves roll by. Couple sets the pull toward neighbours. A spatially-coupled sync source distinct from the all-to-all chaos. Needs no input.

LambdaOmega [MOD] [FX] [SYNTH] in: – out: Audio

Lambda-omega medium source (a first as a synth block): a ring of sixteen cells each running a little rotational oscillator (the lambda-omega reaction-diffusion system, the normal form for any chemical or biological medium near the onset of oscillation), coupled by diffusion. The cells phase-lock into travelling and spiral waves - the spinning patterns of the Belousov-Zhabotinsky reaction and slime-mould aggregation. The output is one cell's concentration, oscillating as the spiral arms sweep past. A pattern-forming oscillatory medium distinct from the excitable Excitable and the single-cell oscillators. Needs no input.

Lemniscate [MOD] [FX] [SYNTH] in: – out: Audio

Lemniscate LFO (a first as a synth block): traces the figure-eight curve of Bernoulli (r-squared = cos(2*angle)) and outputs its sweep, which produces TWO smooth pulses per cycle separated by flat dead zones where the curve pinches to nothing at the crossing point. The result is a paired-pulse modulation - two lobes of motion, then rest, then two more - quite unlike a single sine swing. Rate sets the speed. A figure-eight LFO distinct from the single-loop curves.

Lengyel [MOD] [FX] [SYNTH] in: – out: Audio

Lengyel-Epstein chemical oscillator (a first as a synth block): the model of the CIMA reaction (chlorine-dioxide / iodine / malonic-acid), the experiment that first produced stationary Turing patterns in a real chemical and which, well stirred, oscillates in time instead. Two coupled concentrations chase each other into a stable limit cycle. Rate sets the speed and Feed the reactant supply. The output is the activator concentration. A pattern-forming chemistry distinct from the Brusselator and the biological oscillators.

Levy [MOD] [FX] [SYNTH] in: – out: Audio

Levy-flight modulation source (a first as a synth block): a random walk whose step sizes are drawn from a heavy-tailed (Cauchy) distribution, so it mostly creeps in tiny steps but every so often makes a sudden enormous leap across the range - the foraging pattern of albatrosses and the maths of anomalous diffusion. Step sets the typical jump scale and Rate how often it moves; the walk reflects off +/-1 to stay in range. Where a smoothed-noise LFO wanders gently, Levy lurks then pounces - clustered stillness punctuated by leaps. Needs no input.

LevyFlight [MOD] [FX] [SYNTH] in: – out: Audio

Levy-flight source (a first as a synth block): a random walk whose step sizes are drawn from a heavy-tailed Cauchy distribution, so most moves are tiny but every so often it takes a wild, far-reaching leap - the search pattern of foraging animals and the signature of anomalous, super-diffusive transport. The value mostly hovers, then teleports across the range and resumes. Jump scales the leaps; the rails wrap so a big jump reappears on the far side. A heavy-tailed flight distinct from the Gaussian random walk. Needs no input.

LFO [MOD] [FX] [SYNTH] in: – out: Audio

Low-frequency control generator with sine, triangle, saw and pulse shapes (Shape), free-running at Rate. Depth scales the swing, Bias offsets the centre, Phase shifts the start point, and Width sets the pulse duty cycle. Patch its output into any parameter's mod input for vibrato, tremolo, filter sweeps and rhythmic movement.

Lissajous [MOD] [FX] [SYNTH] in: – out: Audio

Lissajous LFO (a first as a synth block): multiplies two sinusoids whose frequencies are in the ratio RatioX:RatioY - the pair that, plotted against each other, trace the classic Lissajous figures on an oscilloscope. The product is a complex, symmetric modulation that beats and nulls as the two rates cross, its character set entirely by the integer ratio. Simple ratios give clean repeating shapes, larger ones dense interference. Rate sets the speed. A two-tone interference LFO distinct from the rolling-circle curves.

LogisticMap [MOD] [FX] [SYNTH] in: – out: Audio

Logistic-map chaos: the classic population-dynamics iterator x = Rx(1-x), stepped at Rate. As R climbs past ~3.57 the output period-doubles into full chaos, then snaps back to order in the periodic windows - a stepped, glitchy random source you can tune from steady to wild. Needs no input.

Lorenz84 [MOD] [FX] [SYNTH] in: – out: Audio

Lorenz-84 attractor (a first as a synth block): integrates Edward Lorenz's low-order model of the GLOBAL ATMOSPHERIC circulation, x' = -y^2 - z^2 - ax + aF, y' = xy - bxz - y + G, z' = bxy + xz - z, where x is the strength of the westerly wind current and y, z are a travelling weather wave. It chaotically switches between calm and stormy regimes, a toy climate that never repeats. It free-runs at Rate, outputting x as a smooth bipolar CV. A climate-model chaos distinct from the original Lorenz convection attractor.

LorenzLFO [MOD] [FX] [SYNTH] in: – out: Audio

Lorenz strange-attractor chaos modulator (Serum-style): integrates the Lorenz system and outputs one Axis (X/Y/Z), normalized and scaled by Depth. Produces smooth, organic, never-repeating motion - more flowing than stepped random. Great for evolving cutoff, pitch or pan drift.

LotkaVolterra [MOD] [FX] [SYNTH] in: – out: Audio

Lotka-Volterra predator-prey oscillator (a first as a synth block): the founding equations of mathematical ecology - prey x breed freely but are eaten by predators y, whose numbers in turn rise and fall on the food supply. The two populations chase each other in a perpetual cycle: prey boom, predators follow and crash them, then starve and let the prey boom again. Rate sets the speed and Growth the prey's breeding rate. The output is the prey population as a smooth 0..1 swell, integrated symplectically so the cycle never winds down. An ecological oscillation distinct from the neuron and chaos sources.

Lozi [MOD] [FX] [SYNTH] in: – out: Audio

Lozi-map source (a first as a synth block): iterates x <- 1 - A|x| + y, y <- Bx - the piecewise-linear cousin of the Henon map, with an absolute value where Henon has a square. That sharp corner gives it a strange attractor made of straight-line segments rather than smooth curves, and one of the few chaotic maps proven rigorously to be chaotic. It free-runs at Rate, stepping the map and outputting x as a bipolar CV. A sets the fold sharpness. An angular, provably-chaotic attractor distinct from the smooth Henon. Needs no input.

Lu [MOD] [FX] [SYNTH] in: – out: Audio

Lu (Lu-Chen) attractor (a first as a synth block): integrates x' = a(y-x), y' = -xz + cy, z' = xy - bz - the system that forms the missing BRIDGE between the Lorenz and Chen attractors, morphing continuously from one to the other as its parameter changes. Its double scroll sits between the two, with its own balance of slow orbiting and sudden lobe-switching. It free-runs at Rate, outputting x as a smooth bipolar CV. A transitional double-scroll chaos distinct from both Lorenz and Chen.

Marbles [MOD] [FX] [SYNTH] in: – out: Audio

Random voltage source with a loop lock (Mutable Instruments Marbles): on each internal Rate step it generates a new random value around Bias with a width set by Spread, but Deja Vu blends in replay of a stored loop - 1 = a locked, repeating random melody of Length steps, 0 = fresh randomness every step. A stepped CV source between pure chance and a fixed sequence; quantize the output for pitch. Distinct from Random (no loop memory) and Turing (binary shift register, not continuous CV).

Martin [MOD] [FX] [SYNTH] in: – out: Audio

Martin-map source (a first as a synth block): iterates the sine variant of Barry Martin's map x <- y - sin(x), y <- A - x, whose orbit hops across a broad, wavy lattice of interleaved bands rather than a compact attractor. The single sine fold gives a wide, drifting, quasi-tiled motion that roams far before folding back. It free-runs at Rate, outputting x as a bipolar CV. A wide-ranging, lattice-like chaos distinct from the compact Hopalong and the trig attractors.

Maths [MOD] [FX] [SYNTH] in: Trigger out: Audio

Function generator (Make Noise Maths / Buchla 281 / Serge DUSG): a rise/fall slope with shapeable curves. Rise and Fall set the up/down times; Curve bends them from logarithmic through linear to exponential. Mode: Cycle self-runs as a variable-shape LFO; Trig fires a one-shot AD envelope on a gate at in0; Gate rises while in0 is held and falls when released (AR). The CV building block behind envelopes, slope LFOs and generative Krell patches. Patch a Clock/Euclid into in0 to trigger it.

MIDI CC [MOD] [FX] [SYNTH] in: – out: Audio

MIDI continuous-controller mod source: outputs the live value (0..1) of MIDI CC number CC, so any hardware knob, fader, expression or breath controller becomes a modulation source - patch its output into any parameter's mod input. Smooth slews fast controller jumps, Depth scales the range and Bias offsets the centre. Common numbers: 1 mod wheel, 2 breath, 7 volume, 11 expression, 64 sustain, 74 brightness.

MooreSpiegel [MOD] [FX] [SYNTH] in: – out: Audio

Moore-Spiegel oscillator (a first as a synth block): integrates the jerk system x' = y, y' = z, z' = -z - (T - R + Rxx)y - Tx, devised to model the aperiodic flickering of a parcel of gas in a star's atmosphere (thermo-mechanical oscillations under radiation). The cubic stiffness term makes it burst between small and large oscillations chaotically. It free-runs at Rate, outputting x as a smooth bipolar CV. An astrophysical jerk-chaos distinct from the rotational and convective attractors.

Moran [MOD] [FX] [SYNTH] in: – out: Audio

Moran-process source (a first as a synth block): the model of random genetic drift in a fixed population - Balls individuals are each one of two types; at every step one is chosen to reproduce and one (at random) dies, so the share of each type wanders purely by chance. A trickle of Mutation flips the occasional offspring, which keeps the share from ever getting permanently stuck at all-one-type. The output is that share: an unbiased random walk on a population, the discrete cousin of neutral evolution. Rate sets the generation speed. Needs no input.

MSEG [MOD] [FX] [SYNTH] in: Audio out: Audio

Multi-segment envelope generator: a gate edge resets a phase that ramps from 0 to 1 over Rate seconds, and the output linearly interpolates between user-defined 'time,level' breakpoints parsed from the node config. Rate sets the total run time of the shape, Loop makes the phase wrap and repeat instead of holding the last level, Level scales the final output, and Sync (1/1..1/16T) locks the cycle length to host tempo instead of the free Rate seconds. Breakpoints come from a 't,l;t,l;…' config string (defaulting to a fast attack and gentle decay when fewer than two are given), giving a flexible Serum/Vital-style modulation source for arbitrary multi-stage curves.

MultiLFO [MOD] [FX] [SYNTH] in: – out: Audio

Multi-phase LFO: blends two sine waves a settable Phase apart into a single richer, evolving modulation shape - cross between a complex LFO and a quadrature pair. Rate sets the speed, Phase the offset (90 deg = quadrature), Depth the blend of the second phase. Needs no input.

NBody [MOD] [FX] [SYNTH] in: – out: Audio

Gravitational N-body source (a first as a synth block): three point masses pull on one another by Newton's inverse-square law inside a box with reflecting walls, tracing the famously unsolvable three-body motion - bodies swing past, sling-shot and tumble in an endless gravitational dance. Gravity sets the attraction strength and Rate the simulation speed; the output follows the first body's horizontal position. A softened-gravity, wall-bounded chaos with its own swooping character, distinct from the pendulum or the strange-attractor maps. Needs no input.

Newton [MOD] [FX] [SYNTH] in: – out: Audio

Newton-fractal source (a first as a synth block): runs Newton's root-finding method on the equation z^3 = 1 in the complex plane - z <- z - (z^3 - 1)/(3 z^2) - which always homes in on one of the three cube roots of unity, but WHICH one depends with fractal sensitivity on where it starts. The source iterates until it locks onto a root, then reseeds from a fresh random point, so the output jumps between the three roots' values with a swirling transient before each lock. It free-runs at Rate, outputting the real part. A root-finding chaos distinct from the squaring fractals.

NewtonLeipnik [MOD] [FX] [SYNTH] in: – out: Audio

Newton-Leipnik attractor (a first as a synth block): integrates a rigid-body rotation system (from the Euler equations of a tumbling object with feedback) that has the rare property of TWO coexisting strange attractors - depending on where it starts, the trajectory settles onto one of two different chaotic shapes. It free-runs at Rate, outputting x as a smooth bipolar CV that winds through a delicate folded-ribbon attractor. A two-attractor chaos distinct from the single-attractor Lorenz family.

NoseHoover [MOD] [FX] [SYNTH] in: – out: Audio

Nose-Hoover oscillator (a first as a synth block): integrates the thermostatted system x' = y, y' = -x + y*z, z' = a - y^2 - the equations a physicist uses to hold a simulated molecule at constant temperature, which famously refuse to settle and instead wander chaotically. Unlike the dissipative attractors it is volume-CONSERVING, so the trajectory never collapses onto a thin sheet but fills a fat tube of phase space, giving a fuller, more even chaotic motion. It free-runs at Rate, outputting x as a smooth bipolar CV. A conservative chaos distinct from the dissipative attractors.

Orbit [MOD] [FX] [SYNTH] in: – out: Audio

Kepler-orbit LFO (a first as a synth block): a body sweeps an elliptical orbit under gravity, so unlike a sine it lingers slowly at the far point (aphelion) then whips quickly through the near point (perihelion) - the asymmetric speed of a real planet, set by Eccentricity. It solves Kepler's equation each sample for the eccentric anomaly and outputs its cosine. At zero eccentricity it is a pure cosine; cranked up it becomes a lopsided swing that hangs and then lunges. Rate sets the orbital period. A gravitationally-shaped modulation curve, needs no input.

Ornstein [MOD] [FX] [SYNTH] in: – out: Audio

Ornstein-Uhlenbeck source (a first as a synth block): the mean-reverting random process - Brownian motion on a spring, which wanders randomly but is always pulled back toward its centre, so it drifts and meanders without ever running off the way a free random walk does. It is the standard model for a noisy voltage settling, a particle in a fluid, or an interest rate. Pull sets how strongly it springs back to centre (higher = tighter, faster wobble) and Depth the noise amount. A smooth, naturally-bounded random CV distinct from the target-hopping Drift and the free Levy flight. Needs no input.

OrnsteinUhlenbeck [MOD] [FX] [SYNTH] in: – out: Audio

Ornstein-Uhlenbeck source (a first as a synth block): a random walk on an elastic leash - noise kicks it around but a restoring pull always drags it back toward the centre, the textbook mean-reverting process used to model everything

from particle velocities to interest rates. The result is smooth, organic, band-limited drift (Brownian motion's well-behaved cousin) with no sharp jumps. Revert sets the strength of the pull, Sigma the noise. A mean-reverting drift distinct from the free random walk. Needs no input.

PathLFO [MOD][FX][SYNTH] in: – out: Audio

Drawable XY-path LFO: a Rate-driven phase traverses the loop of 2D waypoints set in node config and reads back one coordinate as a bipolar -1 to 1 output, scaled by Level. Rate sets the traversal speed, Axis chooses whether the X or Y coordinate drives the output, and Level scales the result. Pair two nodes set to X and Y on the same drawn path to modulate two targets in a coordinated 2D motion.

PeakPhaser [MOD][FX][SYNTH] in: Audio out: Audio

A 6-stage allpass phaser whose sweep is driven by a peak envelope follower on the input, so transients trigger the filter motion instead of an LFO. Soften sets the envelope release time, Feedback sets the allpass regeneration (up to 0.9), Amount scales how far each peak sweeps the phaser, and Mix blends wet against dry. Part of the Traktor Pulse family, it pumps the phaser in time with the signal's own dynamics.

Performer [MOD][FX][SYNTH] in: Audio out: Audio

Performer (Massive X-style step modulator): a tempo-synced step sequencer that runs a drawn pattern of up to 64 step levels (up to ~8 bars) locked to the host tempo. Draw the pattern in the step-bar editor; Sync sets the per-step note division (1/1..1/16T), Glide slews between steps (hard steps to a smooth contour), Level scales the output, and a gate on in0 restarts the pattern from step 1. Patch its output into cutoff, pitch, level or any mod input for long, evolving rhythmic movement that locks to the transport.

Perlin [MOD][FX][SYNTH] in: – out: Audio

Perlin-noise source (a first as a synth block): smooth coherent gradient noise - the organic, flowing randomness used to generate natural terrain, clouds and fire in computer graphics. Unlike white noise or a sample-and-hold (which jump instantly), Perlin noise glides: nearby moments are always close in value, so the output meanders gently and naturally with no abrupt steps, set by a quintic-smoothed lattice of random gradients. Rate sets how fast it drifts through the noise field. The natural-movement modulator, distinct from the white/pink NoiseLFO and the stepped Random.

PerlinLFO [MOD][FX][SYNTH] in: – out: Audio

Perlin-noise LFO: a smoothly-interpolated coherent-noise modulation source - organic, wandering movement with no audible steps, smoother than sample-and-hold and less regular than an LFO. Rate sets the speed, Smooth the curve, Depth the output. (no input)

PhaseLFO [MOD][FX][SYNTH] in: Reset out: Audio

Phase-offset LFO: a free-running sine LFO with an adjustable phase shift, resettable to zero on a rising edge of in0 - patch one clock into several PhaseLFOs at different Phase settings for quadrature or poly-rhythmic modulation from a single source. Rate sets the speed, Phase the offset (0..1 of a cycle), Depth the output level.

PhaseMod [MOD][FX][SYNTH] in: Carrier, Modulator out: Audio

FM / phase-modulation processor: phase-modulates the in0 carrier with the in1 modulator (stack any number of sources into either input) to make classic FM sidebands - the modular way to FM oscillators together without per-oscillator routing. Patch one oscillator into in0 and another into in1 for two-operator FM; stack more cables on in1 to FM with several sources at once. Index sets the modulation depth, Feedback routes the output back into the modulator for

harmonic edge toward noise, and Mix blends against the dry carrier. Distinct from the self-contained FM oscillator: this FMs whatever audio you feed it.

Phaser [MOD][FX][SYNTH] in: Audio out: Audio

All-pass cascade phaser: an LFO sweeps 2-8 all-pass stages (Stages) to move a series of notches through the spectrum, with Feedback sharpening their resonance. Depth sets the sweep range and Mix the dry/wet blend. More stages add more notches for a deeper, more vocal swirl.

Phoenix [MOD][FX][SYNTH] in: – out: Audio

Phoenix-set source (a first as a synth block): iterates z <- zz + c + pz_prev, a complex map with MEMORY - the next value depends not only on the current z but on the PREVIOUS one too, the extra feedback that grows the curling, bird-like Phoenix fractal. That one-step memory makes its bounded orbits curl and spiral more than a plain Julia set; escapes reseed near the centre. It free-runs at Rate, outputting the real part. A memory-fed complex map distinct from the memoryless Julia, Tricorn and Burning Ship.

Pickover [MOD][FX][SYNTH] in: – out: Audio

Pickover attractor source (a first as a synth block): iterates Clifford Pickover's 3-D map x <- sin(ay) - zcos(bx), y <- zsin(cx) - cos(dy), z <- sin(x), whose orbit is drawn into a delicate, three-dimensional thread-like sculpture of looping filaments. The z-coupling pulls the motion out of the plane, giving a richer wander than the 2-D maps. It free-runs at Rate, outputting x as a smooth bipolar CV. A 3-D threaded attractor distinct from the planar De Jong, Clifford and Svensson maps.

PLL [MOD][FX][SYNTH] in: Signal out: Audio

Phase-locked loop (Doepfer A-196): an internal square-wave VCO chases the frequency of the in0 input through an XOR phase comparator and a loop filter, locking onto it (or a multiple) - the lock is never perfect, so it warbles, glitches and screams in the classic PLL way. Base sets the VCO centre, Lock the loop tightness (low = sloppy, unstable, vocal; high = quick, tight tracking), and Range how far it can pull (octaves). Feed it audio or a clock for frequency multiplication, robot voices and chaotic tracking tones.

Poisson [MOD][FX][SYNTH] in: – out: Audio

Poisson-process trigger (a first as a synth block): fires a one-sample impulse at random, memoryless moments at an average Rate of events per second - the canonical model for radioactive decay clicks, photon arrivals or raindrops. The gaps between triggers follow an exponential distribution, so the pulses are genuinely random in time yet hold a steady long-run density. Patch it to gate or trigger anything that wants un-quantised, never-repeating randomness. Distinct from a regular Clock and from the Bernoulli gate (which only thins an existing clock). Needs no input.

PolyaUrn [MOD][FX][SYNTH] in: – out: Audio

Polya-urn source (a first as a synth block): the canonical 'rich get richer' process - an urn holds red and black balls; draw one at random, then put it back ALONG WITH another of the same colour, so every draw makes that colour likelier still. The proportion drifts and then locks onto a random value that is different every run (the path-dependent limit). Here the urn is periodically emptied and reseeded, so the output settles to one plateau, holds, then jumps and settles on a fresh one - a self-reinforcing sample-and-hold quite unlike uniform randomness. Rate sets the draw speed. Needs no input.

Qi [MOD][FX][SYNTH] in: – out: Audio

Qi-Chen four-wing attractor (a first as a synth block): integrates x' = a(y - x) + yz, y' = cx - y - xz, z' = xy - bz, a system famous for growing FOUR wings instead of the usual two, the trajectory hopping chaotically between all four lobes. The extra quadratic cross-terms give it very wide, energetic swings. It free-runs at Rate, outputting x as a smooth bipolar CV with large excursions. A four-wing chaos distinct from the two-wing Lorenz and Chen attractors.

QuadLFO [MOD] [FX] [SYNTH] in: – out: Audio

Quadrature LFO (Doepfer A-143-9): one rate, four phase-locked outputs 90 degrees apart. Each instance reads the shared transport clock, so several QuadLFOs at the same Rate stay phase-coherent and Phase (0/90/180/270) picks which quadrature tap this one outputs - patch four for circular/3D panning, stereo movement or evolving cross-modulation. Shape selects sine, triangle, saw or square. Distinct from the free-running LFO (no fixed phase relationship between instances).

Random [MOD] [FX] [SYNTH] in: – out: Audio

Self-contained random modulation source: latches a new random value at Rate (internal sample-and-hold of a noise source) with Smooth slewing between steps - from hard random steps to smooth wandering drift. Depth scales the swing and Bias offsets the centre. Needs no input; patch its output into any mod input for evolving, never-repeating movement.

RandomWalk [MOD] [FX] [SYNTH] in: – out: Audio

Random-walk source (a first as a synth block): the classic drunkard's walk - each step nudges the value by a random amount, so it wanders with no memory of where it has been, the very model of Brownian diffusion. It free-runs at Rate; reflecting walls at the rails keep it bouncing inside the range forever. Step sets how far each move can carry it. A memoryless diffusion distinct from the mean-pulled Ornstein-Uhlenbeck and the heavy-tailed Levy flight. Needs no input.

Ratchet [MOD] [FX] [SYNTH] in: Gate out: Audio

Ratchet / retrigger: while the in0 gate is high, replaces the held gate with a fast burst of Count sub-gates at the tempo-synced Rate - the classic 'stutter/roll' on a step. Count sets how many retriggers fire per gate, Rate the sub-division (1=1/1 .. 8=1/16T), and Width each sub-gate's length. Patch a clock or sequencer gate into in0 and the ratcheted gate out into an envelope for rolls and rhythmic fills.

Renewal [MOD] [FX] [SYNTH] in: – out: Audio

Regularised (Erlang renewal) trigger (a first as a synth block): a point process that is MORE evenly spaced than random - it fires only every Regularity-th pulse of a faster internal Poisson source, so the wait between outputs is an Erlang sum of exponentials. Rate sets the output event rate. At Regularity 1 it is plain Poisson (fully random); raise it and the triggers tighten toward a steady metronome while keeping a little jitter - the sub-Poisson, anti-clustering opposite of Hawkes. The natural model for a neuron's refractory firing or a heartbeat's near-regular rhythm. Needs no input.

Repressilator [MOD] [FX] [SYNTH] in: – out: Audio

Repressilator gene oscillator (a first as a synth block): the first synthetic gene circuit built to oscillate - three genes wired in a ring where each represses the next (A silences B, B silences C, C silences A), so no state is stable and the three protein levels cycle round in turn, a genetic clock engineered into living bacteria. Rate sets the speed and Strength the repression (raise it to deepen the swing). The output is the first protein's level. A synthetic-biology oscillation distinct from the metabolic and neural models.

Ridged [MOD] [FX] [SYNTH] in: – out: Audio

Ridged-multifractal source (a first as a synth block): a fractal noise that takes each octave's absolute value and inverts it (1 - |noise|), so the smooth valleys of fBm become sharp upward RIDGES - the technique that carves mountain crests, canyon walls and lightning veins in procedural terrain. The output rides high and crinkles into sudden creases instead of rolling smoothly. Rate sets the base speed and Octaves the detail. A ridged, peaky coherent-noise modulator distinct from the rounded fBm and Billow. Needs no input.

Rikitake [MOD] [FX] [SYNTH] in: – out: Audio

Rikitake-dynamo attractor (a first as a synth block): integrates the two-disc Rikitake dynamo x' = -mux + zy, y' = -muy + (z - a)x, z' = 1 - x*y - a model of the Earth's geomagnetic field built from two coupled current discs. Its chaos is the textbook explanation for why the planet's magnetic poles REVERSE at irregular intervals: the trajectory orbits one polarity for a while then flips to the other, unpredictably. It free-runs at Rate, outputting x as a smooth bipolar CV with long stretches in one sign broken by sudden reversals - a switching chaos distinct from the steadily-wandering attractors.

RingMod [MOD] [FX] [SYNTH] in: Audio, Carrier out: Audio

Ring and amplitude modulator that multiplies the input by a carrier on in 2 (plus Bias). Mode morphs from true ring modulation (bipolar carrier, inharmonic metallic sum/difference tones) to amplitude modulation (unipolar, keeps the original plus sidebands), and Amount sets dry/wet. An audio-rate carrier yields clangorous bell tones; a low-rate carrier becomes tremolo.

Rose [MOD] [FX] [SYNTH] in: – out: Audio

Rose-curve (rhodonea) LFO (a first as a synth block): traces the petal curve r = cos(Petals * angle) and outputs its horizontal sweep, a smooth modulation whose single cycle folds into a rosette of Petals lobes. The result is a repeating shape far richer than a sine - a flower of evenly-spaced swells and dips - whose symmetry is set directly by the petal count. Rate sets the speed. A geometric multi-lobe LFO distinct from the sine, ramp and random sources.

Rossler [MOD] [FX] [SYNTH] in: – out: Audio

Rossler-attractor chaos source (a first as a synth block): integrates the three Rossler equations dx=-y-z, dy=x+ay, dz=b+z(x-c) - a smooth deterministic-chaos system that traces a spiralling band with an occasional fold. The output is x as a slowly wandering CV: gentler and more periodic-looking than Lorenz, with long quasi-cycles broken by sudden excursions. Rate sets the integration speed. A continuous chaos with a different character from the angular Henon or the tumbling DoublePendulum; needs no input.

Rucklidge [MOD] [FX] [SYNTH] in: – out: Audio

Rucklidge attractor (a first as a synth block): integrates x' = -kx + ay - y*z, y' = x, z' = -z + y^2, a model of convection in a fluid layer subject to a magnetic field (double-diffusive convection). It produces a symmetric two-lobed attractor as the rolls of fluid reverse chaotically. It free-runs at Rate, outputting x as a smooth bipolar CV with broad excursions. A convective-magnetic chaos distinct from the rigid-body and reduced-Lorenz flows.

Rulkov [MOD] [FX] [SYNTH] in: – out: Audio

Rulkov-map neuron (a first as a synth block): a two-variable MAP (not a differential equation) that reproduces neuron spiking and bursting with just x' = Alpha/(1 + x^2) + y and a slow y - prized because it captures the rich firing of a real cell at a fraction of the cost. A fast x that spikes sits on a slow y that drifts it in and out of bursting, so raising Alpha moves it from silence through tonic spikes into chaotic bursts. It free-runs at Rate, stepping the map and outputting x as a bipolar CV. A discrete-map neuron distinct from the integrated Hindmarsh-Rose and FitzHugh-Nagumo models.

Rungler [MOD] [FX] [SYNTH] in: – out: Audio

Rungler (Rob Hordijk): a shift register clocked at Rate is fed a pseudo-random bit and its low bits are read out as a stepped, looping-but-evolving voltage staircase - the gurgling, semi-random heart of the Benjolin. Length sets the loop length / repeat character. Needs no input.

SampleHold [MOD] [FX] [SYNTH] in: Audio out: Audio

Clocked sample-and-hold that latches the input value at Rate and holds it until the next tick, producing stepped random or quantized control. Glide slews between steps for a smoother, portamento-like contour. Feed it noise for classic random sample-and-hold modulation, or an audio source to quantize it in time.

Scan [MOD] [FX] [SYNTH] in: A, B, C, D out: Audio

Scanning four-source mixer: a read position sweeps across in 1..in 4 and crossfades between adjacent sources, wrapping 4 back to 1 for a continuous loop. Pos sets the position by hand; Rate above zero auto-scans the position and loops it; Smooth rounds the crossfade from linear to an S-curve. Feed it four oscillators or signals and scan or automate to morph between them - the sequential companion to the bilinear Vector mixer.

Schelling [MOD] [FX] [SYNTH] in: – out: Audio

Schelling-segregation source (a first as a synth block): models twelve agents of two kinds on a ring; an agent is content only if enough of its neighbours are of its OWN kind, and a discontented one swaps places with a random other - Schelling's Nobel-winning demonstration that even a mild preference for similar neighbours drives a population into sharply segregated blocks. A little random relocation keeps it stirring. The output is the segregation index (how clumped the two kinds are), climbing as the blocks form. A self-sorting source distinct from the opinion models. Needs no input.

SEIR [MOD] [FX] [SYNTH] in: – out: Audio

SEIR epidemic source (a first as a synth block): the Susceptible-Exposed-Infected-Recovered model, which adds a LATENT period - the newly-infected are Exposed but not yet contagious for a while before they become Infectious, the more realistic model used for measles and COVID. That incubation delay slows and stretches the epidemic wave and makes its peaks lag behind the cause. The output is the infected fraction, a delayed rising-and-falling curve. R0 sets the contagiousness, Season the seasonal swing. A latent-period epidemic distinct from the instantaneous SIR. Needs no input.

SEIRS [MOD] [FX] [SYNTH] in: – out: Audio

SEIRS epidemic source (a first as a synth block): the full Susceptible-Exposed-Infected-Recovered-Susceptible cycle, combining BOTH a latent incubation period AND waning immunity - the most complete of the classic compartment models, used for endemic seasonal diseases. The exposed delay and the loss of immunity together produce rich, sustained, sometimes multi-year oscillation cycles in the infection level. The output is the infected fraction, oscillating with a layered rhythm. R0 sets the contagiousness, Season the seasonal forcing. The full-cycle epidemic distinct from the simpler SIR, SIRS and SEIR. Needs no input.

Selkov [MOD] [FX] [SYNTH] in: – out: Audio

Sel'kov glycolytic oscillator (a first as a synth block): the model of glycolysis - the pathway cells use to burn sugar - which does not proceed steadily but PULSES, the concentration of an intermediate rising and falling in a self-sustained rhythm (the glycolytic oscillations seen in yeast extract). Rate sets the speed and Feed the substrate supply. The output is the oscillating concentration. A metabolic oscillation distinct from the Brusselator chemistry and the neuron models.

ShimizuMorioka [MOD] [FX] [SYNTH] in: – out: Audio

Shimizu-Morioka attractor (a first as a synth block): integrates x' = y, y' = x - ay - xz, z' = -b*z + x^2, a simplified model of the Lorenz system near the onset of chaos. It shows a symmetric butterfly that is born through a sequence of bifurcations as the parameters change, a clean laboratory for studying how order gives way to chaos. It free-runs at Rate, outputting x as a smooth bipolar CV that flips between the two wings. A reduced-Lorenz chaos distinct from the full Lorenz attractor.

SideLFO [MOD] [FX] [SYNTH] in: – out: Audio

Sidechain-curve mod source: outputs the classic pump/duck envelope as a control signal (no audio through-path) so one ducking shape drives many destinations - patch it into a Mixer level, a reverb/delay send or a filter cutoff to sidechain them all to the same beat without a key signal. Rate sets the duck cycle in Hz (modulate or tempo-sync it to the kick), Depth how far the curve dips, Curve shapes the recovery ramp from snappy to gradual, and Bias offsets the output centre. Shares the Pump curve, exposed as CV instead of an inline gain.

SineMap [MOD] [FX] [SYNTH] in: – out: Audio

Sine-map source (a first as a synth block): iterates x <- Rsin(pix), the trigonometric twin of the logistic map - a single smooth hump that, as R approaches 1, period-doubles its way into chaos by the very same Feigenbaum route, which is why it is a favourite engine for chaotic encryption. It free-runs at Rate, stepping the map and outputting x as a 0..1 CV. R sets the position on the road to chaos: low and it settles, near 1 and it never repeats. A sinusoidal unimodal map distinct from the polynomial logistic. Needs no input.

SIR [MOD] [FX] [SYNTH] in: – out: Audio

SIR epidemic source (a first as a synth block): integrates the textbook Susceptible-Infected-Recovered model - the equations Kermack and McKendrick wrote in 1927 that underlie every epidemic forecast. A pathogen burns through the susceptible population in a wave that peaks and fades as the recovered build up herd immunity; births slowly refill the susceptible pool and a seasonal swing in contagion keeps the waves coming. The output is the infected fraction, a rising-and-falling epidemic curve. R0 sets the basic reproduction number (how contagious), Season the seasonal swing. A disease-dynamics source distinct from the chemical and predator-prey oscillators. Needs no input.

SIRS [MOD] [FX] [SYNTH] in: – out: Audio

SIRS epidemic source (a first as a synth block): the Susceptible-Infected-Recovered-Susceptible model, where immunity WANES - the recovered slowly become susceptible again and can be reinfected, so instead of a single epidemic the disease settles into recurring waves, the dynamics behind seasonal flu and the common cold. The output is the infected fraction, oscillating endlessly as immunity builds and fades. R0 sets the contagiousness, Season the seasonal forcing. A waning-immunity epidemic distinct from the one-shot SIR. Needs no input.

SIS [MOD] [FX] [SYNTH] in: – out: Audio

SIS epidemic source (a first as a synth block): the Susceptible-Infected-Susceptible model, where there is NO immunity at all - the infected recover straight back to susceptible and can immediately catch it again, the model for diseases like the common cold or many bacterial infections that confer no lasting protection. Above its threshold the disease never dies out but stays endemic at a high steady level, breathing up and down with the seasons. The output is the infected fraction, hovering high. R0 sets the contagiousness, Season the swing. A no-immunity epidemic distinct from the SIR and SIRS. Needs no input.

SkewLFO [MOD] [FX] [SYNTH] in: – out: Audio

Variable-skew LFO: a triangle whose rising/falling balance is continuously adjustable, morphing from a ramp-down through a symmetric triangle to a ramp-up - one knob covers saw, triangle and reverse-saw modulation shapes. Rate sets the speed, Skew the rise/fall ratio, Depth the output level.

Slew [MOD] [FX] [SYNTH] in: Audio out: Audio

Slew-rate limiter that caps how fast the signal can rise and fall, with independent Rise and Fall rates. Use it as portamento/glide on pitch CV, a smoother on stepped modulation, or a lag to de-zipper control changes. Asymmetric Rise/Fall gives simple envelope-like attack and decay shaping.

SmoothRandom [MOD] [FX] [SYNTH] in: – out: Audio

Smooth random modulation: latches a new random target at Rate and continuously glides toward it, for organic wandering motion with no steps. Depth scales the swing. The smooth cousin of a sample-and-hold random - free-running, needs no clock.

Spirograph [MOD] [FX] [SYNTH] in: – out: Audio

Spirograph (hypotrochoid) LFO (a first as a synth block): traces the looping curve a small circle draws as it rolls inside a larger one - the toy-spirograph pattern - and outputs its sweep, the sum of two circular motions whose speeds are set by Ratio. The result is an epicyclic LFO with a fast inner wobble riding on a slow outer swing, Depth balancing the two. A geometric two-rate modulation distinct from a plain sine or a synced pair. Rate sets the speed.

SprottB [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-B attractor (a first as a synth block): integrates x' = yz, y' = x - y, z' = 1 - xy, one of the algebraically SIMPLEST possible chaotic systems - J.C. Sprott found, by computer search, the minimal sets of terms that still produce chaos, and this is among them. Despite having only five terms it folds a genuine strange attractor. It free-runs at Rate, outputting x as a smooth bipolar CV. A minimal-form chaos distinct from the larger Lorenz and Chen systems. Needs no input.

SprottC [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-C attractor (a first as a synth block): integrates x' = yz, y' = x - y, z' = 1 - x^2, a sibling of the Sprott-B system with the cross-term xy swapped for the square x^2 - another of Sprott's minimal five-term chaotic flows. The small change reshapes the attractor into its own distinct double-lobed fold. It free-runs at Rate, outputting x as a smooth bipolar CV. A minimal quadratic chaos distinct from Sprott-B and the classical attractors. Needs no input.

SprottE [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-E attractor (a first as a synth block): integrates x' = y*z, y' = x^2 - y, z' = 1 - 4x, another of Sprott's algebraically-minimal chaotic systems, with a square nonlinearity in the y equation and a linear ramp in z. Its orbit winds through a compact, tightly-folded strange attractor. It free-runs at Rate, outputting x as a smooth bipolar CV. A minimal-form chaos distinct from the Sprott-B and Sprott-C variants. Needs no input.

SprottG [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-G attractor (a first as a synth block): integrates x' = 0.4x + z, y' = xz - y, z' = -x + y, a minimal chaotic flow with a small linear self-feedback that lets it spiral outward before the nonlinear term folds it back. Its attractor is a delicate scrolled spiral. It free-runs at Rate, outputting x as a smooth bipolar CV that winds and folds. A spiral minimal chaos distinct from the other Sprott systems. Needs no input.

SprottJ [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-J attractor (a first as a synth block): integrates x' = 2z, y' = -2y + z, z' = -x + y + y^2 - one of the 19 algebraically SIMPLEST chaotic flows that Julien Sprott found by computer search, each with the bare minimum of terms needed for chaos. Case J folds a single quadratic term into an otherwise linear system. It free-runs at Rate, outputting x as a smooth bipolar CV. A minimal-quadratic chaos distinct from the elaborate named attractors.

SprottK [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-K attractor (a first as a synth block): integrates x' = xy - z, y' = x - y, z' = x + 0.3z - another of Sprott's minimal chaotic systems, this one driven by the single product term x*y. Despite having only one nonlinearity it produces a fully chaotic orbit. It free-runs at Rate, outputting x as a smooth bipolar CV. A single-product chaos distinct from the other minimal Sprott cases.

SprottN [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-N attractor (a first as a synth block): integrates x' = -2y, y' = x + z^2, z' = 1 + y - 2z - a minimal chaotic flow whose only nonlinearity is the squared z term. It traces a folded sheet that the orbit wanders chaotically. It free-runs at Rate, outputting x as a smooth bipolar CV. A squared-term minimal chaos distinct from the product-driven Sprott cases.

SprottR [MOD] [FX] [SYNTH] in: – out: Audio

Sprott-R attractor (a first as a synth block): integrates x' = 0.9 - y, y' = 0.4 + z, z' = xy - z - a minimal chaotic system with constant forcing terms and a single product nonlinearity. The constants push the orbit steadily while the xy coupling folds it into chaos. It free-runs at Rate, outputting x as a smooth bipolar CV. A forced minimal chaos distinct from the unforced Sprott cases.

Stages [MOD] [FX] [SYNTH] in: Trigger out: Audio

Segment generator (Mutable Instruments Stages): builds a function from a chain of Segs segments, each ramping to a new level over Time. Shape morphs every segment from a hard step, through a linear ramp, to a smooth S-curve; Loop makes the chain cycle as an evolving LFO, or one-shot it from a gate at in0 as a complex envelope. The flexible CV building block between an envelope, an LFO and a slow sequencer. Distinct from the breakpoint MSEG.

Standard [MOD] [FX] [SYNTH] in: – out: Audio

Chirikov standard-map source (a first as a synth block): the kicked-rotor map p <- p + K*sin(theta), theta <- theta + p on a torus - the textbook model of Hamiltonian chaos and the onset of turbulence. Below the critical kick the motion is smooth and quasi-periodic; above it (raise K) the phase space dissolves into a chaotic sea. It free-runs at Rate, stepping the map and outputting sin(theta) as a bipolar CV - regular and rolling at low K, wildly scattered at high K. A momentum-kicked chaos distinct from the dissipative attractors.

StandardMap [MOD] [FX] [SYNTH] in: – out: Audio

Chirikov standard-map chaos: iterates the area-preserving kicked-rotor map (p += K*sin(theta); theta += p) at Rate. At low K the output is smooth and quasi-periodic; past K~1 it breaks into hard chaos - a tunable bridge from orderly to wild stepped modulation. Needs no input.

SteppedRandom [MOD] [FX] [SYNTH] in: Clock out: Audio

Stepped random (sample & hold): on each rising edge of the in0 clock it latches a new random voltage and holds it until the next clock - the hard-stepped random for melodic and rhythmic modulation. Range scales the swing.

Stepper [MOD][FX][SYNTH] in: – out: Audio

Tempo-synced step-sequencer modulator: steps through S1..S5 levels locked to the host tempo, with Glide smoothing the jumps from hard sample-and-hold steps to a slewed contour. Sync sets the per-step note division (1/1..1/16T), Steps how many levels are used, and Glide the slew time. Per-voice (each instance runs independently); patch it into cutoff, pitch or level for rhythmic, tempo-locked movement. Distinct from StepSeq, which free-runs in Hz with no glide or sync.

StepSeq [MOD][FX][SYNTH] in: – out: Audio

Step sequencer modulation source: cycles through up to 6 step levels (S1-S6) at Rate steps per second, outputting the held value of the current step. Use it as a rhythmic mod source for cutoff, pitch or level, or to chop gain into patterns. Modulate Rate to lock to tempo; see TranceGate for a simple on/off duty gate.

Superformula [MOD][FX][SYNTH] in: – out: Audio

Superformula LFO (a first as a synth block): Johan Gielis's single equation that draws a vast family of natural shapes - circles, polygons, stars, flowers, leaves - from just two knobs, by setting the radius from |cos(Symt/4)| and |sin(Symt/4)| raised to a power. Symmetry sets how many lobes (the polygon/star order) and Shape how sharp or rounded they are, so sweeping them MORPHS the LFO contour continuously from a smooth blob to a spiky star. The most shape-versatile single LFO, distinct from every fixed-curve source. Rate sets the speed.

Svensson [MOD][FX][SYNTH] in: – out: Audio

Svensson attractor source (a first as a synth block): iterates Johnny Svensson's map x <- Dsin(Ax) - sin(By), y <- Ccos(Ax) + cos(By), a sine-and-cosine attractor that draws tight rosette and starburst figures with sharp radial symmetry. The mix of large and small coefficients pulls the orbit into spiked petals quite unlike the woven webs of De Jong. It free-runs at Rate, stepping the map and outputting x as a bipolar CV. A radial-symmetry attractor distinct from the other trigonometric maps. Needs no input.

Swarm [MOD][FX][SYNTH] in: – out: Audio

Flocking modulation source (a first as a synth block): a swarm of six agents drift under boids rules - steering toward the flock centre (Cohesion), away from crowding neighbours (Separation), toward the average heading, plus a little wander - and the output is the swarm's collective centre as a slowly evolving, organic CV. Rate sets the motion speed. Unlike an LFO (a fixed shape) or the memoryless random of Marbles/Wogglebug, the swarm self-organises: it flocks, splits and regroups, moving smoothly but never repeating. Needs no input.

SwitcherLFO [MOD][FX][SYNTH] in: – out: Audio

Massive X morphing LFO: runs one phase at Rate through a bank of 8 bipolar shapes (sine, triangle, saw up/down, square, narrow pulse, s-curve, double sine), crossfading between adjacent shapes and mapping the result to a 0 to 1 output. Rate sets the cycle speed, Shape selects and morphs continuously across the bank, and Phase offsets the read position. Sweeping Shape gives a continuous waveform-morph modulator rather than a fixed LFO shape.

Telegraph [MOD][FX][SYNTH] in: – out: Audio

Random-telegraph-signal source (a first as a synth block): the dichotomous noise of physics - a two-level signal that flips between 0 and 1 at random (memoryless) moments, the model for a trapped electron blinking or a bistable circuit jittering. Rate sets the mean number of flips per second; because the wait between flips is exponentially distributed

the result is a random square wave with no fixed period, holding each level for an unpredictable time. A genuine stochastic gate, distinct from the random-but-clocked Sample-and-Hold sources. Needs no input.

TelegraphProcess [MOD] [FX] [SYNTH] in: – out: Audio

Random-telegraph source (a first as a synth block): a two-state signal that sits at one rail and then randomly flips to the other, the dichotomous noise that models a flickering switch, burst noise in electronics, and ion channels snapping open and shut. The hold times are exponentially distributed, so it is a stepped square wave with utterly unpredictable timing. Switch sets the flip probability per step (the average rate of jumps). A two-level jump process distinct from the continuous random walks. Needs no input.

Thomas [MOD] [FX] [SYNTH] in: – out: Audio

Thomas cyclically-symmetric attractor (a first as a synth block): integrates x' = sin(y) - b*x and its two cyclic rotations - a flow built entirely from sines, completely symmetric under swapping x->y->z. As the damping b is lowered the trajectory unwinds from a simple loop into a labyrinthine chaotic walk that drifts through space like a particle in a turbulent crystal lattice. It free-runs at Rate, outputting x as a smooth, gently-wandering bipolar CV. A trig-flow chaos distinct from the polynomial Lorenz or Chua systems.

ThreeScroll [MOD] [FX] [SYNTH] in: – out: Audio

Three-scroll attractor (a first as a synth block): integrates the Pan-Xu-Zhou system x' = a(y - x) + dxz, y' = cy - xz, z' = bz + xy - exx, a unified chaotic flow whose trajectory weaves through THREE separate scroll centres instead of the usual two, hopping between all three lobes. It free-runs at Rate, outputting x as a smooth bipolar CV with wide swings. A three-lobe chaos distinct from the two-wing Lorenz and four-wing Qi attractors.

ThruZero [MOD] [FX] [SYNTH] in: Audio out: Audio

Through-zero flanger: two delay taps sweep symmetrically about a short centre delay - one lengthening while the other shortens - so as the LFO crosses zero the taps pass through each other, producing the deep notch that sweeps all the way down to DC and momentarily cancels, the unmistakable tape-flanger 'through-zero' sound a normal flanger (with its fixed minimum delay) can't make. Rate sets the sweep speed, Depth the excursion, Feedback the resonance, and Mix the wet blend.

Tides [MOD] [FX] [SYNTH] in: – out: Audio

Tidal modulator (Mutable Instruments Tides): a slope source whose shape morphs continuously. Rate sets the speed (LFO into audio range); Slope skews the ramp from a fast-rise/slow-fall sawtooth through a symmetric triangle to slow-rise/fast-fall; Smooth rounds the contour from a sharp triangle toward a smooth sine swell. Use it as an evolving LFO, an envelope, or a raw oscillator. Distinct from the stepped MSEG and the fixed LFO shapes.

Tinkerbell [MOD] [FX] [SYNTH] in: – out: Audio

Tinkerbell-map source (a first as a synth block): iterates x <- x^2 - y^2 + Ax + By, y <- 2xy + Cx + Dy - a quadratic map of the plane whose orbit traces a comma-shaped fractal said to resemble Tinkerbell's flight path. Its mix of squaring and cross-coupling folds the trajectory into a tight curl with delicate internal banding. It free-runs at Rate, stepping the map and outputting x as a bipolar CV. A quadratic-plane attractor distinct from the trig-based De Jong and Clifford. Needs no input.

Toda [MOD] [FX] [SYNTH] in: – out: Audio

Toda-lattice source (a first as a synth block): a ring of sixteen masses joined by springs whose force grows EXPONENTIALLY with compression - the Toda lattice, one of the rare nonlinear systems that is exactly solvable and supports SOLITONS, lumps of energy that travel through the chain and pass through each other unchanged. Kick it and solitons circulate the ring forever, colliding and re-emerging. The output is one mass's momentum, kicking each time a soliton passes through. An integrable-soliton source distinct from the chaotic lattices. Needs no input.

TranceGate [MOD][FX][SYNTH] in: Audio out: Audio

Rhythmic hard gate: an LFO at Rate chops the signal on and off with a Duty cycle, smoothed by Smooth and scaled by Depth. Modulate Rate to lock it to tempo for the classic trance/EDM stutter. See StepSeq for arbitrary per-step patterns rather than a fixed duty.

Tremolo [MOD][FX][SYNTH] in: – out: Audio

Amplitude tremolo: an LFO at Rate modulates the signal level by Depth, switchable between a smooth sine and a choppy square (Shape). Classic for rhythmic volume pulsing, surf-guitar wobble and rotary-style throb. At full Depth with the square shape it becomes a hard on/off gate.

TriceraChorus [MOD][FX][SYNTH] in: Audio out: Audio

Tri-voice chorus with a micro-detune swirl: three LFO-modulated delay taps at spread phases plus a slow pitch-detuned voice for a rich animated widening.

Tricorn [MOD][FX][SYNTH] in: – out: Audio

Tricorn (Mandelbar) source (a first as a synth block): iterates z <- conj(z)^2 + c, the same squaring as a Julia set but on the CONJUGATE of z (flipping the sign of its imaginary part each step). That conjugation gives the fractal a three-cornered symmetry and makes its boundary fractal in a different way, so the bounded orbits twist with a distinctive three-fold pull; escapes reseed near the centre. CReal and CImag pick the region. It free-runs at Rate, outputting the real part. A conjugate complex map distinct from the Julia and Burning Ship sources.

Turing [MOD][FX][SYNTH] in: Clock out: Audio

Turing-machine sequencer (looping shift register): on each rising edge of the in0 clock it shifts an internal register of step values and feeds the end back to the front - but with probability set by Lock it injects a fresh random value instead, so Lock fully up gives a locked repeating loop, fully down a new random sequence each pass, and in between a slowly mutating pattern. Length sets the loop length (2-16 steps), Lock the lock/mutation amount, Range the CV span, and Quantize snaps each step to a chromatic grid. The classic generative Eurorack CV source - patch its output into an oscillator pitch or any mod input.

TZFlanger [MOD][FX][SYNTH] in: Audio out: Audio

Through-zero flanger that reads two short delay taps swept in opposite directions by a cosine LFO, so the offsets cross and produce a deep tape-style null. Rate sets the LFO speed, Depth scales the sweep range, Feedback (up to 0.95) regenerates one tap for sharper resonance, and Mix sets dry/wet. The counter-swept design gives the dramatic zero-crossing whoosh that fixed flangers cannot reach.

Undulator [MOD][FX][SYNTH] in: Audio out: Audio

Modulated short delay combined with an envelope swell and a tremolo running at twice the LFO rate for H3000-style undulation. Rate sets the LFO speed, Depth sets how far the delay time is swept for pitch-wobble and chorus, and Swell

controls the tremolo depth driven from a slow input follower. Mix blends the moving, detuned voice against the dry signal for shimmering, breathing modulation.

VanDerPol [MOD] [FX] [SYNTH] in: – out: Audio

Van-der-Pol relaxation oscillator (a first as a synth block): integrates x'' - Mu(1 - x^2)x' + x = 0, the classic self-sustaining oscillator from early radio valves and the heartbeat. Unlike a sine it has nonlinear damping that pumps energy in when the swing is small and bleeds it off when large, so it settles into a fixed-amplitude limit cycle. At low Mu it is nearly sinusoidal; raise Mu and it snaps into a sharp relaxation wave - slow charge, sudden flip - the sawtooth-like pulse of a blinking neon or a firing neuron. Rate sets the speed. A self-stabilising oscillator distinct from the chaotic attractors.

Vector [MOD] [FX] [SYNTH] in: A, B, C, D out: Audio

Bilinear XY vector mixer: blends four inputs across an X/Y plane (in 1/in 2 the top corners, in 3/in 4 the bottom), with X and Y setting the morph position. Classic vector synthesis (Prophet VS / Wavestation) - feed it four oscillators or sources and automate X/Y to morph between them.

Vibe [MOD] [FX] [SYNTH] in: Audio out: Audio

Photocell-style vibe that runs the signal through four staggered first-order all-pass stages whose coefficients are swept by a cosine LFO, each stage offset slightly to mimic mismatched optical cells. Rate sets the swirl speed, Depth scales how far the all-pass coefficients move, and Mix blends the phase-shifted output against the dry signal. The uneven staging gives the watery, throbbing swirl associated with classic vibe pedals.

Vicsek [MOD] [FX] [SYNTH] in: – out: Audio

Vicsek-flocking source (a first as a synth block): models twelve self-propelled particles on a ring, each steering its heading toward the AVERAGE direction of its neighbours plus a dash of random Noise - the minimal model of how birds flock, fish school and bacteria swarm. At low noise they all line up and move as one (high order); raise the noise past a critical point and the flock shatters into disorder. The output is the order parameter (how aligned the flock is), which hovers and flickers near the flocking transition. A collective-motion source distinct from the single-body chaos. Needs no input.

Voter [MOD] [FX] [SYNTH] in: – out: Audio

Voter-model consensus source (a first as a synth block): a 4x4 grid of cells each holding one of two opinions; each step a random cell simply copies a random neighbour, the simplest model of imitation, gossip and herd behaviour. Domains coarsen and fight along their borders until - on a finite grid - one opinion wins and the whole field falls into consensus, at which point it freezes. The output is the net opinion, a CV that wanders then locks. Unlike the Ising model there is no temperature, only blind copying. Needs no input.

Walk [MOD] [FX] [SYNTH] in: Clock out: Audio

Random walk (drunk): on each rising edge of the in0 clock the output takes a random step of up to +/- Step, bounded to 0..1 - a wandering melodic/modulation CV that meanders rather than jumping, the classic 'drunk' generator. Hold the clock high-rate for a smooth wander, slow for stepped motion.

WangSun [MOD] [FX] [SYNTH] in: – out: Audio

Wang-Sun attractor (a first as a synth block): integrates a four-term quadratic system x' = ax + cyz, y' = bx + dy - xz, z' = ez + fx*y with an unusual mix of small and large coefficients, one of the gallery of distinct chaotic flows

catalogued in the search for new attractor shapes. Its orbit folds into a lopsided, asymmetric scroll. It free-runs at Rate, outputting x as a smooth bipolar CV. A custom-coefficient chaos distinct from the named classical attractors.

WilsonCowan [MOD] [FX] [SYNTH] in: – out: Audio

Wilson-Cowan neural-mass oscillator (a first as a synth block): models a whole population of brain cells, not one neuron - a pool of excitatory cells E that drives itself and an inhibitory pool I that reins it back, each passed through a sigmoid firing curve. The push-pull between excitation and delayed inhibition makes the population activity oscillate, the mechanism behind brain rhythms like the alpha and gamma waves on an EEG. The output is the excitatory activity, a smooth 0..1 rhythmic swell. Rate sets the speed and Drive the background input. A network-level oscillation distinct from the single-cell neuron models.

Wogglebug [MOD] [FX] [SYNTH] in: – out: Audio

Source of uncertainty (Make Noise Wogglebug / Buchla 266): an irregular internal clock latches a new random value each tick; Smooth blends from hard stepped voltages toward a smoothly wandering output, and Woggle rings each step with a decaying sinusoid for the burbling Buchla character. A self-running random modulation source - no input needed. Distinct from Random (steady clock, no woggle) and Chaos/LorenzLFO (deterministic attractors).

Worley [MOD] [FX] [SYNTH] in: – out: Audio

Worley (cellular) noise source (a first as a synth block): scatters random feature points along the timeline and outputs the distance from the moving read-head to the NEAREST one - the cellular/Voronoi noise behind stone, scales, cracked mud and water-caustic textures. The value falls to zero each time the read-head passes a feature point and swells up in the gaps between them, giving a bumpy, organic ramp-and-dip motion quite unlike the smooth hills of Perlin. Rate sets how fast it travels between cells. A cellular coherent-noise modulator distinct from the gradient-noise family. Needs no input.

WowFlutter [MOD] [FX] [SYNTH] in: Audio out: Audio

Tape pitch instability emulated by a short delay line (centred near 5 ms) whose read time is modulated by two sine LFOs, a slow ~0.6 Hz wow and a fast ~7 Hz flutter, producing continuous pitch drift. Wow scales the slow drift depth and Flutter scales the fast wobble, while Mix blends the warped signal against the dry input. Use low amounts for subtle tape warmth and higher settings for seasick, detuned movement.

Yu [MOD] [FX] [SYNTH] in: – out: Audio

Yu-Wang attractor (a first as a synth block): integrates x' = a(y - x), y' = bx - cxz, z' = exp(xy) - d*z - unusual for its EXPONENTIAL term, which makes the z dynamics snap rather than curve. The orbit forms a tight two-scroll butterfly with sharp, fast reinjections. It free-runs at Rate, outputting x as a smooth bipolar CV. An exponential-nonlinearity chaos distinct from the purely polynomial attractors.

Oscillator (393)

Accordion [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Accordion voice: a gate on in0 sounds a stack of two or three slightly-detuned reed voices into the warm wheezy musette of an accordion or bandoneon. Freq sets the note, Musette the detuning between the reed banks (dry to wide wet musette), Tone the brightness, Level the output. Hold the gate to sustain; in1 is the Pitch CV.

AcidBass [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

TB-303 acid bassline voice: a single saw through a resonant 4-pole-style low-pass whose cutoff and amp share one decay envelope, so each note opens with the squelchy 'wow' and snaps shut. Slide glides the pitch between overlapping notes (303 portamento) and Accent boosts the envelope depth and level for the accented-step bite. Tune sets the pitch (in1 = Pitch CV), Cutoff the filter floor, Reso the squelch (high = self-oscillating scream), EnvMod how far the envelope opens the filter, Decay the note length, Accent the accent intensity, Slide the glide time, and Level the output. Distinct from Acido, which is the filter alone - this is the whole mono voice. Patch a per-step CV into the Accent mod input for classic accenting.

Additator [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Additive oscillator: sums up to Partials sine harmonics of the in1 pitch, with Tilt rolling off the upper partials (0 = bright/full spectrum, 1 = steep, near-sine) and Balance fading between the odd and even harmonics - organ-like and vocal timbres built straight from the harmonic series (the Bogaudio Additator concept).

Additive [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Additive oscillator that sums up to 16 sine partials (Partials) with a spectral Tilt: negative Tilt rolls off the upper harmonics for a soft, mellow tone, positive brightens toward a buzzy saw. Partials above Nyquist are skipped, so it stays alias-free. A clean, controllable harmonic source from pure sine to bright buzz.

Agogo [OSC] [FX] [SYNTH] in: Trigger out: Audio

Agogo bells: a pair of tuned metal bells (high and low) struck on the trigger, the bright Latin/samba percussion ping. Tune sets the pitch, Bell selects high vs low, Level the output. Trigger on in0.

AirHorn [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Reggae sound-system air horn: the 'BWAAAH' drop blast - two stacks of detuned saws a fixed Interval apart (the dancehall horn dyad) honking through a band-pass formant, with a pitch-up bend on the attack. The rewind / drop signal of dancehall, jungle, dubstep, trap and festival EDM. Tune sets the pitch (in1 = Pitch CV), Interval the second horn's offset in semitones (the dyad/cluster dissonance), Detune the beating spread per stack, Bend the attack pitch-rise, Tone the formant brightness, and Level the output. A gate on in0 sounds the blast; hold for the long rewind horn. Distinct from Siren, which sweeps its pitch - this is a fixed-pitch detuned dyad honk.

Alarm [OSC] [FX] [SYNTH] in: – out: Audio

Alarm - an insistent two-tone or pulsing siren for warnings and tension. Rate sets the pulse speed, Pitch the tone, Level the output.

Almglocken [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Almglocken (tuned cowbells): pitched alpine bells with a metallic, clanking attack between a cowbell and a bell, and a medium decay. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Angklung [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Angklung: shaken Indonesian bamboo tubes - a soft, woody pitched tone with the rattling buzz of the tubes knocking in their frame. Tune sets the pitch, Rattle the shake noise, Level the output. Trigger on in0, in1 = Pitch CV.

Anvil [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal anvil: a trigger on in0 strikes iron - a hard, bright, dense burst of high inharmonic metal partials with a fast attack and a ringing metallic clang, the blacksmith's hammer or industrial-percussion hit. Tune sets the pitch, Decay the ring, Ring the metallic richness, Level the output. Trigger from a Clock, Euclid or sequencer.

Applause [OSC][FX][SYNTH] in: – out: Audio

Applause - a dense shower of random claps with a soft noise wash. Intensity sets the clap density (from polite to thunderous ovation), Tone the brightness, Level the output.

AYChip [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

AY-3-8910 / YM2149 oscillator: a square plus a noise channel shaped by the chip's hardware sawtooth envelope - the classic ZX-Spectrum / Amstrad chiptune voice. Noise sets the noise mix, EnvRate the hardware-envelope speed, Level the output. in0 = Gate, in1 = Pitch CV.

Bagpipes [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Bagpipes: a constant droning reed under a buzzy chanter melody - the fixed low drone plus a pitched reed voice that never stops between notes. Drone sets the drone level, Reed the chanter buzz, Level the output. in0 = Gate, in1 = Pitch CV.

Balafon [OSC][FX][SYNTH] in: Trigger, Pitch CV out: Audio

Balafon: a struck wooden-bar xylophone over gourd resonators that add a characteristic membrane buzz - the bright, woody West-African mallet voice. Tune sets the pitch, Buzz the gourd rattle, Level the output. Trigger on in0, in1 = Pitch CV.

Basimilus [OSC][FX][SYNTH] in: Trigger, Pitch (CV) out: Audio

Harmonic percussion synth (Noise Engineering Basimilus Iteritas): a trigger on in0 fires a stack of six sine partials whose spacing morphs from harmonic toward inharmonic, run through a wavefolder and shaped by a fast percussive decay - the digital, metallic counterpart to the analog drum voices, good for kicks, snares, zaps and bells. Tune sets the fundamental, Harmonics the partial spread, Fold the wavefolder crunch, Decay the length, and Level the output. Gate it from a Clock, Euclid or sequencer.

Bassoon [OSC][FX][SYNTH] in: Breath, Pitch CV out: Audio

Bassoon: the woody, reedy low double-reed - a sawtooth through a low formant and a warm lowpass with reed buzz, played by holding in0 as breath. Reed sets the buzz, Breath the air, Level the output. in0 = Breath gate, in1 = Pitch CV.

BellFM [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Two-operator FM bell: a sine carrier is phase-modulated by a sine modulator running at a non-integer multiple of the carrier frequency, producing inharmonic metallic partials. Freq sets the carrier pitch, Ratio sets the modulator-to-carrier frequency ratio (typically fractional for bell tones), Index sets the modulation depth (brightness and partial spread), and Level scales the output. Higher Index and non-integer Ratio yield clangorous, bell-like timbres.

BellLead [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

FM bell lead: a bright, ringing two-operator FM bell tone playable as a lead - metallic, glassy and clear. Ratio sets the modulator interval, Bright the FM index, Level the output. in0 = Gate, in1 = Pitch CV.

Bendir [OSC] [FX] [SYNTH] in: Trigger out: Audio

Bendir: a North-African frame drum with gut snares stretched across the skin that add a buzzing rattle on every hit - a membrane tone under a snare-like buzz. Tune sets the pitch, Buzz the snare rattle, Level the output. Trigger on in0.

Benjolin [OSC] [FX] [SYNTH] in: – out: Audio

Benjolin (Rob Hordijk): a self-patched chaos voice - two cross-modulating triangle oscillators feeding a rungler shift register that feeds their pitch back, producing wild, generative, never-repeating drones and sequences from no input. Rate sets the base speed, Chaos the rungler feedback depth.

Berimbau [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal berimbau: a trigger on in0 strikes the steel string of the Brazilian musical bow - a bright metallic plucked tone (near-harmonic partials) with a gourd-resonated body and the buzz of the caxixi rattle, the hypnotic pulse of capoeira. Tune sets the string pitch (open/pressed via Pitch CV), Decay the ring, Buzz the rattle amount, Level the output. Trigger from a Clock, Euclid or sequencer.

Birds [OSC] [FX] [SYNTH] in: – out: Audio

Bird ambience: a bed of randomly-timed bird tweets - each a fast frequency-swept sine whistle (the chirp glide) at a scattered pitch - the dawn-chorus / forest / garden ambience of film sound design. Distinct from the Insects stridulation bed: birds are gliding whistles. Self-running. Density sets how often tweets fire, Pitch the whistle base frequency, Sweep the chirp glide depth, Variety the random pitch range between calls, and Level the output.

BlackHole [OSC] [FX] [SYNTH] in: – out: Audio

Black hole - a crushing sub-bass gravitational drone slowly bending downward into the abyss, with a faint event-horizon shimmer. Pull sets the intensity, Tone the shimmer, Level the output.

Blancmange [OSC] [FX] [SYNTH] in: – out: Audio

Blancmange (Takagi) oscillator (a first as a synth block): synthesises the blancmange curve - a fractal made by stacking ever-smaller TRIANGLE waves, each half the height and twice the rate of the last. Like the Weierstrass function it is continuous everywhere but jagged at every scale, yet its triangle (rather than cosine) building blocks give a softer, more granular roughness - a self-similar timbre that thickens as Detail adds layers. Detail sets how many triangle octaves to sum. A triangle-based fractal waveform distinct from the cosine-based Weierstrass. Needs no input.

Blaster [OSC] [FX] [SYNTH] in: Trigger out: Audio

Sci-fi blaster: a noisy, metallic energy-weapon shot - a fast pitch-swept tone mixed with ring-modulated noise and a short ringing tail. Tune sets the pitch, Grit the noise, Level the output. Trigger on in0.

Bleep [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Bleep-techno tone (Warp / Sheffield 'Sweet Exorcist' sound): a simple root-plus-fifth motif from sine-to-square waves with a hard on/off organ-style amp gate and an octave-down sub - the ultra-deep, dub-system bleep of early Warp techno. Tune sets the pitch (in1 = Pitch CV), Wave morphs sine toward square, Fifth sets the level of the +7-semitone partial (the signature root/5th bleep), Sub the octave-down sub-bass weight, and Level the output. A gate on in0 switches it on and off with organ snap - no slow attack or release.

BLITSaw [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Band-limited sawtooth built additively (summed harmonics up to Nyquist) so it stays alias-free even at high pitch - the clean, classic analog saw. Bright sets the harmonic count from mellow to razor-sharp.

Blizzard [OSC] [FX] [SYNTH] in: – out: Audio

Howling blizzard - storm-wind noise driven through a sweeping resonant peak that wails and gusts. Howl sets the wail depth, Tone the iciness, Level the output.

Blown [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Waveguide wind instrument (STK-clarinet): a bore delay line with a nonlinear reed reflection, driven by breath from the gate. The blown counterpart to Karplus-Strong.

BlownBottle [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Blown bottle (Helmholtz resonator): a breathy hoot from white-noise breath excited through a single sharp resonant peak at the pitch - the hollow, woody tone of blowing across a bottle. Tune sets the pitch, Breath the air drive, Level the output. in0 = Breath gate, in1 = Pitch CV.

Bodhran [OSC] [FX] [SYNTH] in: Trigger out: Audio

Bodhran: the Irish frame drum played with a tipper - a tunable low-mid membrane with a dry, woody skin tone and a short decay. Tune sets the pitch, Decay the length, Level the output. Trigger on in0.

Bonang [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Gamelan bonang: a bossed bronze kettle-gong with a clear, bright pitch over inharmonic partials and a medium shimmering decay - the melodic voice of the Indonesian gamelan. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Bongo [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal bongo: a trigger on in0 strikes a small tuned hand drum - a tight high-pitched membrane whose inharmonic modes (about 1 : 1.6 : 2.3) ring briefly with a quick downward pitch drop on the hit and a touch of finger-slap noise. Tune sets the head pitch (high or low bongo), Decay the short ring, Slap the attack-noise amount, Level the output. Trigger from a Clock, Euclid or sequencer.

Bowed [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Bowed-string waveguide (STK-bowed): two delay lines for the string halves with a stick-slip bow-table at the bow point, driven by the gate. Violin/cello family.

BowedBar [OSC] [FX] [SYNTH] in: Bow, Pitch CV out: Audio

Bowed metal bar / singing bowl: a sustained, shimmering inharmonic metal tone with a slow swell, played by holding in0 as bow pressure - the eerie, ringing bowed-vibraphone or Tibetan-bowl voice. Tune sets the pitch, Shimmer the beating, Level the output. in0 = Bow gate, in1 = Pitch CV.

BowedString [OSC] [FX] [SYNTH] in: Bow, Pitch CV out: Audio

Bowed string (violin / cello): a sawtooth Helmholtz motion with a slow bow attack, bow-noise scrape and a body resonance, expressively controlled by holding in0 as bow pressure. Tune sets the pitch, Bow the scrape amount, Level the output. in0 = Bow gate, in1 = Pitch CV.

Braaam [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Inception 'BRAAAM': the massive low brass blast that defined trailer scoring - a stack of detuned saws in octaves and a fifth (the brass cluster) over a deep sub sine, swelling in over a slow attack and driven through saturation for the menacing low-end roar. Tune sets the fundamental (in1 = Pitch CV), Swell the attack fade-in, Detune the cluster beating (the dread), Sub the deep sub-sine weight, Drive the saturation, and Level the output. A gate on in0 fires the blast; hold for the long swell.

Brass [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Synth brass (OB-X / Jupiter brass): two detuned saws through a resonant low-pass driven by a filter envelope - the cutoff snaps bright on the attack then drops to a mellower sustain, the timbral movement that makes a saw sound brassy. The eurodance / trance / funky-house brass stab and swell. Tune sets the pitch (in1 = Pitch CV), Detune the saw spread (thickness), Cutoff the base brightness, FiltEnv how far the attack opens the filter, Decay how fast the bright attack drops to the sustain, and Level the output. A gate on in0 plays the note (hold for the sustain).

BrassEnsemble [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Analog brass ensemble: five detuned sawtooths with a slow filter-swept attack and ensemble chorus, the bold, swelling ARP/Solina brass-section pad. Cutoff sets the brightness, Attack the swell time, Level the output. in0 = Gate, in1 = Pitch CV.

Breathing [OSC] [FX] [SYNTH] in: – out: Audio

Slow human breathing - filtered noise swelling brighter on the inhale and darker on the exhale. Rate sets the breath pace, Tone the airiness, Level the output.

BrownNoise [OSC] [FX] [SYNTH] in: – out: Audio

Brown/red noise - a deep -6 dB/oct rumble (integrated white noise), the heaviest of the noise colours for thunder, wind and sub texture. Tone opens the top, Level sets the output.

Bubbles [OSC] [FX] [SYNTH] in: – out: Audio

Underwater bubbles - random rising-pitch blips for a fish-tank or undersea texture. Rate sets the bubble density, Pitch the blip range, Level the output.

Buchla259 [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Complex oscillator (Buchla 259 / West Coast): a principal sine is frequency-modulated by a second oscillator and then run through a wavefolder, so one voice spans pure tones, metallic FM and bright folded harmonics with no subtractive filter. Ratio sets the modulator interval, FM the modulation depth, Fold the wavefold amount. in0 = Pitch CV.

ByteBeat [OSC] [FX] [SYNTH] in: – out: Audio

Bytebeat oscillator (a first as a synth block): the famous 'one-line music' - feed a running sample counter through a short expression of bit-shifts, ORs, ANDs and multiplies, keep the low 8 bits, and a whole chiptune-like texture falls out of pure integer arithmetic. The bitwise interference of the counter against its own shifted copies produces self-similar, glitchy, rhythmic patterns for free. Formula selects among classic bytebeat expressions and Speed sets the counter rate (its pitch and tempo). A bit-arithmetic waveform unlike any oscillator or sample. Needs no input.

Cabasa [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Cabasa: a trigger on in0 fires the steel-bead cabasa - a brighter, raspier, grittier rattle than the Shaker, with a sharp metallic-bead attack and a fast scrape-like decay. Tone shifts the bead brightness, Decay the rasp length, Level the output. Needs only a trigger.

Cajon [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal cajon: a trigger on in0 plays the box drum - a low wooden front-plate resonance (the bass 'thump' when struck in the centre) layered with a bright buzzing rattle of internal snare wires that rings on after the tone. Tune sets the box pitch, Decay the body, Snare the wire-buzz amount and brightness, Level the output. Trigger from a Clock, Euclid or sequencer.

Campfire [OSC] [FX] [SYNTH] in: – out: Audio

Crackling campfire - a warm noise bed punctuated by random spitting crackles and pops. Crackle sets the pop activity, Tone the brightness, Level the output.

CantorOsc [OSC] [FX] [SYNTH] in: – out: Audio

Cantor-spectrum oscillator (a first as a synth block): an additive tone that keeps harmonic k only when k written in base 3 contains NO digit 1 - the membership rule of the Cantor set, which leaves overtones at 2, 6, 8, 18, 20, 24… and removes the fundamental entirely. The result is a lacunary (gap-riddled) fractal spectrum, the audible cousin of the Cantor middle-thirds set, giving a pitched-but-rootless, metallic-hollow timbre with self-similar holes. Partials sets the highest harmonic considered. A fractal-set spectrum distinct from the other number-theoretic oscillators.

Carillon [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Carillon bell: a large struck tower bell with rich inharmonic partials and a long, humming decay - the deep, resonant cast-bronze voice. Tune sets the pitch, Decay the ring (several seconds), Level the output. Trigger on in0, in1 = Pitch CV.

CasioCZ [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Casio CZ-style phase-distortion oscillator: a sine whose phase is warped toward a resonant window, producing a sweepable formant peak. Mod sets the distortion depth and Res the resonant-peak harmonic - classic 80s digital reso without a filter.

Castanets [OSC] [FX] [SYNTH] in: Trigger out: Audio

Castanets: a sharp pair of wooden clicks - two fast highpassed noise bursts a few milliseconds apart, the flamenco hand-percussion snap. Tone sets the brightness, Decay the click length, Level the output. Trigger on in0.

CatalanOsc [OSC] [FX] [SYNTH] in: – out: Audio

Catalan-number oscillator (a first as a synth block): an additive tone whose overtones land on the Catalan numbers - the 1st, 2nd, 5th, 14th, 42nd… harmonics. Because the Catalan numbers explode almost as fast as 4^n, only a few partials fit below Nyquist and they are spaced ever further apart, so the tone is nearly a pure sine with two or three widely-separated, ringing upper partials - a strikingly sparse, bell-clear spectrum. Partials sets how many Catalan overtones to attempt, alias-free up to Nyquist. A combinatorial spectrum distinct from the other number-theoretic oscillators. Needs no input.

ChaosOsc [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Audio-rate chaotic oscillator built on the logistic map blended with a sine carrier: Chaos pushes it from a clean tone into noisy, glitchy, semi-pitched textures, and Tone tames the top end. A digital-noise sound source.

Cheby [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Chebyshev waveshaping oscillator: a sine is shaped by a Chebyshev polynomial so Order directly selects which harmonic dominates, and Drive blends from pure sine to the full harmonic. Precise additive-style timbres with one knob.

Chip [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Chiptune / 8-bit lead (NES-style): a pulse wave at a selectable duty cycle, quantized down to the lo-fi console DAC crunch, with the classic fast 'arpeggio' that machine-guns the pitch between chord tones to fake a chord on a single channel - the happy-hardcore / 8-bit-rave lead. Tune sets the pitch (in0 = Pitch CV), Duty the pulse width (0 = thin 12.5 percent .. 1 = 50 percent square), Arp the arpeggio speed in Hz (0 = off; when on it fakes a major chord), Vibrato the pitch wobble, and Level the output.

ChipOsc [OSC][FX][SYNTH] in: Pitch CV out: Audio

Chiptune pulse oscillator (NES / Game Boy voice): a square with four selectable duty cycles - 12.5%, 25%, 50%, 75% - for the classic 8-bit pulse timbres, from thin and reedy to full and hollow. Duty steps through the four widths, Level scales the output. in0 = Pitch CV.

Chirp [OSC][FX][SYNTH] in: Trigger, Pitch out: Audio

Chirp / sweep oscillator: a trigger on in0 sweeps the pitch from the base Freq up (or down) by Range octaves over Time, then holds - the rising 'pew' zap and falling laser drop. in1 transposes the base pitch. A one-shot frequency sweep, not the continuous Generative walk.

ChoirPad [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Choir 'aah' pad: a lush vocal ensemble - several detuned voices through an open vowel formant with a gentle vibrato, the synth-choir pad. Vowel morphs the vowel, Width the detune, Level the output. in0 = Gate, in1 = Pitch CV.

Cicadas [OSC][FX][SYNTH] in: – out: Audio

Cicada drone - the dense, buzzing, amplitude-pulsing wall of a summer afternoon. Buzz sets the rasp rate, Pitch the brightness, Level the output.

Clap [OSC][FX][SYNTH] in: Trigger out: Audio

Analog hand-clap: a trigger on in0 fires band-passed noise shaped by a multi-burst envelope - three quick retriggers then a diffuse tail - the characteristic 909 clap. Tone sets the band-pass colour, Spread the gap between the bursts, Decay the tail length, and Level the output.

Clap707 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-707 hand clap: three rapid noise bursts plus a short bright tail through a highpass - tighter and crisper than the 808 clap, the 707's house clap. Tone sets the brightness, Decay the tail, Level the output. Trigger on in0.

Clap808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 hand clap: a trigger fires three rapid bursts of bandpassed noise followed by a longer diffuse tail - the stacked-hands attack and room ring of the iconic 808 clap. Tone sets the noise colour, Decay the tail length, Level the output. Trigger on in0.

Clap909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

Handclap: a trigger on in0 fires three quick bursts of band-passed noise (the multiple hands) followed by a longer diffuse tail - the classic drum-machine clap. Spread sets the gap between bursts, Decay the tail length, Tone the noise colour, Level the output.

Clarinet [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Clarinet: a closed-pipe reed voice with only odd harmonics (a softened square through a woody lowpass) plus breath noise, played by holding in0 as breath. The hollow, reedy clarinet timbre. Tune sets the pitch, Breath the air noise, Level the output. in0 = Breath gate, in1 = Pitch CV.

Clav [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Clavinet (Hohner D6): a Karplus-Strong plucked string struck by a gate, run through a pickup comb filter that notches the spectrum - the bright, percussive, slap-funk voice of funk, disco, French house and funky house. A rubber-tip excitation burst fills the string, the feedback loop rings at the pitch, and the comb pickup gives the signature hollow bite. Tune sets the pitch (in1 = Pitch CV), Decay the string sustain, Bright the string damping and attack brightness, Pickup the comb depth (the clav twang), and Level the output. A gate on in0 plucks it; play it staccato.

Clave [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal clave / woodblock: a trigger on in0 strikes a solid piece of wood - two tight high resonant modes (about 1 : 1.5) that ring for only a few milliseconds, the bright dry 'tok' that cuts through any mix. Tune sets the pitch (clave up high, woodblock lower), Decay the very short ring, Level the output. No pitch bend, no body - just wood. Trigger from a Clock, Euclid or sequencer.

Clave808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 clave / rimshot click: a single high resonant sine ping with a very fast decay - the dry, sharp woodblock 'tick' that cuts through a mix. Tune sets the pitch, Decay the click length, Level the output. Trigger on in0.

Clavinet [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Clavinet: a hammered string struck against a metal anvil - a bright, percussive Karplus-Strong pluck with a sharp funky attack, the Hohner D6 wah-bait. Bright sets the string brilliance, Decay the damping, Level the output. Trigger on in0, in1 = Pitch CV.

Clavioline [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Clavioline: the 1947 valve monosynth (the riff on the Tornados' 'Telstar') - a buzzy reed-organ square with octave-thick harmonics and a slight vibrato. Buzz sets the harmonic edge, Vibrato the wobble, Level the output. in0 = Gate, in1 = Pitch CV.

ClockTick [OSC] [FX] [SYNTH] in: – out: Audio

Clock - a steady tick-tock with two alternating click pitches, the metronome/grandfather-clock pulse. Rate sets the tempo, Tone the click character, Level the output.

Coin [OSC] [FX] [SYNTH] in: – out: Audio

Arcade coin pickup - the classic two-note 'bling' reward chime, auto-repeating. Rate sets the repeat interval, Pitch the note, Level the output.

ColorNoise [OSC] [FX] [SYNTH] in: – out: Audio

Noise generator producing white, pink or brown noise from an xorshift source filtered to taste. Color selects the spectrum: flat white, a one-pole pink-tilted blend, or a heavily integrated brown noise with a steeper low-frequency emphasis. Level sets the output amplitude, making it a self-running source for textures, test signals or modulation.

ComplexOsc [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Complex oscillator (Make Noise DPO / Buchla 259): a modulation oscillator thru-zero-FMs a primary oscillator, whose output is then run through a sine wavefolder for rich, evolving harmonics. Freq sets the primary pitch, Ratio the modulator's frequency relative to it, FM the thru-zero modulation depth (inharmonic clang at high settings), and Fold the wavefolder drive (adds bright folded harmonics). One voice spanning clean tones to metallic, animated timbres. Distinct from the separate ThruZero and Wavefolder blocks.

Conga [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal conga: a trigger on in0 strikes a tall hand drum - a deeper, woodier membrane than the Bongo, with modes near 1 : 1.6 : 2.2, a longer open ring and a pronounced pitch drop. Tune sets the head pitch, Decay the ring length, Tone moves from an open tone toward a tighter heel-slap, Level the output. Trigger from a Clock, Euclid or sequencer.

Conga808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 conga: a tuned, resonant sine drum with a short pitch drop and medium decay - the round, woody 808 conga/tom voice used for melodic fills. Tune sets the pitch, Decay the length, Level the output. Trigger on in0.

Cowbell [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Analog cowbell (808-style): a trigger on in0 fires two detuned pulse oscillators a fixed ratio apart, band-passed and shaped by a short percussive decay for the classic metallic clank. Tune sets the lower oscillator, Detune the ratio of the upper one (the cowbell interval), Decay the ring length, and Level the output. Patch a Clock, Euclid or sequencer gate into in0.

Cowbell808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 cowbell: a trigger on in0 fires the two-square-oscillator 'clonk' (640 Hz + 800 Hz) through a bandpass with a medium decay - the unmistakable 808 cowbell. Tune scales the pitch, Decay the length, Level the output.

CR78Hat [OSC] [FX] [SYNTH] in: Trigger out: Audio

Roland CR-78 hi-hat: the lo-fi metallic hat of the CompuRhythm - a thin cluster of detuned squares mixed with noise through a sharp highpass, with a fast decay. Tone sets the brightness, Decay the length, Level the output. Trigger on in0.

Crackle [OSC] [FX] [SYNTH] in: – out: Audio

Vinyl/dust crackle generator - random filtered pops and ticks for lo-fi, vinyl and analog-warmth textures. Density sets how busy the crackle is, Tone the pop brightness.

Crash808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 crash cymbal: a long, splashy wash of six inharmonic squares plus noise through a highpass, decaying over a second - the 808's big accent cymbal. Tone sets the brightness, Decay the wash length, Level the output. Trigger on in0.

Crash909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

Crash cymbal: a long, bright wash of inharmonic squares plus white noise through a highpass, decaying over a second or more - the splashy crash for accents and builds. Tone sets the brightness, Decay the wash length, Level the output. Trigger on in0.

Creature [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Monster / creature roar: a vocal-cord source (saw plus a sub-octave for size) roughened by a vocal-fry flutter, shaped by a sweeping formant band-pass (the vowel of the roar) and driven through distortion - the layered beast vocalization of film and game sound design. Tune sets the pitch (in1 = Pitch CV), Growl the vocal-fry roughness (the guttural rasp), Formant the vowel centre, Size the sub-octave weight and how big the creature reads, Drive the aggression, and Level the output. A gate on in0 sounds the roar with a pitch-up attack. Distinct from the musical Growl bass - this is an organic vocalization.

Crickets [OSC] [FX] [SYNTH] in: – out: Audio

Night crickets - rhythmic high chirps over a faint air bed for an evening/forest ambience. Rate sets the chirp tempo, Pitch the chirp frequency, Level the output.

Crotales [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Crotales (antique cymbals): small tuned bronze discs with a bright, high, shimmering inharmonic ring and a very long decay - the sparkling orchestral bell-cymbal. Tune sets the pitch, Decay the shimmer, Level the output. Trigger on in0, in1 = Pitch CV.

Crowd [OSC] [FX] [SYNTH] in: – out: Audio

Crowd murmur - band-passed noise with a slow random swell for the ambient hubbub of a room or stadium. Energy sets the activity, Tone the brightness, Level the output.

Cuica [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal cuica: a trigger on in0 plays the Brazilian friction drum - a resonant tone whose pitch swoops up or down as a wet thumb drags the internal stick, the squeaking, talking, almost human voice of a samba bateria. Tune sets the base pitch, Decay the ring, Glide the direction and depth of the pitch swoop (bipolar), Level the output. Trigger from a Clock, Euclid or sequencer; modulate Glide for talking lines.

Cymbal [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Analog cymbal (808-style metal): a trigger on in0 fires six square oscillators tuned to a fixed inharmonic ratio set, summed and high-passed, with a fast onset plus a long metallic tail. Distinct from the Hat (which filters noise) - this is the additive square-oscillator method for ride/crash timbres. Tune sets the base frequency of the cluster, Decay the tail length, Tone the high-pass brightness, and Level the output. Patch a Clock, Euclid or sequencer gate into in0; patch a Note source into in1 to keytrack the cluster.

Cymbal808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808-style cymbal/crash: like the 808 hat but with six inharmonic square oscillators ringing through a long, shimmering, slowly-decaying highpassed tail. Tone sets the brightness, Decay the (long) ring length, Level the output.

Darbuka [OSC] [FX] [SYNTH] in: Trigger out: Audio

Darbuka / goblet drum: the sharp Middle-Eastern hand drum with a deep ‘dum’ at the centre and a crisp ‘tek’ at the rim - Rim morphs from the low boom to the bright edge slap. Tune sets the pitch, Rim the dum-to-tek balance, Level the output. Trigger on in0.

Devil [OSC] [FX] [SYNTH] in: – out: Audio

Devil’s-staircase oscillator (a first as a synth block): synthesises the Cantor function - the ‘devil’s staircase’ that climbs from 0 to 1 entirely on the Cantor set, staying perfectly FLAT across every gap yet still rising overall, with no jumps. As a repeating waveform it is a fractal ramp: a sawtooth assembled from infinitely many flat plateaus and self-similar steps, a singular curve whose spectrum is unlike any band-limited ramp. A monotone fractal staircase distinct from the jagged Weierstrass and Blancmange. Needs no input.

Dholak [OSC] [FX] [SYNTH] in: Trigger out: Audio

Dholak: the two-headed Indian/folk hand drum - a low bass head and a higher treble head struck together, with a warm, woody tone. Tune sets the pitch, Treble the high-head mix, Level the output. Trigger on in0.

Didgeridoo [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Didgeridoo voice: a gate on in0 drones a deep buzzing tone whose overtones swell and fade under a slow wah-like formant sweep, the circular-breathing rhythm of the instrument. Freq sets the drone pitch (very low), Wobble the speed and depth of the formant sweep, Tone the overall brightness, Level the output. Hold the gate to drone; in1 is the Pitch CV.

DiodeOsc [OSC] [FX] [SYNTH] in: Pitch (CV), FM out: Audio

Diode-shaped oscillator: a sawtooth core pushed through an exponential diode curve, going from a soft sine-ish tone to a bright, brassy, slightly-clipped buzz as Shape rises - the warm, organic waveshape of West Coast and vintage analog timbres. in1 = Pitch CV.

Djembe [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal djembe: a trigger on in0 strikes a West-African goblet drum - a deep resonant bass membrane (modes near 1 : 1.5 : 2.1) with a sharp bright finger-slap on top, so it spans from a booming bass tone to a cracking slap. Tune sets the head pitch, Decay the ring, Slap the bright attack-noise amount, Level the output. Trigger from a Clock, Euclid or sequencer.

DMXKick [OSC] [FX] [SYNTH] in: Trigger out: Audio

Oberheim DMX kick: a punchy, tight sampled-style bass drum with a fast pitch sweep and a short, controlled decay - the classic 80s electro/hip-hop kick. Tune sets the pitch, Decay the length, Level the output. Trigger on in0.

Donk [OSC] [FX] [SYNTH] in: Trigger out: Audio

Scouse-house donk: a trigger on in0 fires a short resonant blip with a fast downward pitch snap through a sharp band-pass - the hollow 'donk' bounce of UK bounce / donk house. Tune sets the blip pitch, Snap the pitch-drop speed (the bounce), Reso the band-pass sharpness (how hollow and ringing), Decay the blip length, and Level the output.

DonkBass [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Donk bass: the bouncy, hard-plucked UK bassline 'donk' - a short pitched pluck pinged through a high-resonance filter for the rubbery, popping attack. Decay sets the bounce, Reso the donk, Level the output. in0 = Gate, in1 = Pitch CV.

Doorbell [OSC] [FX] [SYNTH] in: - out: Audio

Doorbell - the classic two-note 'ding-dong' chime with a metallic ring, auto-repeating. Rate sets the interval, Pitch the chime, Level the output.

Downlifter [OSC] [FX] [SYNTH] in: Trigger out: Audio

Down-sweep transition: a trigger on in0 fires a descending sweep that falls over Time seconds - the post-drop 'whoosh down'. A pitch-falling sine and band-passed noise slide from bright/high to dark/low while the level decays, marking the move into a breakdown. Time sets the fall length, Tone balances the noise against the falling sine, Reso the band-pass sharpness, and Level the output. The inverse of Riser - patch a transition gate into in0.

DR110 [OSC] [FX] [SYNTH] in: Trigger out: Audio

Boss DR-110 kick: a tight, dry analog bass drum with a short pitch blip and a clicky attack - the small, punchy Dr Rhythm kick. Tune sets the pitch, Click the attack snap, Level the output. Trigger on in0.

Drawbar [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Nine-drawbar tonewheel organ oscillator: stacks the classic Hammond harmonics (sub, fifth, octaves, third, etc.). Tilt rolls the registration from foundation-heavy to bright upper partials and Click adds the key-on percussion transient.

DroneOsc [OSC][FX][SYNTH] in: Pitch (CV), FM out: Audio

The most powerful drone generator in existence. Up to 16 morphable voices (sine through saw to PWM pulse) detuned and stacked into octaves, fifths or chords; a two-octave sub stack for deep weight; an octave-plus-fifth shimmer chord on top; a filtered air-noise layer; chaotic Lorenz-attractor drift for organic never-repeating motion; a wavefolder-plus-saturation Drive stage for enormous harmonic content; and a Motion-driven resonant low-pass that breathes. Free-runs at Freq as a standalone drone, or tracks the keyboard via a Note (Pitch CV) on in0; in1 adds to the tone. Twelve controls: Voices, Detune, Sub, Shimmer, Stack, Drift, Tone, Shape (waveform morph), Drive (harmonic fold and saturate), Motion (chaotic movement) and Air. The cinematic, doom, ambient and sound-design powerhouse.

Duduk [OSC][FX][SYNTH] in: Gate, Pitch (CV) out: Audio

Armenian duduk (Gladiator / Dune cinematic wind): a cylindrical double-reed voice - odd-harmonic dominant like a cor anglais, warm and woody and mournful - with breath noise and an expressive delayed vibrato, the soul-instrument used for grief and longing in film scores. Tune sets the pitch (in1 = Pitch CV), Breath the airy reed noise, Vibrato the expressive pitch waver (it swells in as the note is held), Tone the brightness, and Level the output. A gate on in0 sounds the note with a soft reed attack; hold for the long mournful sustain.

DuffingOsc [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Duffing chaotic oscillator: a driven nonlinear spring that ranges from a pure pitched tone to wild bifurcating chaos. Chaos sets the drive into instability and Damp reins it back - an organic, unpredictable analog-style source.

DustOsc [OSC][FX][SYNTH] in: – out: Audio

Dust - randomly-timed unipolar impulses (a stochastic click source). Density sets the average rate from sparse ticks to a dense crackle. Classic for granular triggers and percussive texture.

Earthquake [OSC][FX][SYNTH] in: – out: Audio

Earthquake - a sub-bass brown-noise rumble that swells and recedes, felt more than heard. Intensity sets the magnitude, Tone the upper grind, Level the output.

Electric [OSC][FX][SYNTH] in: Note, Gate out: Audio

Electric piano (Rhodes/Wurlitzer-style physical model): a gate on in1 strikes a tuned tine - an exponentially-decaying sine fundamental plus a bright inharmonic 'bark' partial that decays faster - run through a soft pickup nonlinearity, the classic electric-piano bell-and-body tone. in0 is the note (keyboard-tracked), Transpose tunes it, Decay the note length, Bark the metallic attack, Tone the pickup brightness, and Level the output.

Elements [OSC][FX][SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal synthesis voice (Mutable Instruments Elements): an exciter feeds a tuned modal resonator bank. A gate on in0 fires the exciter, which Exciter morphs from blown (filtered noise) to struck (impulse); the six-mode resonator imposes the ringing of a physical object, with Geometry morphing its partials from a harmonic series toward inharmonic bell/plate ratios and Damping setting the ring time. Tune sets pitch, Level the output. Bowed strings, struck bars, blown tubes and alien resonances from one voice. Distinct from the self-struck Modal and the resonator-only Rings.

Engine [OSC][FX][SYNTH] in: – out: Audio

Combustion engine: a pulse train of sharp combustion transients fired at the engine's cylinder rate through a resonant exhaust filter, with a noise rasp - the procedural car / motorcycle / machine engine of film and game sound design. RPM sets the engine speed (the firing rate), Cylinders the number of cylinders (rhythm and harmonic spacing), Tone

the exhaust resonance frequency, Growl the resonance and grit, and Level the output. Automate RPM for revs and gear changes; self-running.

Erhu [OSC] [FX] [SYNTH] in: Bow, Pitch CV out: Audio

Chinese erhu: a bowed two-string fiddle with an intense, vocal vibrato and a nasal, reedy tone - a bowed sawtooth through a nasal formant, played by holding in0 as bow pressure. Vibrato sets the wobble depth, Nasal the formant emphasis, Level the output. in0 = Bow gate, in1 = Pitch CV.

Explosion [OSC] [FX] [SYNTH] in: – out: Audio

Explosion - a deep boom (pitch-dropping body + noise blast) with a rumbling tail, auto-repeating. Rate sets the interval, Tone the debris brightness, Level the output.

Expo [OSC] [FX] [SYNTH] in: – out: Audio

Exponential-ramp oscillator (a first as a synth block): a sawtooth whose ramp is not straight but EXPONENTIALLY curved - it rises (or, with the curve reversed, decays) like a charging capacitor rather than a linear slope, the natural shape of an analogue envelope or an RC circuit. Curve sets how bent the ramp is: near zero it is an ordinary saw, high and it hugs the floor then snaps up at the end. The curvature reshapes the harmonic rolloff, giving a rounder, more organic edge than the buzzy linear saw. A capacitor-curve waveform distinct from the geometric saw. Needs no input.

Factory [OSC] [FX] [SYNTH] in: – out: Audio

Factory floor - rhythmic mechanical clanks and presses over a motor hum and steam hiss. Rate sets the machine tempo, Tone the metallic brightness, Level the output.

FeedbackFM [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Single-operator FM with self-feedback (the DX7 feedback operator): a sine modulates its own phase, sweeping smoothly from pure tone toward a saw-like buzz as Feedback rises. Tone tames the top end.

FibonacciOsc [OSC] [FX] [SYNTH] in: – out: Audio

Fibonacci-harmonic oscillator (a first as a synth block): an additive tone whose overtones land only on the Fibonacci numbers - the 1st, 2nd, 3rd, 5th, 8th, 13th, 21st… harmonics. The gaps between partials widen by the golden ratio as you climb, so the low end is dense and the top sparse, giving a warm body with a thin, glassy shimmer on top - a spectrum tuned to phi rather than the even comb of a saw. Partials sets how many Fibonacci overtones to stack, alias-free up to Nyquist. Distinct from the prime-harmonic and tilt-based oscillators.

FibreString [OSC] [FX] [SYNTH] in: Pitch (CV), FM out: Audio

Two coupled Karplus-Strong plucked strings tuned a hair apart for a rich, chorused acoustic pluck/pad. Damp sets the decay (short pluck to long sustain) and Detune the beating between the two strings.

FifthLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Power-fifth lead: a saw doubled a perfect fifth above for the bold, open parallel-fifths organ/rock lead. Mix sets the fifth level, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Fire [OSC][FX][SYNTH] in: – out: Audio

Fire / combustion texture: three procedural layers - a brown-noise roar (the steady burn), an airy high-frequency hiss (combustion), and randomly-timed crackle pops (wood splitting) - the campfire / torch / burning-building ambience of film sound design. Self-running. Roar sets the low rumble level, Crackle the density of the popping, Hiss the airy combustion noise, Bright the crackle brightness, and Level the output. Layer two instances for a richer fire; automate Crackle for flare-ups.

FireCrackle [OSC][FX][SYNTH] in: Amount out: Audio

Fire: a crackling campfire - a low filtered-noise roar speckled with random snaps and pops. Crackle sets the snap rate, Tone the brightness, Level the output. in0 = Amount gate.

Flute [OSC][FX][SYNTH] in: Gate, Pitch (CV) out: Audio

Breathy flute voice: a gate on in0 sounds a soft nearly-pure tone (fundamental with a whisper of upper harmonics) wrapped in breath noise and a gentle vibrato, with a slow soft attack. Freq sets the note, Breath the airy-noise amount, Vibrato the pitch waver, Level the output. Hold the gate to sustain; in1 is the Pitch CV.

FM [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Two-operator FM voice (the DX7 building block): a sine carrier is phase-modulated by a sine modulator at Ratio times the frequency, with Index setting depth and modulator self-Feedback adding harmonic edge toward noise. Integer ratios give harmonic, organ/bass timbres; non-integer ratios give bells and metallic tones.

FMBass [OSC][FX][SYNTH] in: Pitch CV out: Audio

Two-operator FM bass: a sine carrier frequency-modulated by a second sine at an integer ratio, the punchy, metallic DX-style bass with a bright attack-to-body movement. Ratio sets the modulator interval, Index the FM brightness, Decay the index falloff. in0 = Pitch CV.

FMDrum [OSC][FX][SYNTH] in: Trigger, Pitch out: Audio

FM percussion voice: a trigger on in0 fires a 2-operator FM tone with a fast decay - metallic toms, bells, blips and zaps depending on Ratio. Tune sets the carrier pitch, Ratio the modulator ratio (inharmonic at non-integers), Decay the length, Level the output. in1 = Pitch CV.

FOF [OSC][FX][SYNTH] in: – out: Audio

Formant-wave-function synthesis (CHANT): each fundamental period retriggers a bank of decaying formant grains, generating vocal/formant tones. Vowel morphs A-E-I-O-U.

Footstep [OSC][FX][SYNTH] in: Trigger out: Audio

Footstep foley: a trigger on in0 fires a layered foot-floor impact - a damped low resonance (the body of the step) plus a band-passed noise contact - with a Surface control that morphs from a tight solid hit (wood / asphalt) to a scattered cluster of stochastic micro-pops (gravel / aggregate). The walk, run and stomp foley of film and game sound design. Weight sets the step body pitch, Surface the solid-to-gravel morph, Tone the contact brightness, Hardness the impact sharpness, and Level the output. Trigger per step; vary Weight / Surface per footfall.

Forcefield [OSC][FX][SYNTH] in: – out: Audio

Energy force-field - a detuned electric hum pulsing with a slow tremolo and a faint crackle, the protective barrier. Power sets the intensity, Tone the brightness, Level the output.

FormantBass [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Formant (talking) bass: a sawtooth shaped by a two-formant vowel filter that morphs through vowels, for a bass that says 'wow' and 'yoy'. Vowel morphs the vowel, Sub the sub-octave weight, Level the output. in0 = Gate, in1 = Pitch CV.

FourOpFM [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Four-operator FM: a stack of four sine operators (4 modulates 3 modulates 2 modulates the carrier), giving deep, evolving FM timbres from bells to brass to clangour. Ratio sets the operator interval, Index the FM depth, Decay the index falloff. in0 = Gate, in1 = Pitch CV.

FrameDrum [OSC][FX][SYNTH] in: Trigger out: Audio

Frame drum: a shallow hand drum with a warm mid-pitched membrane tone and a soft skin slap - the open, resonant world-percussion drum. Tune sets the pitch, Decay the length, Level the output. Trigger on in0.

FrenchHorn [OSC][FX][SYNTH] in: Breath, Pitch CV out: Audio

French horn: the warm, round, mellow brass - a sawtooth through a softer formant and a gentle lowpass with a slow swell, played by holding in0. Brass sets the formant bite, Breath the air, Level the output. in0 = Breath gate, in1 = Pitch CV.

Fridge [OSC][FX][SYNTH] in: – out: Audio

Refrigerator hum - a low compressor drone with a faint mechanical buzz and the occasional thermostat click, the quintessential room-tone. Tone sets the brightness, Buzz the rattle, Level the output.

Frogs [OSC][FX][SYNTH] in: – out: Audio

Frog pond - random low croaks with a watery resonance for a swamp/marsh night ambience. Activity sets how busy the pond is, Pitch the croak depth, Level the output.

FutureBass [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Future-bass lead-bass: bright detuned supersaws with a pitch-glide attack and a lowpass, the gliding, vocal-ish drop bass of future bass. Glide sets the attack slide, Detune the width, Cutoff the brightness. in0 = Gate, in1 = Pitch CV.

Gabber [OSC][FX][SYNTH] in: Trigger, Pitch (CV) out: Audio

Gabber / hardcore kick: a 909-style kick - a sine body with a downward pitch sweep - overdriven hard into clipping until it becomes a distorted, square-ish melodic tone, the way the classic gabber kick was made by feeding a 909 through an overdriven mixer channel. The pitch tail falls off slower than a clean kick so the body stays melodic. Tune sets the body pitch (in1 = Pitch CV), PSweep the pitch-tail length, Decay the body length, Distort the overdrive amount (the gabber character), Tone the final clip hardness (soft -> square), and Level the output. A trigger on in0 strikes it.

GameOver [OSC][FX][SYNTH] in: – out: Audio

Game-over jingle - a descending square-wave arpeggio that tumbles down, auto-repeating. Rate sets the replay interval, Pitch the key, Level the output.

Geiger [OSC] [FX] [SYNTH] in: – out: Audio

Sparse-impulse noise: each sample has a probability set by Rate of firing a random-amplitude impulse, which then decays exponentially, all scaled by Level. Rate sets the average clicks per second and Decay sets how long each impulse rings before fading. Low Rate with short Decay gives sparse ticks like a Geiger counter, while higher Rate and longer Decay thicken it toward a crackling texture.

Gendy [OSC] [FX] [SYNTH] in: – out: Audio

Dynamic-stochastic (GENDYN) oscillator (a first as a synth block): Xenakis's radical idea of synthesising sound directly from probability - the waveform is a handful of breakpoints joined by straight lines, and after every cycle each breakpoint takes a small RANDOM WALK in height. So the wave keeps its rough shape but never repeats exactly, slowly mutating from one cycle to the next - the engine behind his GENDY pieces, sound built bottom-up from chance rather than from notes. Points sets the number of breakpoints and Step how far they wander each cycle (0 = frozen, high = noisy). A stochastic waveform distinct from every fixed-shape oscillator. Needs no input.

Geyser [OSC] [FX] [SYNTH] in: – out: Audio

Geyser - a cyclic eruption that builds from a low gurgle into a hissing high-pressure blast, then subsides. Cycle sets the eruption period, Tone the spray brightness, Level the output.

GlassFM [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Two-operator FM with bright, inharmonic ratios for bell, glass and electric-piano tones. Ratio sets the modulator-to-carrier frequency ratio and Index the modulation depth (brightness and clang).

GlassHarp [OSC] [FX] [SYNTH] in: Pressure, Pitch CV out: Audio

Rubbed glass (glass harmonica / wine glass): a sustained, almost-pure tone with a slow swell and a faint shimmering second partial, played by holding in0 as the 'finger pressure'. The ethereal, breathy crystal-glass voice. Tune sets the pitch, Shimmer the vibrato depth, Level the output. in0 = Pressure gate, in1 = Pitch CV.

Glockenspiel [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal glockenspiel: a trigger on in0 strikes a metal bar modelled as bright, long-ringing inharmonic partials (1 : 2.7 : 5.4 : 8.9), the clear bell-like tone of a glock/celesta. Tune sets the pitch, Decay the (long) ring, Mallet the brightness, and Level the output.

GoldenOsc [OSC] [FX] [SYNTH] in: – out: Audio

Golden-ratio oscillator (a first as a synth block): an INHARMONIC tone whose partials are spaced not by whole numbers but by powers of the golden ratio (1, 1.62, 2.62, 4.24, 6.85…). Because no partial is a simple multiple of another, nothing fuses into a clear pitch the way a harmonic tone does - the result is a shimmering, metallic, bell-like timbre that sits between a pitch and a noise, the most irrationally-spaced spectrum there is. Partials sets how many golden overtones to stack, alias-free up to Nyquist. A phi-spaced inharmonic spectrum distinct from the integer-harmonic oscillators. Needs no input.

Gong [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal gong: a trigger on in0 strikes a large gong - a dense cluster of low inharmonic metal partials that wash together into a shimmering, slowly-decaying roar with a long sustain. Tune sets the pitch, Decay the long tail, Shimmer the upper-partial brightness and clangour, Level the output. Distinct from the noise-based Cymbal - this is tuned, blooming metal. Trigger from a Clock, Euclid or sequencer.

GrainOsc [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Granular formant oscillator: emits one Hann-windowed sine grain per cycle of the fundamental, with the grain's internal frequency set by Formant - so pitch follows Freq while a fixed formant peak stays put, giving vocal, buzzy, FOF-style timbres. Freq sets the pitch, Formant the grain harmonic, Level the output. in0 = Pitch CV.

Granular [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Granular oscillator/texture: continuously captures the input into a ~2 s ring buffer and sprays overlapping Hann-windowed grains read back from it. Size sets grain length in ms, Density the spawn rate in grains/sec, Pitch transposes each grain in semitones, and Jitter randomizes the read origin for a diffuse, smeared texture. Mix blends the grain cloud against the dry input – low density gives a sparse stutter, high density a thick wash.

Growl [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Dubstep / brostep growl bass: an FM voice whose modulation index and a midrange formant band-pass are swept together by one LFO, then pushed through heavy distortion - moving the FM amount and the formant at once is what gives the Skrillex-style 'talking' growl, distinct from a plain filter wobble. Tune sets the pitch (in0 = Pitch CV), Rate the growl LFO speed (tempo-sync it), Ratio the FM modulator ratio, Index the FM depth, Formant the band-pass centre the LFO sweeps, Drive the distortion, and Level the output. Layer a clean Sub808 under it for the low end.

GrowlBass [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Growl bass: a sawtooth through a sharp formant bandpass swept by a built-in LFO, giving a vocal, growling, talking-bass character. Growl sets the LFO rate, Formant the centre, Drive the grit. in0 = Gate, in1 = Pitch CV.

Guiro [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Guiro scraper: a trigger on in0 plays one stroke across the ridges of a guiro - a 'rrrip' of band-passed noise rhythmically chopped by the teeth at Rate, the rasping scrape of Latin and cumbia percussion. Rate sets how fast the ridges pass, Length the stroke duration, Tone the brightness, Level the output. Re-trigger for the up-down stroke pattern.

Gunshot [OSC] [FX] [SYNTH] in: Trigger out: Audio

Gunshot SFX: a trigger on in0 fires the layered crack of a weapon - a bright transient snap, a band-passed noise body for the weight, a sub LFE thump with a fast pitch drop, and a noise tail for the room reflection. The film / game firearm report. Tone sets the body and transient brightness, Body the low-mid weight, Sub the LFE thump level, Tail the room-decay length, and Level the output. Trigger from a sequencer or one-shot.

Hail [OSC] [FX] [SYNTH] in: – out: Audio

Hailstorm - a dense barrage of sharp icy ticks over a rain bed. Intensity sets the hail density, Tone the hardness of each strike, Level the output.

Hammond [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Tonewheel organ (Hammond): nine sine drawbars summed into one rich sustained voice, with a percussive key-click on attack and a Leslie-style vibrato - the gospel/rock B3 sound. Bright mixes in the upper drawbars, Leslie the rotary depth, Level the output. in0 = Gate, in1 = Pitch CV.

Handbell [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Handbell: a clear, ringing tuned handbell - a strong fundamental with an octave and a twelfth, a bright strike and a medium shimmering decay. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Handpan [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Struck handpan / hang drum: mellow near-harmonic partials (1 : 2 : 3 : 4) with a soft attack and medium-long sustain - the warm, meditative hang voice. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

HardLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Hardstyle lead: detuned sawtooths slammed through drive into a bright filter for the screaming, euphoric rawstyle lead. Detune sets the width, Drive the distortion, Tone the brightness. in0 = Gate, in1 = Pitch CV.

HardSync [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Hard-sync oscillator: a slave saw is reset every cycle of the master pitch, and Sync sweeps the slave frequency up for the classic tearing, vowel-like sync lead. Shape blends saw toward square.

Harmonica [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Harmonica voice: a gate on in0 sounds two slightly-detuned free reeds beating together into the bright wheezing tone of a blues harp, with vibrato. Freq sets the note, Detune the reed beating (thin to thick), Vibrato the waver, Level the output. Hold the gate to sustain; in1 is the Pitch CV.

Harpsichord [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Harpsichord: a plectrum-plucked string pair (8' + 4' octave) with a bright, thin, buzzy attack and a quick decay - the baroque keyboard voice. Bright sets the upper-octave mix, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Hat [OSC] [FX] [SYNTH] in: Trigger out: Audio

Analog hi-hat: a trigger on in0 fires bright high-passed metallic noise with a short percussive decay. Tone sets the brightness, Decay the length (short = closed, long = open hat), Metal blends in inharmonic ringing for a more cymbal-like tone, and Level the output.

Hat606 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-606 hi-hat: a bright metallic hat built from four detuned squares through a sharp highpass with a fast decay - thinner and brasher than the 808 hat, the sizzling Drumatix top end. Tone sets the brightness, Decay the length (short = closed, long = open), Level the output. Trigger on in0.

Hat808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 hi-hat: a trigger on in0 fires six detuned square-wave oscillators (the 808's metal-on-metal ring) through a bright highpass with a fast decay. Tone sets the brightness, Decay the length (short = closed, long = open), Level the output.

Hat909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-909 hi-hat: six detuned squares blended with a burst of white noise through a sharp highpass - noisier and more sizzling than the 808 hat, the bright house/techno cymbal top. Tone sets the brightness, Decay the length (short = closed, long = open), Level the output. Trigger on in0.

Heartbeat [OSC] [FX] [SYNTH] in: – out: Audio

Heartbeat: a self-clocking 'lub-dub' double sub-thump - two soft low pulses per beat (the first louder), each a sine with a fast pitch drop and a muffled decay - the tension pulse of film and game sound design. Rate sets the beats per second (resting ~1, racing ~2.5), Tune the thump pitch, Decay the thump length, Tone the muffled softness (low-pass), and Level the output. Self-running; automate Rate to race the pulse for suspense.

Helicopter [OSC] [FX] [SYNTH] in: – out: Audio

Helicopter - a deep rotor thump (blade-rate amplitude chop) under an engine whine. Rotor sets the blade rate, Tone the engine brightness, Level the output.

Hum [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Closed-mouth hum: the soft, nasal 'mmm' of humming - a mellow sine with a low nasal formant and a gentle second harmonic. Nasal sets the formant emphasis, Vibrato the wobble, Level the output. in0 = Gate, in1 = Pitch CV.

HyperSaw [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Seven detuned saw voices in a tight unison (a classic supersaw): Detune spreads the voices and Blend balances the centre voice against the spread sides for anything from a subtle thickening to a screaming trance lead.

Impact [OSC] [FX] [SYNTH] in: Trigger out: Audio

Cinematic drop impact: a trigger on in0 fires a deep sub-sine whose pitch plunges from a high boom down to Tune, layered with a short noise crack on the transient and a long decaying sub tail - the 'boom' that lands on a drop or downbeat. Tune sets the final sub pitch, Boom the pitch-plunge depth and time, Decay the sub-tail length, Noise the transient crack level, and Level the output. Distinct from Kick: a deep cinematic hit, not a tuned drum.

Impulse [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Band-limited impulse/pulse train (a BLIT): a stream of clean clicks at the pitch rate, the raw material for subtractive synthesis and excitation. Width morphs the impulse toward a narrow pulse.

Insects [OSC] [FX] [SYNTH] in: – out: Audio

Insect night ambience: a bed of randomly-timed cricket chirps - a high tone (the stridulation pitch) pulsed by a fast wing-stroke amplitude modulation and gated into short chirps - the field, jungle and night-time critter ambience of film sound design. Self-running. Density sets how often the chirps fire, Pitch the stridulation tone, Rate the wing-stroke pulse speed inside each chirp, Spread the random pitch variation between insects, and Level the output.

Jet [OSC] [FX] [SYNTH] in: – out: Audio

Jet engine - a massive filtered-noise roar topped by a screaming turbine whine. Thrust sets the power, Tone the whine pitch, Level the output.

JewsHarp [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Jew's harp / mouth harp: a fixed low twang reed whose harmonics are shaped by a sweeping mouth-cavity formant, retriggered on in0 - the wobbling 'boing-wow' of a plucked lamellophone. Tune sets the twang pitch, Sweep the formant motion, Level the output. Trigger on in0, in1 = Pitch CV.

JunoVoice [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Juno-style voice: a single sawtooth with a square sub-oscillator an octave down and PWM movement, run through a lowpass and lightly detuned for the lush Roland Juno-106 character. Cutoff sets the filter, Sub the sub-oscillator level, Level the output. in0 = Gate, in1 = Pitch CV.

Kalimba [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal kalimba (thumb-piano tine): a trigger on in0 plucks a metal tine modelled as a strong fundamental plus a couple of mellow inharmonic partials (1 : 2.0 : 3.9) with a soft buzzy onset. Tune sets the pitch, Decay the ring length, Buzz the attack-noise transient, and Level the output.

Kenong [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Gamelan kenong: a large bronze kettle-gong with a deep, round, resonant tone and a long humming decay - the time-keeping voice of the gamelan. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Kettle [OSC] [FX] [SYNTH] in: – out: Audio

Boiling kettle - a bubbling hiss that rises into a building steam whistle, then resets. Cycle sets the boil time, Pitch the whistle height, Level the output.

Kick [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Analog kick drum: a trigger on in0 fires a sine whose pitch sweeps from a high click down to the body Tune, with a percussive amp Decay. Tune sets the fundamental, Punch the pitch-drop time (snap), Decay the body length, Drive adds saturation for harder kicks, and Level the output - the synthesized 808/909-style kick. Patch a Clock, Euclid or sequencer gate into in0.

Kick606 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-606 kick drum: a short, punchy bass drum with a fast pitch sweep and a tight decay - brighter and snappier than the 808's long boom, the driving Drumatix kick. Tune sets the base pitch, Decay the length, Level the output. Trigger on in0.

Kick707 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-707 kick drum: a tight, clicky digital-flavoured bass drum - a short pitch-swept sine with an added transient click at the attack, the dry 707 thump used across early house. Tune sets the pitch, Click the attack snap, Level the output. Trigger on in0.

Kick808 [OSC] [FX] [SYNTH] in: Trigger, Pitch out: Audio

TR-808-style kick drum: a trigger on in0 fires a long, deep sine boom with a downward pitch sweep and a soft saturated tail - the classic 808 sub-kick. Tune sets the body pitch, Decay the (long) length, Punch the attack pitch-sweep amount, Level the output. in1 = Pitch CV.

Kick909 [OSC] [FX] [SYNTH] in: Trigger, Pitch out: Audio

TR-909-style kick drum: punchier and clickier than the 808 - a trigger on in0 fires a sine body with a fast, snappy pitch envelope plus a sharp transient click for cut. Tune sets the body pitch, Decay the length, Click the attack-click amount, Level the output. in1 = Pitch CV.

Knock [OSC] [FX] [SYNTH] in: – out: Audio

Door knock - a periodic double or triple rap on wood with a hollow resonance. Rate sets how often, Tone the wood resonance, Level the output.

Koto [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Japanese koto: a plucked zither string with a bright woody attack and the characteristic upward pitch bend as the note settles (the ato-oshi press), over a Karplus-Strong string. Decay sets the ring, Bend the attack pitch rise, Level the output. Trigger on in0, in1 = Pitch CV.

Krell [OSC] [FX] [SYNTH] in: – out: Audio

Self-generating Krell patch: a self-running voice that, at random intervals, jumps to a new random pitch and glides its amplitude toward a new random level - the endlessly-evolving generative tone (after the Forbidden Planet patch). Rate sets the event speed, Range the pitch spread in octaves, Level the output. No input needed; patch it and walk away.

Laser [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Sci-fi laser blaster: a trigger on in0 fires a square tone with a steep attack and a fast descending pitch drop, ring-modulated by a carrier for the metallic 'pew', through a resonant low-pass that tracks the pitch, with a noise-grit layer. The blaster bolt and beam of sci-fi sound design. Tune sets the start pitch (in1 = Pitch CV), Drop the pitch-envelope descent depth, Ring the ring-mod carrier (metallic colour), Length the decay (short = bolt, long = beam), Grit the noise layer, and Level the output. Distinct from Zap: ring-modulated and metallic, with a beam length.

LinnSnare [OSC] [FX] [SYNTH] in: Trigger out: Audio

LinnDrum snare: a tight, punchy sampled-style snare - a short tonal body under a crisp, highpassed noise crack, the early-80s drum-machine backbeat. Tone sets the body-vs-noise balance, Decay the length, Level the output. Trigger on in0.

Lorentzian [OSC] [FX] [SYNTH] in: – out: Audio

Lorentzian-pulse oscillator (a first as a synth block): emits the Lorentzian (Cauchy) bell - 1 / (1 + (t/Width)^2) - once per cycle, a peak with a tall sharp tip and long, slowly-fading shoulders, the lineshape of a resonance in

physics. Its fatter tails (compared with a Gaussian or cosine pulse) give a brighter, buzzier spectrum that rolls off exponentially, while Width sets how narrow and piercing the spike is. A resonance-shaped pulse train distinct from the Theta and window pulses. Needs no input.

LucasOsc [OSC][FX][SYNTH] in: – out: Audio

Lucas-number oscillator (a first as a synth block): an additive tone whose overtones land on the Lucas numbers - 1, 3, 4, 7, 11, 18, 29… - the Fibonacci sequence's companion, built on the same golden-ratio recurrence but from a different start. Its partials share Fibonacci's phi-spaced widening yet sit on different harmonics, so it has a related warm-but-glassy character with its own distinct colour - a sibling timbre to the FibonacciOsc. Partials sets how many Lucas overtones to sound, alias-free up to Nyquist. Needs no input.

Maracas [OSC][FX][SYNTH] in: Trigger out: Audio

Maracas / shaker: a trigger on in0 fires a short burst of bright high-passed noise with a fast decay - the crisp shaker tick. Tone sets the brightness, Decay the length, Level the output.

Marimba [OSC][FX][SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal marimba: a trigger on in0 strikes a wooden bar modelled as inharmonic decaying sine partials (the characteristic 1 : 3.9 : 9.2 bar modes), warm with a soft mallet onset. Tune sets the pitch, Decay the ring length, Mallet the brightness (how long the upper modes sustain), and Level the output. A melodic mallet voice to pair with the drum kit; gate it from a Clock, Euclid or sequencer.

Mbira [OSC][FX][SYNTH] in: Trigger, Pitch CV out: Audio

Mbira (thumb piano): a plucked metal tine with the characteristic buzzing rattle of its bottle-cap resonators - the warm, percussive African lamellophone. Tune sets the pitch, Buzz the rattle, Level the output. Trigger on in0, in1 = Pitch CV.

Mellotron [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Mellotron: the tape-replay keyboard's wobbly string/choir ensemble - lightly-detuned sawtooth voices with tape wow and a breath of hiss, the lo-fi orchestral pad of prog and pop. Wobble sets the tape flutter, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Melodica [OSC][FX][SYNTH] in: Breath, Pitch CV out: Audio

Melodica: the buzzy, sustained free-reed of the breath-blown keyboard harmonica - lightly-detuned reed sawtooths through a soft lowpass, played by holding in0. Reed sets the detune buzz, Tone the brightness, Level the output. in0 = Breath gate, in1 = Pitch CV.

MetalFM [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Three-operator FM tuned to inharmonic ratios for metallic, gong and bell percussion. Ratio sets the (deliberately non-integer) modulator spacing and Index the clang/brightness.

Microwave [OSC][FX][SYNTH] in: – out: Audio

Microwave oven - a steady transformer hum and turntable whir, ending each cycle with the finished ding. Cycle sets the run length, Tone the hum brightness, Level the output.

Minkowski [OSC] [FX] [SYNTH] in: – out: Audio

Minkowski question-mark oscillator (a first as a synth block): synthesises Minkowski's ?(x) function - the 'question-mark' curve that warps the number line by walking the Stern-Brocot tree, sending the quadratic irrationals to the rationals and flattening the golden ratio's run of 1s into a plain binary fraction. As a waveform it is a singular staircase like the devil's staircase but woven from continued fractions instead of base 3, giving a different self-similar ramp with its own fractal spectrum. A continued-fraction singular function distinct from the Cantor (Devil) and the smooth ramps. Needs no input.

MobiusOsc [OSC] [FX] [SYNTH] in: – out: Audio

Mobius oscillator (a first as a synth block): an additive tone where each harmonic k is weighted by the Mobius function mu(k) - so harmonics on a repeated-prime multiple (4, 8, 9, 12…) are silenced entirely, while the squarefree ones are added with a PLUS or MINUS sign depending on whether they have an even or odd number of prime factors. The mix of dropped partials and phase-flipped (inverted) partials carves a spectrum found nowhere in ordinary synthesis - a signed, squarefree-only comb. Partials sets the highest harmonic considered. Distinct from the other number-theoretic oscillators.

Modal [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Modal synthesis: a bank of 6 tuned decaying resonators struck by a gate (bells, mallets, struck metal). Structure morphs harmonic to inharmonic-bar partials.

Monsoon [OSC] [FX] [SYNTH] in: – out: Audio

Torrential downpour - dense high rain hiss over a deep rumble, with random thunder swells. Downpour sets the rain density, Tone the brightness, Level the output.

MoogVoice [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Minimoog-style voice: three slightly-detuned sawtooths stacked and pushed through a self-resonant four-pole Moog ladder filter for the fat, creamy mono-synth lead/bass. Cutoff sets the filter, Reso the ladder resonance, Level the output. in0 = Gate, in1 = Pitch CV.

MorphOsc [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

A single oscillator that morphs continuously through the four classic waveforms - sine, triangle, saw, square - as Morph sweeps 0 to 1, with a Warp control that bends the phase for extra harmonic motion.

Multisampler [OSC] [FX] [SYNTH] in: Note, Gate, Velocity out: Audio

Multisampler: on each note-on (from the note, gate, and velocity inputs) it strikes every region whose key and velocity zones match, resampling each by note-vs-root plus fine tune so it plays at the right pitch. Slot selects which loaded .sfz region set to use (0 to 7), Loop forces looping of the regions' loop or play windows, and Level scales output; velocity crossfades and round-robin sequencing come from the region data. Use it for realistic multisampled instruments where timbre tracks key and velocity.

MusicBox [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal music box: a trigger on in0 plucks a steel comb tine - a bright bell-like tone from a strong fundamental plus high inharmonic partials (1 : 5.4 : 13) with a fast tinkling attack and medium decay, the unmistakable music-box timbre. Tune sets the pitch, Decay the ring, Tone the brightness of the upper partials, and Level the output.

Nebula [OSC] [FX] [SYNTH] in: – out: Audio

Nebula - a slowly shifting cloud of detuned high sines over a soft noise wash, an icy interstellar shimmer. Drift sets the movement, Tone the brightness, Level the output.

NeuroBass [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Neurofunk bass: a detuned-saw sub pushed through cascaded distortion and a resonant lowpass for the screaming, metallic, multi-layered DnB bass. Detune sets the beating, Drive the distortion, Cutoff the filter. in0 = Gate, in1 = Pitch CV.

Noise [OSC] [FX] [SYNTH] in: – out: Audio

Colored-noise generator: Color morphs from white (flat spectrum) toward a low-passed pink-ish tone, scaled by Level. Use it as a percussion/wind source, a sample-and-hold input, or to add air and dither. It takes no signal input - it is a pure generator.

NoiseColor [OSC] [FX] [SYNTH] in: – out: Audio

Tunable coloured noise: one knob sweeps the spectral tilt from deep brown (−6 dB/oct, rumbling) through pink (−3 dB/oct), white (flat), blue (+3 dB/oct) to violet (+6 dB/oct, hissy). A single source for every noise colour, where the other noise blocks are fixed. Level scales the output.

Novachord [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Novachord: the 1939 vacuum-tube polyphonic - a soft, divide-down organ tone with a slow vibrato and a gentle, hollow voice, the first commercial synthesizer. Vibrato sets the wobble, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Oboe [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Oboe: a bright, nasal, penetrating double-reed - a narrow pulse driven through a strong resonant formant with reed buzz, played by holding in0 as breath. Reed sets the buzz, Breath the air, Level the output. in0 = Breath gate, in1 = Pitch CV.

Ocarina [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Ocarina: a vessel flute with a nearly pure tone plus a soft second harmonic and a touch of breath, played by holding in0. The round, whistle-like clay-flute timbre. Tune sets the pitch, Breath the air noise, Level the output. in0 = Breath gate, in1 = Pitch CV.

Ocean [OSC] [FX] [SYNTH] in: – out: Audio

Ocean surf - filtered noise swelling in and out like waves rolling onto a beach. Rate sets the wave period, Tone the brightness (spray vs deep roll), Level the output.

OceanWave [OSC] [FX] [SYNTH] in: Amount out: Audio

Ocean waves: slow swells of surf - filtered noise that rises and breaks in a long, repeating crash-and-recede cycle. Rate sets the swell period, Tone the spray brightness, Level the output. in0 = Amount gate.

OctaveOsc [OSC] [FX] [SYNTH] in: – out: Audio

Octave-stack oscillator (a first as a synth block): an additive tone whose overtones are only the powers of two - the 1st, 2nd, 4th, 8th, 16th… harmonics, i.e. the fundamental plus a stack of pure octaves above it. Because every partial is an octave of the one below, they fuse into a single, enormously reinforced pitch with the bright, hollow body of a full organ stop or a Shepard-tone layer, no in-between harmonics to muddy it. Partials sets how many octaves to stack, alias-free up to Nyquist. A pure-octave spectrum distinct from the dense harmonic saw. Needs no input.

OndesMartenot [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Ondes Martenot: the haunting, vocal early-electronic voice - a sine with a few harmonics and a deep, expressive vibrato (the classic 'gliding' theremin-cousin), played by holding in0. Vibrato sets the wobble, Timbre the harmonic richness, Level the output. in0 = Gate, in1 = Pitch CV.

Ondioline [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Ondioline: the buzzy, intensely-vibratoed reed-organ keyboard (Jean-Jacques Perrey's voice) - a harmonically-rich pulse with a fast, deep vibrato and a percussive attack. Vibrato sets the wobble, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

OpenHat909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-909 open hi-hat: a long, sizzling wash of six detuned squares and white noise through a sharp highpass, the bright, ringing open hat of house and techno. Tone sets the brightness, Decay the length, Level the output. Trigger on in0.

OrchHit [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Orchestra hit (Fairlight ORCH5 / Stravinsky stab): a trigger on in0 fires a dense detuned cluster of saws stacked in octaves and fifths - strings and brass hitting one staccato chord - with a sharp attack, a short decay and 8-bit-style bit-crush for the lo-fi digital crunch that made the sound iconic in rave, hip-hop, hardcore and techno. Tune sets the pitch (in1 = Pitch CV), Spread the detune width of the cluster, Decay the staccato length, Bits the lo-fi crunch (low = crunchier), Tone the brightness, and Level the output.

Organ [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Additive drawbar organ oscillator that sums four sine partials at the first four harmonics of Freq. Bar1, Bar2 and Bar3 set the drawbar levels of the fundamental, second and third harmonics (the fourth harmonic tracks Bar2 at half level), and Level sets the overall output. A self-running tone generator with no audio input, voiced from sine-only partials for a clean drawbar timbre.

Oscillator [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Audio-rate tone generator with sine, saw, square and triangle waves (Wave) at Freq. Use it as a ring-mod or FM carrier, a drone, a sub layer, or a test tone. It takes no signal input - patch its output into RingMod, a filter, or straight to Out.

Oud [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Arabic oud: a warm, fretless plucked lute with a round, fast-decaying tone and no buzz - a softly-damped Karplus string voiced for the mellow Middle-Eastern lute. Decay sets the ring, Tone the brightness, Level the output. Trigger on in0, in1 = Pitch CV.

PadStack [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Lush pad oscillator: the fundamental plus detuned copies an octave and two octaves up, gently detuned for slow beating. Spread sets the detune width and Octaves the upper-layer level - an instant wide synth-pad bed.

Pandeiro [OSC] [FX] [SYNTH] in: Trigger out: Audio

Pandeiro: the Brazilian frame drum with jingling platinelas - a tuned membrane hit wrapped in a bright metallic jingle. Tune sets the pitch, Jingle the platinela mix, Level the output. Trigger on in0.

PanFlute [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Pan flute / shakuhachi: a breathy edge-blown voice - a sine fundamental wrapped in tuned breath noise from a resonant bandpass at the pitch, played by holding in0 as breath. Airy and hollow. Tune sets the pitch, Breath the air balance, Level the output. in0 = Breath gate, in1 = Pitch CV.

Pew [OSC] [FX] [SYNTH] in: Trigger out: Audio

Laser pew: a quick descending-pitch zap - a sine swept rapidly down with a short decay, the retro arcade/sci-fi laser shot. Tune sets the start pitch, Sweep the drop, Level the output. Trigger on in0.

PhaseDist [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Casio CZ phase-distortion oscillator: a phase ramp drives a cosine through a warped read so DCW morphs a sine toward the chosen shape, then scales by Level. Shape selects Saw or Pulse (true phase distortion) or three resonant modes (ResoSaw, ResoTri, ResoTrap) that are windowed hard-sync, and DCW sets the distortion amount or, in resonant modes, the resonant multiple (1 to 16). Low DCW stays near a clean sine while high DCW opens into bright sawtooth, pulse, or formant-like resonant tones.

PhaseDistort [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Casio CZ phase distortion: a sine read with a warped phase (fast then slow), synthesising a resonant, filter-swept sawtooth without a filter - the bright, vocal PD timbre. Amount sets the distortion (dark to resonant), Level the output. in0 = Gate, in1 = Pitch CV.

Piano [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Additive piano (house piano stab): sums inharmonic partials tuned by the real piano stretch formula fnsqrt(1+B*n^2) - so the overtones run slightly sharp the way struck strings do - with a bright hammer-noise attack and a low-pass that darkens as the note decays (higher partials die first). The acoustic-piano chord stab of piano house, deep house and progressive. Tune sets the pitch (in1 = Pitch CV), Inharm the string-stretch detune, Decay the note length, Hammer the attack-noise knock, Tone the initial brightness, and Level the output. A gate on in0 strikes it.

PinkNoise [OSC] [FX] [SYNTH] in: - out: Audio

Pink (1/f) noise - equal energy per octave, the natural-sounding noise for wind, surf and analog hiss. Tone tilts it from full pink toward darker low-pass, Level sets the output.

PipeOrgan [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Church pipe organ (Interstellar-style): additive ranks at the true organ-stop pitches - 8' fundamental, 4' octave, 2 2/3' twelfth, 2' fifteenth, 1 3/5' seventeenth and 1 1/3' nineteenth (harmonics 1-6) - so the upper mutation stops reinforce the fundamental with cathedral brilliance, plus a wind 'chiff' on the attack and an optional tremulant. The huge sustained organ of cinematic and gothic scoring, distinct from the Hammond drawbar Organ. Tune sets the pitch (in1 = Pitch CV), Stops the registration (how many upper ranks are drawn = brightness), Chiff the attack wind-noise, Tremulant the slow amplitude vibrato, and Level the output. A gate on in0 holds the note.

Plaits [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Macro-oscillator (Mutable Instruments Plaits): one voice, six synthesis Models selected by the Model param - Analog (saw/square), FM (2-op), Grain (formant), Chord (stacked intervals), Wavetable (sine-saw-square morph) and Modal (struck bar) - each shaped by Timbre and Morph. Tune sets pitch; an internal decay envelope (Decay) fires when a gate hits in0, so it plays as a drone unpatched or a pinged percussive voice when triggered. The Swiss-army oscillator covering most synthesis techniques in a single block.

Pluck [OSC] [FX] [SYNTH] in: Note (CV), Gate out: Audio

Karplus-Strong plucked-string physical model: a gate edge fills a delay line with a white-noise burst, then each pass averages neighbouring samples and scales by Decay so the noise settles into a pitched, decaying tone. Tune shifts the note in semitones (sets the delay length from the in0 note), Damp blends in more of the lowpass average to dull the highs, Decay sets how slowly the string rings out, and Level scales the output. Plucks on the in1 gate; short Decay and high Damp give a soft muted pluck, long Decay and low Damp a bright sustained string.

PluckBass [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Plucked bass: a tight, finger-plucked electric-bass tone over a Karplus-Strong string - warm, punchy and dynamic. Decay sets the sustain, Tone the brightness, Level the output. Trigger on in0, in1 = Pitch CV.

PMOsc [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Phase-modulation oscillator: a sine modulator running at Ratio times Freq offsets the carrier phase by depth Index, and the warped phase is read through the selected carrier waveform, then scaled by Level. Wave selects the carrier shape (Sine, Tri, three bent/saturated triangle variants, narrowed sine), Ratio sets the modulator-to-carrier frequency, and Index sets modulation depth. Raising Index and Ratio builds increasingly bright, inharmonic FM-style spectra.

POKEY [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Atari POKEY oscillator: a square wave fed through the chip's polynomial-counter noise, sweeping from a clean tone to the dirty, buzzing distortion-bass POKEY is famous for. Dirt sets the noise blend, Width the pulse duty, Level the output. in0 = Gate, in1 = Pitch CV.

PortaLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Portamento lead: a smooth, gliding monophonic saw lead that slides between notes - the expressive, singing solo voice. Glide sets the slide time, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Powerup [OSC] [FX] [SYNTH] in: Trigger out: Audio

Sci-fi power-up / energy charge: a trigger on in0 starts a tone that rises over Time - the pitch sweeps up Range octaves while bright harmonics fade in and a fast shimmer tremolo intensifies toward the peak, the 'charging up' of a weapon, shield or pickup. Tune sets the start pitch, Time the charge duration, Range the octaves it climbs, Shimmer the high-harmonic sparkle and tremolo, and Level the output. Trigger to charge; the energy peaks and holds at the top of the sweep. Distinct from the noise-based Riser - this is a tonal ascending charge.

PrimeAdditive [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Additive oscillator that sums only the prime-numbered harmonics (2, 3, 5, 7, 11, …) with a tunable rolloff - a hollow, woody, clarinet-like spectrum you can't get from saw/square. Partials sets how many primes and Rolloff their decay.

PrimeOrgan [OSC] [FX] [SYNTH] in: – out: Audio

Prime-harmonic oscillator (a first as a synth block): an additive tone built from the fundamental plus only the PRIME harmonics - the 2nd, 3rd, 5th, 7th, 11th… partials, with the composite ones (4th, 6th, 8th, 9th…) left out entirely. Because every overtone is at a prime multiple, the usual octave and fifth reinforcements are missing, giving a hollow, slightly bell-like organ timbre that no harmonic or subtractive source produces. Partials sets how many prime overtones to stack, alias-free up to Nyquist. A number-theoretic spectrum, distinct from the tilt-shaped Additive oscillator.

Propeller [OSC] [FX] [SYNTH] in: – out: Audio

Propeller plane - a chopping blade thrum over a droning piston engine. Rpm sets the blade rate, Tone the engine brightness, Level the output.

ProphetVoice [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Prophet-style voice: a sawtooth and a pulse oscillator detuned together through a two-pole filter, the punchy, slightly-gritty Sequential Prophet-5 poly character. Cutoff sets the filter, Reso the resonance, Level the output. in0 = Gate, in1 = Pitch CV.

PsyBass [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Psytrance rolling bassline: a self-clocking 16th-note sub that retriggers a fast-attack / short-decay amp envelope and a downward filter sweep on every step, the hypnotic driving roll under a psytrance kick. A saw runs through a resonant low-pass whose cutoff starts bright and decays toward the sub each step. Tune sets the pitch (in0 = Pitch CV), Rate the step-clock frequency (tempo-sync it so the steps land on 16ths), Cutoff the filter floor, Reso the squelch, Decay the per-step length, and Level the output. Sidechain it under the kick (Pump / Ducker) for the classic off-kick pump.

Pulsar [OSC] [FX] [SYNTH] in: – out: Audio

Pulsar synthesis (Roads): a pulsaret (windowed sine) is emitted once per fundamental period, then silence. Freq sets pitch, Formant the pulsaret cycles, Width the duty.

Pulsar2 [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Pulsar-synthesis oscillator: a single-cycle pulsaret is emitted once per fundamental period then followed by silence, so Width sets a movable formant region independent of pitch - the granular/pulsar tone behind Curtis Roads' synthesis and a range of harsh-to-vocal digital timbres. Freq sets the fundamental, Width the duty (formant), Level the output. in0 = Pitch CV.

Pulsaret [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Pulsar synthesis oscillator: at each fundamental period a Hann-windowed sinusoidal grain (the pulsaret) is retriggered, with silence filling the rest of the cycle. Freq sets the fundamental (grain repetition rate), Formant sets the sine frequency inside the grain (formant pitch), Width sets the fraction of the period the grain occupies, and Level scales the output. Narrow widths and high formants give buzzy, formant-rich tones.

PWM [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Pulse-width-modulation oscillator (Juno-style): a single pulse wave whose duty cycle is swept by a slow LFO, so one oscillator breathes and thickens like a chorused string / pad - the classic Juno / Jupiter PWM movement behind hollow synth strings and reedy basses. Tune sets the pitch (in0 = Pitch CV), Rate the PWM LFO speed, Depth how far the width is swept, Sub an octave-down square for weight, and Level the output. Distinct from SuperPWM, which stacks many detuned pulses - this is the single classic PWM voice.

PWMLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

PWM lead: a pulse-width-modulated square lead with continuous PWM movement for a thick, animated, hollow solo voice. Width sets the duty, Move the PWM depth, Tone the brightness. in0 = Gate, in1 = Pitch CV.

PWMOsc [OSC] [FX] [SYNTH] in: Pitch (CV), FM, Pitch Mod out: Audio

Pulse-width-modulation oscillator: a variable-width square wave, from a thin nasal pulse to a full square. Width sets the duty cycle and in1 modulates it (patch an LFO for the classic fattening PWM sweep). in2 = Pitch CV.

PWMStrings [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

String-machine pad: a stack of pulse-width-modulated squares detuned into a wide ensemble with a gentle highpass, the shimmering Solina/Logan string-synth wash. Cutoff sets the body, Width the PWM motion, Level the output. in0 = Gate, in1 = Pitch CV.

Quasar [OSC] [FX] [SYNTH] in: – out: Audio

Quasar - a pulsing stream of radio-telescope beeps and bursts over cosmic static. Pulse sets the beep rate, Tone the pitch, Level the output.

Rain [OSC] [FX] [SYNTH] in: – out: Audio

Rain texture: a steady band-passed noise wash (the hiss of falling rain) under randomly-timed resonant droplet ‘plinks’ - short decaying pings at scattered pitches, the patter of drops on surfaces. Distinct from Fire’s broadband crackle: rain is a wet high wash plus pitched droplets. Self-running. Wash sets the steady rain level, Drops the droplet density, Pitch the droplet resonance, Tone the wash brightness, and Level the output. Layer instances for heavier rain; add Thunder for a storm.

RainPad [OSC] [FX] [SYNTH] in: Amount out: Audio

Rain: a steady downpour - a wash of highpassed noise speckled with random droplet ticks. Density sets the droplet rate, Tone the brightness, Level the output. in0 = Amount gate.

Recorder [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Recorder: the simple, pure, slightly-breathy whistle of the wooden recorder - a sine with a soft second harmonic and a touch of air, played by holding in0. Breath sets the air noise, Tone the second-harmonic mix, Level the output. in0 = Breath gate, in1 = Pitch CV.

ReeseBass [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Reese bass: two heavily-detuned sawtooths beating against each other through a resonant lowpass, the growling, metallic drum-and-bass / neurofunk sub-bass. Detune sets the beating rate, Cutoff the filter brightness, Reso the growl. in0 = Pitch CV.

ResoComb [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Noise-excited resonant comb: white noise fed through a tuned feedback comb rings at the pitch, giving a metallic, pitched-noise tone between a flute and a struck pipe. Reso sets the ring time, Tone the brightness.

ResonatorBank [OSC] [FX] [SYNTH] in: Audio out: Audio

Bank of three tuned resonators excited by the input - strike it with a click or noise and it rings like a struck object, feed it audio and it adds metallic, bell-like resonant body. Freq sets the fundamental, Spread detunes the upper resonators (harmonic to inharmonic), Decay the ring time, Mix the wet amount. A compact modal/Rings-style resonator.

ReverseBass [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Hardstyle / jumpstyle reverse bass: a trigger on in0 (the offbeat gate) restarts a sub that swells up from silence along an accelerating exponential - the 'reversed reverb tail' shape the genre is built on - then is hard-cut by the next trigger so it sits in the gap between kicks. A sine sub blended with a saw is driven through tanh for weight. Tune sets the pitch (in1 = Pitch CV), Swell the rise time, Curve the swell shape (higher = slower start, sharper rush at the end), Drive the distortion, and Level the output. Gate it on the off-beats against a kick on the downbeat.

Rhodes [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

FM electric piano (DX-style tine EP): a sine carrier phase-modulated by a sine at Ratio, where the modulator index decays fast to give the metallic 'tine' bark on the attack before settling to a mellow near-sine body - the warm electric piano of deep, soulful and lo-fi house. Tune sets the pitch (in1 = Pitch CV), Ratio the tine frequency ratio (higher = more bell/bark), Bark the attack FM depth (brightness / velocity), Tine how fast the bark fades, Decay the note length, and Level the output. A gate on in0 strikes the note.

Ride808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 ride cymbal: a sustained metallic ping - inharmonic squares with a tonal centre and a steady, bell-like decay, more pitched and controlled than the crash. Tone sets the brightness, Decay the ring, Level the output. Trigger on in0.

Rim909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-909 rimshot: a short, sharp, slightly-tonal click - a fast high-frequency ping under a bright noise transient, the 909's dry rim. Tune sets the ping pitch, Decay the click length, Level the output. Trigger on in0.

Rimshot [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Analog rimshot (808-style): a trigger on in0 fires a very short burst of two high resonant tones (a bright tap plus a lower ring) with an extremely fast decay for the sharp click of a rim hit. Tune sets the bright tone (the lower ring tracks it), Decay the click length (very short), and Level the output. Patch a Clock, Euclid or sequencer gate into in0.

Rimshot808 [OSC] [FX] [SYNTH] in: Trigger, Pitch out: Audio

TR-808 rimshot / claves: a trigger on in0 fires a very short, sharp pitched click with a tiny resonant ring - the tight 808 rim hit. Tune sets the pitch, Level the output. in1 = Pitch CV.

RingPair [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Two oscillators ring-modulated together: Ratio detunes the second against the first and Mix blends the ring product against the carrier for metallic, clangorous, bell-like inharmonics.

Riser [OSC] [FX] [SYNTH] in: Trigger out: Audio

Build-up riser: a trigger on in0 restarts a sweep that rises over Time seconds. White noise is driven through a resonant band-pass whose cutoff climbs while a pitch-rising sine fades in underneath and the whole thing swells in level - the classic pre-drop tension build. Time sets the sweep length, Tone balances the noise against the rising sine, Reso sets the band-pass sharpness, and Level the output. Patch a bar clock or downbeat gate into in0; the swell accelerates toward the drop.

Robot [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Robot / computer voice (sci-fi): a pulse source ring-modulated by a low metallic carrier, shaped by a formant band-pass and stepped to a new pitch at Rate (the flat, phoneme-by-phoneme 'robot talk'), then bit-crushed for digital grain - the 1980s computer-voice and droid chatter of film and game sound design. Tune sets the base pitch (in0 = Pitch CV), Rate the speech-step speed (how fast the pitch jumps), Ring the ring-mod carrier (metallic clang), Formant the vowel centre, Crush the bit-grain, and Level the output. Distinct from the Vocoder/RingMod effects - this is a self-contained robotic voice.

Sampler [OSC] [FX] [SYNTH] in: – out: Audio

Reads one of the 8 shared SampleStore slots with linear interpolation, advancing a playback position scaled by pitch and the slot/host sample-rate ratio, then scaled by Level. Slot picks the source, Pitch transposes -24 to +24 semitones, Start sets the entry point (0 to 0.99 of the buffer), and Loop chooses whether playback wraps back to Start or stops at the end. Useful for looped wavetable-style sources or one-shot sample playback depending on Loop.

Sandstorm [OSC] [FX] [SYNTH] in: – out: Audio

Desert sandstorm - a gritty mid-band noise rush with grains whipping past. Force sets the gust strength, Grit the abrasiveness, Level the output.

Saron [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Gamelan saron: a struck bronze-bar metallophone with a bright, clangy attack and a short metallic decay - the driving melodic bar of the gamelan. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

SawSync [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Hard-sync sawtooth: a slave saw is reset every time the master cycle completes, so raising Ratio above 1 forces the bright, vocal, formant-rich sweep of oscillator hard-sync. Freq sets the master pitch, Ratio the slave-to-master frequency. in0 = Pitch CV.

Sax [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Saxophone voice: a gate on in0 sounds a reedy harmonically-rich tone (a soft sawtooth) with vibrato - honking low, singing high. Freq sets the note, Tone the brightness and reediness (number of harmonics), Vibrato the waver, Level the output. Hold the gate to sustain; in1 is the Pitch CV.

Scanned [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Scanned synthesis (Mathews/Verplank): a 16-mass spring ring evolves slowly after a gate hammer-strike; a scan reads the mass positions at audio rate as the waveform. Tension/Damping shape the timbre's evolution.

ScreamLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Screaming lead: a heavily-driven saw forced through a sweeping resonant formant for a vocal, howling, distorted solo lead. Scream sets the formant sweep, Drive the distortion, Level the output. in0 = Gate, in1 = Pitch CV.

Seagulls [OSC] [FX] [SYNTH] in: – out: Audio

Seagulls - periodic descending squawk-cries over a faint shore wash for a coastal ambience. Rate sets the call frequency, Pitch the cry register, Level the output.

Shaker [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Shaker / maraca: a trigger on in0 fires a soft burst of band-passed noise with a quick 'tsh' envelope - the egg-shaker and maraca sound, all air and no pitch. Tone sets the noise band (low and dark to high and crisp), Decay the burst length, Level the output. Needs only a trigger; chain two at offset times for a swung shaker groove.

Shakuhachi [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Japanese shakuhachi: a breathy end-blown bamboo flute with a strong air component and expressive pitch bends - a sine wrapped in heavy breath noise with a subtle attack bend, played by holding in0. Breath sets the air, Bend the attack pitch slide, Level the output. in0 = Breath gate, in1 = Pitch CV.

Shamisen [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Japanese shamisen: a plucked three-string lute with a percussive snap and the buzzing 'sawari' resonance at the nut - a Karplus string with a nonlinear bridge that adds the signature gritty buzz. Decay sets the ring, Buzz the sawari amount, Level the output. Trigger on in0, in1 = Pitch CV.

Shoot [OSC] [FX] [SYNTH] in: – out: Audio

Laser shot - a fast downward pitch-zap with a bright click, the arcade blaster, auto-repeating. Rate sets the fire rate, Pitch the start frequency, Level the output.

Shriek [OSC] [FX] [SYNTH] in: – out: Audio

Shriek - a piercing high dissonant scream of two close beating tones smeared with noise. Pitch sets the height, Tone the rasp, Level the output.

SIDVoice [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Commodore 64 SID oscillator: a gritty saw/pulse blend with optional ring modulation against a sub-octave - the lo-fi 8-bit chiptune-bass voice. Shape morphs saw to pulse, Ring sets the ring-mod against the sub, Level the output. in0 = Gate, in1 = Pitch CV.

Sigmoid [OSC] [FX] [SYNTH] in: – out: Audio

Sigmoid sine-to-square oscillator (a first as a synth block): takes a pure sine and pushes it through a tanh sigmoid, so as Shape rises the sine's curves are progressively squashed flat - rounded at low Shape, then a soft-clipped near-square, then a hard square at the top. One knob sweeps the entire continuum from sine to square WITHOUT the abrupt harmonic jumps of switching waveforms or the aliasing of a raw square, because the edges stay smoothly rounded. A continuous waveform morph distinct from the fixed geometric shapes. Needs no input.

Simmons [OSC] [FX] [SYNTH] in: Trigger out: Audio

Simmons SDS electronic tom: a sine with a steep downward pitch sweep plus a noise click - the unmistakable 80s 'pew/dooo' electronic drum. Tune sets the start pitch, Sweep the pitch-drop amount, Level the output. Trigger on in0.

Siren [OSC] [FX] [SYNTH] in: – out: Audio

Rave siren oscillator: a tone whose pitch glides up and down between Low and High at Rate - the hardcore/jungle air-raid siren. Low and High set the pitch range, Rate sets how fast the pitch sweeps through the cycle, Wail skews the sweep from a smooth triangle glide toward a fast-rise / slow-fall ramp, and Level the output. A self-running source - no input needed; the glide is exponential so it tracks musically across the range.

Sitar [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Plucked sitar: a Karplus-Strong string whose bridge adds the buzzing 'jawari' overtone shimmer through a nonlinear waveshaper in the feedback loop - the droning, sympathetic-buzz character of the Indian sitar. Tune sets the pitch, Buzz the bridge nonlinearity, Level the output. Trigger on in0, in1 = Pitch CV.

SixOpFM [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Six-operator FM: three modulator-carrier pairs summed (a DX7-style parallel algorithm), for thick, layered FM pads, basses and electric pianos. Spread detunes the three pairs, Index the FM depth, Decay the index falloff. in0 = Gate, in1 = Pitch CV.

Sleighbells [OSC] [FX] [SYNTH] in: Trigger out: Audio

Sleigh bells: a bright cluster of jingling metal bells shaken together - high inharmonic metallic noise with a fast attack and a shimmering tail. Tone sets the brightness, Decay the shimmer, Level the output. Trigger on in0.

Slenthem [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Gamelan slenthem: the lowest, softest tube-resonated metallophone - a mellow, round low bar with a gentle attack and a smooth decay. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Snare [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Analog snare drum: a trigger on in0 fires two detuned body tones plus a burst of band-passed noise (the snare wires). Tune sets the body pitch, Snap the noise level, Tone the body/noise balance, Decay the length, and Level the output.

Snare606 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-606 snare drum: a thin, buzzy snare - a short tonal body under a bright burst of highpassed noise, cheaper and more lo-fi than the 808, the gritty Drumatix backbeat. Tone sets the body-vs-noise balance, Decay the length, Level the output. Trigger on in0.

Snare707 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-707 snare drum: a tight, bright, slightly-digital snare - a short tonal body under a crisp highpassed noise crack, the 707's punchy backbeat. Tone sets the body-vs-noise balance, Decay the length, Level the output. Trigger on in0.

Snare808 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-808 snare drum: a trigger on in0 fires two detuned tone oscillators (the 808's shell body) plus a burst of filtered noise (the snappy wires), each with its own decay. Snappy balances the tonal body against the noise, Decay sets the length, Level the output - the dry, snappy 808 backbeat.

Snare909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-909 snare drum: brighter and noisier than the 808 - a short tonal thwack under a long crack of highpassed white noise, the punchy house/techno snare. Tone sets the body-vs-noise balance, Decay the noise length, Level the output. Trigger on in0.

SnareRoll [OSC] [FX] [SYNTH] in: Gate out: Audio

Build-up snare roll: while the gate on in0 is held, fires band-passed noise hits (snare / clap) at a rate that accelerates from Start to End over the Accel ramp - the pre-drop EDM snare roll that speeds up into the drop. Start and End set the hit rate at the beginning and end of the build (End higher = it speeds up), Accel the ramp time, Tone the noise brightness, Decay the per-hit length, and Level the output. Hold the gate over the build bar and release it at the drop.

Snore [OSC] [FX] [SYNTH] in: – out: Audio

Snoring - a rhythmic buzzy growl on the in-breath with a softer snort on the out-breath. Rate sets the breath pace, Tone the rasp, Level the output.

SolarWind [OSC] [FX] [SYNTH] in: – out: Audio

Solar wind - a vast shifting cosmic-noise drone with a faint pitched whistle drifting through it. Flux sets the movement, Tone the brightness, Level the output.

Sonar [OSC] [FX] [SYNTH] in: – out: Audio

Submarine sonar - a clean periodic ping with a long ringing tail. Rate sets the ping interval, Pitch the ping frequency, Level the output.

Speech [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Vowel/speech synthesizer (Mutable Instruments / SAM-style): a buzzing saw source is shaped by three formant band-passes tuned to vowel sounds, so it sings. Vowel morphs through A-E-I-O-U; Speak, when above zero, auto-advances the vowel at that rate for talking/chanting textures; Tune sets the pitch. A formant voice for choirs, robots and vocal pads. Distinct from the Formant filter (which colours external audio) and Vosim (a single grain pair) - this sweeps a vowel sequence over its own oscillator.

Spire [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Spire-style multimode oscillator: sums up to 9 unison voices, each rendered by the selected Mode (Classic saw, Noise, FM, AMSync, SawPWM, HardFM, Vowel) with the sum normalized by the voice count. Mode picks the algorithm, Shape is the per-mode control (FM index, sync ratio, pulse width, or vowel position), Voices sets unison count (up to 9, matching Spire), Detune the fine +/-3% spread, and Interval fans the voices out over a musical interval (0-12 semitones, e.g. octave/fifth stacks). The Vowel mode adds three morphing formant band-passes over the summed saw for talking-synth timbres.

SquareArmy [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

A wall of detuned pulse waves with movement: Voices sets how many, Detune spreads them, and Width is the pulse-width (square at 0.5) that an internal LFO slowly drifts for a hollow PWM ensemble.

SquareLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Square-wave lead: the classic hollow chiptune/synth square lead with a gentle vibrato. Vibrato sets the wobble, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

SquareNumOsc [OSC] [FX] [SYNTH] in: – out: Audio

Square-number oscillator (a first as a synth block): an additive tone (NOT a square wave) whose overtones sit on the perfect squares - the 1st, 4th, 9th, 16th, 25th… harmonics. Because the partials thin out quadratically, the few that remain are widely and unevenly spaced, giving a clear, glassy, almost-pure tone with a faint metallic ring - the spectral fingerprint of the squares. Partials sets how many square overtones to sound, alias-free up to Nyquist. A figurate spectrum distinct from the triangular and prime oscillators. Needs no input.

Stab [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Chord stab: a trigger on in0 fires a detuned-saw triad (root, third, fifth) through a fast amp-and-filter pluck envelope - the staccato house/trance organ-stab voice. Tune sets the root pitch (in1 = Pitch CV), Chord picks the voicing (0 major / 1 minor / 2 sus4 / 3 power-octave), Detune spreads paired saws per note for width, Decay sets the stab length, Cutoff the low-pass brightness, and Level the output. Distinct from the MIDI Chord block: a self-contained audio voice, not a note processor.

Static [OSC] [FX] [SYNTH] in: – out: Audio

Radio static - white-noise hiss with random crackle bursts and a faint drifting carrier whine, the between-stations sound. Noise sets the hiss level, Tune the whine pitch, Level the output.

Steam [OSC] [FX] [SYNTH] in: Trigger out: Audio

Steam / pressure release: a trigger on in0 vents a burst of band-passed noise - the hydraulic 'psssh' / hiss of escaping gas, valves and pneumatics - with a sharp attack and a decaying tail whose filter falls as the pressure drops. The mech, robot-joint and steam-pipe sound of film and game design. Tone sets the hiss brightness, Hole the resonance (how whistling / pitched the leak is), Decay the vent length, Sweep how far the filter falls as it decays, and Level the output. Trigger per vent.

Steeldrum [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Struck steelpan (steel drum): a bright metallic note from partials near 1 : 2 : 2.8 : 4 with a medium shimmering decay - the sunny Caribbean steelpan timbre. Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Steelpan [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal steelpan (steel drum): a trigger on in0 strikes a tuned note on an oil-drum face - a bright shimmering tone with near-harmonic partials (1 : 2 : 3 : 4) and a metallic edge, medium sustain. Tune sets the pitch, Decay the ring, Shimmer the upper-partial brightness, and Level the output.

Stinger [OSC] [FX] [SYNTH] in: – out: Audio

Horror stinger - a sudden dissonant cluster stab with a sharp attack and fast decay, the jump-scare hit, auto-repeating. Rate sets the interval, Tone the harshness, Level the output.

Stream [OSC] [FX] [SYNTH] in: – out: Audio

Babbling brook - bright filtered noise with random water gurgles for a flowing-stream ambience. Flow sets the gurgle activity, Tone the brightness, Level the output.

StretchOsc [OSC] [FX] [SYNTH] in: – out: Audio

Stretched-harmonic oscillator (a first as a synth block): models the inharmonicity of a real struck or plucked string, where stiffness makes each overtone sharper than a perfect multiple - partial k sits at ksqrt(1 + Stretchk^2) instead of exactly k. That tiny upward stretch, growing with each partial, is what gives a piano its warm, slightly detuned brilliance and a struck metal bar its character. Stretch sets the amount (0 = perfectly harmonic, up = ever more bell-like). Partials sets how many to stack. A physically-modelled inharmonic spectrum distinct from the golden and integer oscillators. Needs no input.

StringMachine [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Vintage divide-down string ensemble: a full sawtooth chord run through a triple-chorus for the lush, shimmering 70s string-synth pad. Ensemble sets the chorus depth and Tone the brightness.

Strings [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

Orchestral string section: a wide ensemble of detuned saws with a slow bowed attack, section vibrato and a warm low-pass body - the sustained legato strings of cinematic and Zimmer-style scoring. Distinct from the Solina BBD ensemble effect (which colours an input) and the single Bowed string: this is the full section as a voice. Tune sets the pitch (in1 = Pitch CV), Ensemble the detune spread (section width and beating), Attack the bow swell time, Vibrato the section pitch waver, Tone the brightness, and Level the output. A gate on in0 bows the note; hold for long legato.

StruckTube [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Struck open tube / pipe: a hollow, woody-metallic pitched 'tonk' from striking an open pipe, ringing on its odd harmonics (1 : 3 : 5 : 7). Tune sets the pitch, Decay the ring, Level the output. Trigger on in0, in1 = Pitch CV.

Stylophone [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Stylophone: the buzzy, lo-fi stylus-organ - a bright square with a fast vibrato and a slightly unstable pitch, the 60s pocket-synth toy, played by holding in0. Vibrato sets the wobble, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Sub [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Dedicated sub oscillator: runs a single phase at Freq dropped by Octave, outputting either a sine or a square, then scaled by Level. Octave shifts down 0, 1, or 2 octaves, Wave selects sine or square, and Level sets the output gain. Use it to add low-end weight under a main oscillator, with sine for clean sub and square for a harder, more present low end.

Sub808 [OSC] [FX] [SYNTH] in: Gate, Pitch (CV) out: Audio

808 sub-bass: a tuned sine sub with a short downward pitch-drop attack (the TR-808 bridged-T 'damped sine' punch), portamento glide between notes for the trap-style slide, an octave-up layer for midrange, and parallel saturation that adds upper harmonics so the sub translates on small speakers. Tune sets the pitch (in1 = Pitch CV), Glide the portamento time, Punch the pitch-drop attack, Decay the note length, Drive the parallel saturation, and Level the output. A gate on in0 strikes the note; lives in the 30-80 Hz sub range.

SubBoom [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Devastating sub-bass oscillator: a sine fundamental reinforced with two subharmonics an octave and two octaves below, then driven into saturation. Sub sets the lower-octave weight and Drive the harmonic grit so it cuts on small speakers.

SubGrowl [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Sub-growl bass: a deep sine sub blended with a driven, growling harmonic layer - clean weight at the bottom with grit on top. Growl sets the harmonic drive, Sub the sub level, Level the output. in0 = Gate, in1 = Pitch CV.

SubharmonicOsc [OSC] [FX] [SYNTH] in: – out: Audio

Undertone-series oscillator (a first as a synth block): the mirror image of an ordinary tone - instead of stacking overtones ABOVE the fundamental it stacks the UNDERTONE series below it (f, f/2, f/3, f/4…), the descending ratios that Harry Partch and the old harmoniums explored. The fundamental sits at the TOP and the partials descend, giving a deep, hollow, slightly unsettling body quite unlike any overtone-based saw or square. Partials sets how many undertones to stack. A subharmonic spectrum distinct from every overtone oscillator. Needs no input.

Subway [OSC] [FX] [SYNTH] in: – out: Audio

Subway train - rhythmic rail-joint clatter over a rolling rumble, with brake squeals. Speed sets the clatter tempo, Tone the metallic brightness, Level the output.

SuperPWM [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Supersaw built from detuned pulse waves: stacks several pulse oscillators spread symmetrically in tuning and averages them for a thick unison. Freq sets the center pitch, Detune spreads the voices apart in tuning, Width sets the pulse

duty cycle (timbre), Voices sets how many oscillators stack, and Level scales the output. High detune and voice counts give wide, rich pad and lead tones.

SuperSquare [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Super-square: seven detuned pulse oscillators stacked into one huge unison voice - the square-wave cousin of the supersaw, giving a wide, hollow, chorused wall of sound for hardstyle leads and fat basses. Detune spreads the seven copies, Mix balances the centre against the detuned pack. in0 = Pitch CV.

SuperTri [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Detuned triangle stack: up to 9 triangle voices spread by Detune for a soft, hollow, flute-like unison with none of a saw's bite. Voices sets the thickness. A mellow alternative to the supersaw.

Surdo [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal surdo: a trigger on in0 strikes the deep Brazilian samba bass drum - a very low membrane (modes near 1 : 1.8) with a long booming decay and a slow pitch drop, the heartbeat under a samba bateria. Tune sets the low pitch, Decay the long boom, Mute tightens it toward a damped stroke, Level the output. Trigger from a Clock, Euclid or sequencer.

Susaw [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Massive X super-saw: sums 7 saws spread across a detune range, with a slow random drift added to the base frequency, then scaled by Level. Detune sets the +/-3% spread between voices, Blend lowers the 6 side voices relative to the loud centre voice, and Drift sets how much the wandering frequency offset is applied. Higher Blend gives a wider unison wash; lower Blend keeps the centre pitch dominant for a tighter lead.

Sword [OSC] [FX] [SYNTH] in: Trigger out: Audio

Sword / blade SFX: a trigger on in0 fires a bright metallic swish - a band-passed noise whoosh as the blade cuts the air, layered with ringing inharmonic metal partials (the steel 'shing') that shimmer and decay. The unsheathe, swing and parry of film and game sound design. Tone sets the swish brightness, Ring the metallic-resonance level, Pitch the ring fundamental, Decay the ring length, and Level the output. Trigger per swing.

Sync [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Hard-sync oscillator: a slave saw runs at Sync times the master frequency and is reset to zero each time the master phase wraps, producing the classic sync-sweep timbre, then scaled by Level. Freq sets the master pitch and Sync sets the slave ratio (1 to 6). Higher Sync ratios add brighter, more formant-like harmonics from the forced phase resets.

SyncLead [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Hard-sync lead: a slave saw reset by a master each cycle, swept by Sync for the bright, vocal, tearing sync sweep - the classic aggressive synth lead. Sync sets the slave ratio, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Tabla [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal tabla: a trigger on in0 strikes a tuned Indian hand drum whose loaded membrane gives near-harmonic modes (1 : 2 : 3 : 4) plus its signature pitch-bend - the fundamental swoops as it rings, the singing 'tun' of the dayan. Tune

sets the pitch, Decay the ring, Bend how far the pitch glides during the hit, Level the output. Trigger from a Clock, Euclid or sequencer.

Taiko [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Cinematic taiko drum: a trigger on in0 strikes a deep membrane - a sine body with a fast downward pitch bend (the skin tensioning), an inharmonic mode for the skin 'thwack', and a wooden stick-attack click - decaying with the round boom of a big Japanese drum. The epic ensemble percussion of trailer and Zimmer-style scoring. Tune sets the pitch (in1 = Pitch CV), Bend the attack pitch-drop depth, Decay the boom length, Stick the wooden attack-click level, Skin the inharmonic body character, and Level the output. Trigger from a Clock, Euclid or sequencer; layer several for an ensemble.

TaikoBig [OSC] [FX] [SYNTH] in: Trigger out: Audio

Big taiko drum: a deep, thunderous Japanese barrel drum - a low pitch-swept membrane boom with a hard wooden attack and a long resonant decay. Tune sets the pitch, Decay the boom, Level the output. Trigger on in0.

Tambourine [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal tambourine: a trigger on in0 shakes a ring of jingles - a cluster of high, bright, inharmonic metallic partials that shimmer and ring, struck with a noise transient. Tune sets the jingle pitch, Decay the shimmer length, Jingle the metallic-partial richness, Level the output. Trigger from a Clock, Euclid or sequencer for tambourine hits.

Tannerin [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Tannerin / electro-theremin: a controllable slide oscillator - a pure sine you glide in pitch (the 'Good Vibrations' sound), simpler to play than a true theremin. Glide sets the portamento, Tone the harmonic richness, Level the output. in0 = Gate, in1 = Pitch CV.

Teleport [OSC] [FX] [SYNTH] in: – out: Audio

Teleport - a shimmering upward sweep that dissolves into sparkle, the sci-fi beam-out, auto-repeating. Rate sets the interval, Tone the shimmer brightness, Level the output.

Telharmonium [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Telharmonium: the 1897 additive tonewheel organ (the first electronic instrument) - a pure sum of sine harmonics with no filter, giving a clean, glassy, drawbar-organ tone. Bright mixes in the upper harmonics, Level the output. in0 = Gate, in1 = Pitch CV.

Tension [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Cinematic tension drone: a slowly evolving underscore bed - a low cluster of detuned voices (root, fifth, octave, twelfth) that beat and drift against each other, swept by a slow filter LFO over a bed of filtered air noise - the sustained dread under a Zimmer-style scene. Self-running. Tune sets the root pitch (in0 = Pitch CV), Motion how fast the detuning and filter drift evolve, Width the cluster spread (dissonance), Noise the air-bed level, Tone the filter base frequency, and Level the output. Automate Tune for rising or falling tension.

TheraminOsc [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

A smooth, expressive lead sine with a gentle vibrato and portamento glide between pitch changes - the theremin/whistle voice. Vibrato sets the wobble depth and Glide the portamento time.

Theremin [OSC][FX][SYNTH] in: Pitch CV, Volume out: Audio

Theremin: a continuously-pitched sine voice with a warm vibrato, its pitch played by in0 (1V/oct) and its loudness by in1 - the hands-in-the-air theremin glide. Tune sets the base pitch, Vibrato the wobble depth, Level the output. in0 = Pitch CV, in1 = Volume CV.

Theta [OSC][FX][SYNTH] in: – out: Audio

Jacobi-theta oscillator (a first as a synth block): synthesises the theta function - a periodic version of the Gaussian bell, built as a cosine series whose harmonic k is weighted by q to the power k-squared. As Width (the q value) rises toward 1 those weights stay strong for many harmonics, so the bell sharpens into a narrow spike-train; as it falls the upper harmonics vanish and it rounds back toward a pure sine. A continuous sine-to-pulse morph rooted in one of the deepest functions in mathematics, distinct from a PWM or a filtered pulse. Needs no input.

Throat [OSC][FX][SYNTH] in: Gate, Pitch CV out: Audio

Throat singing (khoomei): a low buzzing drone with a single sharp overtone whistling above it, swept by Overtone - the Tuvan harmonic-singing voice. Overtone selects the emphasized harmonic, Drone the fundamental weight, Level the output. in0 = Gate, in1 = Pitch CV.

Thruster [OSC][FX][SYNTH] in: – out: Audio

Rocket thruster - a roaring filtered-noise blast with a low combustion body and pressure flutter. Thrust sets the power, Tone the brightness, Level the output.

ThueOsc [OSC][FX][SYNTH] in: – out: Audio

Thue-Morse oscillator (a first as a synth block): an additive tone that keeps harmonic k only when k is a Thue-Morse 'odious' number - one whose binary digits sum to an ODD count (1, 2, 4, 7, 8, 11…). Because the keep/drop pattern is the self-similar Thue-Morse sequence, the spectrum is fractal: the same fair-share thinning repeats at every octave, producing a hollow, evolving timbre with a built-in self-similar comb. Partials sets the highest harmonic considered, alias-free up to Nyquist. A self-similar spectrum distinct from the prime and Fibonacci oscillators.

Thunder [OSC][FX][SYNTH] in: Trigger out: Audio

Thunderclap: a trigger on in0 fires a sharp crack (a band of noise) followed by a deep brown-noise sub rumble that swells then rolls away over several seconds - the storm thunder of film sound design. Crack sets the initial snap level, Rumble the sub-rumble depth, Roll the length of the rolling tail, Tone the low-pass darkness of the rumble, and Level the output. Trigger over a Rain bed for a storm; short Roll reads as a near strike, long Roll as distant.

ThunderHit [OSC][FX][SYNTH] in: Trigger out: Audio

Thunder: a deep, rolling thunderclap - a low rumble of filtered noise and a sub sweep that booms then tumbles away. Tune sets the depth, Decay the roll, Level the output. Trigger on in0.

Timbale [OSC][FX][SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal timbale: a trigger on in0 strikes a shallow metal-shell drum - a tuned head plus the bright metallic inharmonic ring of the steel shell (modes near 1 : 2.7 : 4.2), the cutting crack of salsa and Latin percussion. Tune sets the pitch, Decay the ring, Ring the metallic shell brightness, Level the output. Trigger from a Clock, Euclid or sequencer.

Timpani [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Tuned kettledrum (timpani): the prominent near-harmonic membrane modes (1 : 1.5 : 1.98 : 2.44 : 2.9) that give a kettledrum its definite pitch, with a soft attack thump and a downward pitch drop as the head settles. Tune sets the pitch, Decay the boom length, Level the output. Trigger on in0, in1 = Pitch CV.

Tom [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Analog tom drum: a trigger on in0 fires a sine whose pitch bends down from Tune with a gentler sweep than the Kick (no sub click), plus a short noise transient for stick attack. Tune sets the fundamental, Bend the pitch-drop amount, Decay the body length, Tone the attack-noise blend, and Level the output - the synthesized 808/909-style tom (low/mid/high by Tune). Patch a Clock, Euclid or sequencer gate into in0.

Tom808 [OSC] [FX] [SYNTH] in: Trigger, Pitch out: Audio

TR-808-style tom: a trigger on in0 fires a tuned sine with a downward pitch sweep and a medium decay - the round, pitched 808 tom/conga. Tune sets the pitch, Decay the length, Sweep the pitch-drop amount, Level the output. in1 = Pitch CV.

Tom909 [OSC] [FX] [SYNTH] in: Trigger out: Audio

TR-909 tom: a punchy pitch-swept tom with a touch of noise grit, brighter and tighter than the 808 tom, the house/techno fill voice. Tune sets the pitch, Decay the length, Level the output. Trigger on in0.

Tornado [OSC] [FX] [SYNTH] in: – out: Audio

Tornado - a vast roaring vortex: deep filtered-noise roar with a low rotating tone and debris. Fury sets the roar intensity, Tone the upper shriek, Level the output.

Traffic [OSC] [FX] [SYNTH] in: – out: Audio

City traffic - a low layered road rumble with occasional passing-car doppler swooshes and distant horns. Density sets the activity, Tone the brightness, Level the output.

TrainWhistle [OSC] [FX] [SYNTH] in: – out: Audio

Train horn - a rich chord of detuned tones blaring with a slow doppler bend, the classic locomotive whistle. Pitch sets the key, Tone the brightness, Level the output.

Trautonium [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Trautonium: Oskar Sala's gliding subharmonic synthesizer - a sawtooth plus its strong subharmonics (f/2, f/3) for a rich, formant-heavy, organ-meets-string voice. Sub sets the subharmonic mix, Tone the brightness, Level the output. in0 = Gate, in1 = Pitch CV.

Triangle [OSC][FX][SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal triangle: a trigger on in0 strikes a metal triangle - a cluster of high inharmonic metallic partials with a long, bright, shimmering ring that sits on top of a mix. Tune sets the pitch, Decay the long sustain, Shimmer the upper-partial brightness, Level the output. A clean, sustained metallic ping, unlike the short noisy shakers. Trigger from a Clock, Euclid or sequencer.

TriangleDrum [OSC][FX][SYNTH] in: Trigger out: Audio

Struck triangle / metallic ping: four inharmonic high partials rung together with a long shimmering decay - the bright, bell-like triangle and finger-cymbal sparkle for percussion accents. Tune sets the pitch, Decay the ring time, Level the output. Trigger on in0.

TriangularOsc [OSC][FX][SYNTH] in: – out: Audio

Triangular-number oscillator (a first as a synth block): an additive tone whose overtones land on the triangular numbers - the 1st, 3rd, 6th, 10th, 15th, 21st… harmonics (k(k+1)/2). The gaps between partials grow by one each step, so the spectrum starts dense and thins out smoothly as it climbs, giving a clear-but-airy body that sits between a full harmonic saw and a sparse sine stack. Partials sets how many triangular overtones to sound, alias-free up to Nyquist. A figurate-number spectrum distinct from the prime and Fibonacci oscillators. Needs no input.

TritaveOsc [OSC][FX][SYNTH] in: – out: Audio

Bohlen-Pierce (tritave) oscillator (a first as a synth block): a tone built from ODD harmonics only (1, 3, 5, 7, 9, 11…), with no even partials at all - the spectrum that fits the Bohlen-Pierce scale, which divides the TRITAVE (a 3:1 ratio, an octave plus a fifth) into 13 steps instead of dividing the octave. With only odd harmonics it has a hollow, clarinet-like purity, and it consonates with the strange non-octave intervals of BP music. Partials sets how many odd harmonics to stack, alias-free up to Nyquist. A non-octave timbre distinct from the usual harmonic oscillators. Needs no input.

Trombone [OSC][FX][SYNTH] in: Breath, Pitch CV out: Audio

Trombone: the brassy, slightly-buzzy mid-brass - a sawtooth pushed through a brass formant with a slow swell and breath, played by holding in0. Brass sets the formant bite, Breath the air, Level the output. in0 = Breath gate, in1 = Pitch CV.

Trumpet [OSC][FX][SYNTH] in: Gate, Pitch (CV) out: Audio

Trumpet voice: a gate on in0 sounds a bright brassy tone - harmonically rich with a brass-like formant peak that opens up as the note swells in. Freq sets the note, Bright the brassiness (upper-harmonic weight), Vibrato the waver, Level the output. Hold the gate to sustain; in1 is the Pitch CV.

Tuba [OSC][FX][SYNTH] in: Breath, Pitch CV out: Audio

Tuba: the deep, round, powerful low brass - a sawtooth through a low formant and lowpass with a slow swell, played by holding in0. Brass sets the bite, Breath the air, Level the output. in0 = Breath gate, in1 = Pitch CV.

TubeOsc [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Waveguide wind/tube oscillator: a delay-line resonator excited by breath noise models a flute or pipe. Breath sets the noise excitation and Tone the resonance damping - airy, organic pitched wind tones.

TubularBell [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Struck tubular bell / chime: five inharmonic partials (1 : 2.76 : 5.4 : 8.93 : 13.3) with a long shimmering decay and a metallic strike, the orchestral tubular-bell and clock-chime voice. Tune sets the pitch, Decay the ring time, Level the output. Trigger on in0, in1 = Pitch CV.

Typewriter [OSC] [FX] [SYNTH] in: – out: Audio

Typewriter - mechanical key clacks at a typing rhythm with the occasional carriage ding. Rate sets the typing speed, Tone the clack brightness, Level the output.

Udu [OSC] [FX] [SYNTH] in: Trigger out: Audio

Udu clay pot drum: a deep, hollow, tuned 'boop' from striking the pot's mouth, plus a finger-slap transient - a pitch-dropping sine with a noise click. Tune sets the pitch, Decay the boom, Level the output. Trigger on in0.

VAnalog [OSC] [CIRCUIT] [FX] [SYNTH] in: Pitch (CV) out: Audio

Virtual-analog oscillator: saw or pulse (Wave) with adjustable pulse width (PWM), a square sub-oscillator an octave down (Sub), and slow random Drift for analog pitch instability. Level scales the output. A warm, slightly unstable VA voice - pair with the Mini/Jup-8 analog filters for a classic synth chain.

VectorOsc [OSC] [FX] [SYNTH] in: Pitch CV out: Audio

Vector-synthesis oscillator: blends four waveforms - sine, saw, square and triangle - placed at the corners of an XY pad, with X and Y crossfading smoothly between them (the Prophet-VS / Korg Wavestation vector joystick). Sweep X/Y for evolving timbres from one oscillator. in0 = Pitch CV.

VelvetNoise [OSC] [FX] [SYNTH] in: – out: Audio

Velvet noise - sparse random impulses instead of dense hiss, giving a smooth, airy decorrelated texture used in reverb and diffusion. Density sets the impulse rate, Level the output.

Vibraphone [OSC] [FX] [SYNTH] in: Trigger, Pitch (CV) out: Audio

Modal vibraphone: a trigger on in0 strikes an aluminium bar (inharmonic partials 1 : 4 : 10, a metal cousin of the marimba) with a long shimmering sustain, plus the characteristic motor tremolo - an amplitude vibrato. Tune sets the pitch, Decay the (long) ring, Vibrato the tremolo depth, and Level the output.

Vibraslap [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Modal vibraslap: a trigger on in0 cracks the ball against the wooden box, then the loose pins rattle and buzz as they ring out - the sharp 'crack-brrrrr' heard at the top of so many percussion breaks. Tone sets the rattle brightness, Decay how long the pins buzz, Level the output. Needs only a trigger.

VocalFilter [OSC] [FX] [SYNTH] in: Audio out: Audio

Vowel / formant filter: three resonant formant peaks tuned to the vowels A-E-I-O-U, with Vowel morphing continuously between them and Reso setting the formant sharpness - turns any bright source into a talking, vocal timbre. A morphable vowel bank, distinct from the single Formant block.

VocalFry [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Vocal fry: the low, creaky glottal rattle at the bottom of the voice - sparse, jittery pulses through a vocal formant. Rate sets the creak speed, Vowel the formant, Level the output. in0 = Gate, in1 = Pitch CV.

VowelFormant [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Formant oscillator that imposes vowel resonances on a buzzy source: Vowel morphs through A-E-I-O-U formant pairs and Q sharpens the peaks, turning a saw into a singing, talking timbre.

VoxPad [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Synth-vox pad: a robotic, two-formant vocal pad on detuned pulses, morphing through vowels - the talking, choir-machine sound of vintage string synths. Vowel morphs the vowel, Width the detune, Level the output. in0 = Gate, in1 = Pitch CV.

Walsh [OSC] [FX] [SYNTH] in: – out: Audio

Walsh-function oscillator (a first as a synth block): builds its waveform from the Walsh functions - the SQUARE-wave orthogonal basis that does for digital signals what sines do for analogue, used in the Hadamard transform. Each one is a product of doubling square waves, so the output is a hard +/-1 pattern with exactly Sequency sign-changes per cycle (sequency being the square-wave equivalent of frequency). The result is a buzzy, bit-exact, distinctly digital timbre - a complete non-sinusoidal basis rather than a filtered square. Sequency picks which Walsh function to sound. Needs no input.

Warp [OSC] [FX] [SYNTH] in: Pitch (CV) out: Audio

Phase-warping oscillator: a master phase feeds a base waveform but is reshaped by one of several Mode warps (Neutral, Wrap, Grain, Hardsync, Hard Up-Down, Bend, Mirror, Random, Jitter) before the wave is read. Wave picks the base shape (sine, saw, square, triangle), Mode selects the warp, Amount sets warp depth, and Ratio scales the slave frequency for the sync modes. Pushing Amount drives anything from subtle phase bend to per-sample jitter noise depending on Mode.

WarpOsc [OSC] [FX] [SYNTH] in: – out: Audio

Spectral-warp oscillator (a first as a synth block): a single knob that bends the whole harmonic series. Each partial sits at k raised to the power Warp, so at Warp = 1 it is an ordinary harmonic saw; below 1 the partials crowd together (a compressed, dense, organ-like spectrum) and above 1 they spread apart into an ever-more-inharmonic, bell-to-clangorous timbre. Sweeping Warp morphs continuously from harmonic to inharmonic - a one-control spectral stretch unlike any fixed waveform. Partials sets how many to stack, alias-free up to Nyquist. Needs no input.

Water [OSC] [FX] [SYNTH] in: – out: Audio

Water / bubbles: randomly-triggered bubble 'bloops' - sine pings whose pitch rises sharply as they pop (the physical bubble model Asin(2pift)*e^-bt with rising f) - over an optional flowing-noise wash, the stream, drip and underwater sound of film sound design. Distinct from Rain's falling droplet plinks: bubbles sweep up. Self-running. Flow sets the stream-noise level, Bubbles the pop density, Pitch the bubble base frequency, Spread the random pitch range, and Level the output.

Waterphone [OSC] [FX] [SYNTH] in: Bow out: Audio

Waterphone: the eerie, bowed-metal horror-film instrument - several inharmonic metal-rod resonances with a slow random glissando, played by holding in0 as bow pressure. Density sets the resonance spread, Glide the pitch wander, Level the output. in0 = Bow gate.

WaveScan [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Additive harmonic scanner: sums a series of sine partials whose amplitudes follow a power-law roll-off, then normalizes the result. Freq sets the fundamental, Harmonics sets how many partials are stacked, Scan tilts the spectrum from bright (all harmonics equal at 0) toward dark (fundamental only as it approaches 1), and Level scales the output. Sweep Scan for a sawtooth-to-sine timbral morph.

Wavetable [OSC][FX][SYNTH] in: – out: Audio

Wavetable oscillator: it advances a phase at Freq and reads single-cycle frames loaded from the node config, interpolating both within and between frames. Position (0 to 1) morphs across the frame stack, Warp (-1 to +1) phase-distorts the read pointer for timbral bending, Freq sets pitch (20 to 8000 Hz), and Level scales output. A pure generator (no inputs) that sweeps from one waveform to another as Position moves.

WaveTerrain [OSC][FX][SYNTH] in: – out: Audio

Wave-terrain synthesis: a Lissajous orbit traverses a 2D polynomial surface z=f(x,y); the height is the output. Warp tilts the orbit, Ratio sets its y/x frequency.

Weierstrass [OSC][FX][SYNTH] in: – out: Audio

Fractal-waveform oscillator (a first as a synth block): synthesises the Weierstrass function - the textbook curve that is continuous everywhere but differentiable nowhere - as a self-similar audio tone, summing eight cosine octaves whose frequencies climb by Lacunarity and amplitudes fall by Detail. The result is infinitely jagged: zoom in at any scale and the same roughness repeats. Detail sets the high-frequency weight (roughness/brightness) and Lacunarity the gap between layers. A genuinely fractal timbre, not a filtered or wavefolded one.

WestCoast [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Buchla-style west-coast oscillator: a pure sine driven into a sine wavefolder. Fold sets how hard it folds (sparse to dense harmonics) and Symmetry biases the fold for even-harmonic, brassy timbres - timbre from folding, not filtering.

Whale [OSC][FX][SYNTH] in: – out: Audio

Whale song - slow, deep, pitch-bending moans drifting through an underwater haze. Calls sets how often, Pitch the depth, Level the output.

Whip [OSC][FX][SYNTH] in: Pitch (CV) out: Audio

Whip crack / slapstick: a trigger on in0 fires a single sharp crack - a fast burst of bright band-passed noise with a quick downward zip, the slapstick thwack and whip-crack of cartoon and orchestral percussion. Tone sets the brightness of the crack, Decay its (very short) length, Level the output. Needs only a trigger.

Whisper [OSC][FX][SYNTH] in: – out: Audio

Whispering voice - breathy mid-band noise gated into syllable-like bursts. Pace sets the syllable rate, Tone the sibilance, Level the output.

Whistle [OSC] [FX] [SYNTH] in: Breath, Pitch CV out: Audio

Human whistle / piccolo-pure tone: an almost-sinusoidal voice with a gentle vibrato and a faint breath hiss, played by holding in0. Tune sets the pitch, Vibrato the wobble depth, Level the output. in0 = Breath gate, in1 = Pitch CV.

Whoosh [OSC] [FX] [SYNTH] in: Trigger out: Audio

Transition whoosh: a trigger on in0 fires a band-passed noise swish whose loudness and filter both swell to a peak at the mid-point then fall away - the air pass-by used for cuts, swipes and reveals in film and trailers. A doppler-style arc, not a tonal riser. Time sets the pass duration, Tone the filter centre the sweep peaks at, Reso the band sharpness, Body a low-rumble layer for weight, and Level the output.

Wind [OSC] [FX] [SYNTH] in: – out: Audio

Wind texture from filtered noise: white noise is fed through a resonant TPT band-pass whose center frequency is modulated by a slow 0.3 Hz gust LFO. Cutoff sets the band-pass center frequency, Reso sets the resonance (how whistling/pitched the noise becomes), Gust scales the LFO cutoff sweep depth, and Level scales the output. Produces ambient wind, breath and atmospheric beds.

WindChimes [OSC] [FX] [SYNTH] in: – out: Audio

Wind chimes - randomly struck tuned metal tubes (FM bells on a pentatonic scale) drifting in a breeze. Activity sets how often they ring, Tone the metallic brightness, Level the output.

WindPad [OSC] [FX] [SYNTH] in: Amount out: Audio

Wind: a howling, gusting wind texture - white noise through a resonant bandpass whose pitch and level wander randomly, from a gentle breeze to a storm. Gust sets the wander, Pitch the centre, Level the output. in0 = Amount gate.

WobbleBass [OSC] [FX] [SYNTH] in: Gate, Pitch CV out: Audio

Dubstep wobble bass: a sawtooth through a resonant lowpass swept by a built-in LFO - the talking, wobbling bass of dubstep. Wobble sets the LFO rate, Cutoff the centre, Drive the grit. in0 = Gate, in1 = Pitch CV.

Wolves [OSC] [FX] [SYNTH] in: – out: Audio

Wolf pack - mournful howls that glide up to a sustained pitch and fall away, layered for a pack. Howls sets how often they call, Pitch the howl register, Level the output.

Woodblock [OSC] [FX] [SYNTH] in: Trigger, Pitch out: Audio

Woodblock / clave: a trigger on in0 fires a short, bright resonant ping - the dry, percussive wood knock. Tune sets the pitch, Decay the ring length, Level the output. in1 = Pitch CV.

Wormhole [OSC] [FX] [SYNTH] in: – out: Audio

Wormhole - a swirling vortex of FM-swept tones spiralling through space-time. Swirl sets the sweep rate, Tone the brightness, Level the output.

Wurlitzer [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Wurlitzer electric piano: a reedy tine voice - a sine fundamental with an odd-harmonic bark on the attack and a warm, woody decay, the bluesy 200A timbre. Tone sets the bark brightness, Decay the note length, Level the output. Trigger on in0, in1 = Pitch CV.

Xylophone [OSC] [FX] [SYNTH] in: Trigger, Pitch CV out: Audio

Struck wooden bar (xylophone): a bright modal voice from three inharmonic partials tuned 1 : 3 : 6 like a rosewood bar, with the high partials decaying fastest for the characteristic hard, woody 'tock'. Tune sets the pitch, Decay the ring (short = staccato), Level the output. Trigger on in0, in1 = Pitch CV.

Zap [OSC] [FX] [SYNTH] in: Trigger out: Audio

Psytrance zap: a trigger on in0 fires a fast descending pitch sweep - a bright saw that drops from Top times the pitch down to Tune in a few milliseconds with a short decay, the classic laser/zap blip and FX accent. Tune sets the landing pitch, Top the start-pitch multiplier (sweep height), Fall the sweep speed, Decay the blip length, and Level the output. Distinct from Impact: a bright high descending laser, not a deep sub boom.

Pitch (14)

Doppler [PIT] [FX] [SYNTH] in: Audio, Trigger out: Audio

Doppler pass-by: makes the input sound like a source moving past the listener - on a trigger the pitch bends up as it approaches then down as it recedes (a varispeed delay line), the level swells to a peak at the closest point, and a low-pass opens at the pass then closes with distance. The car / jet / projectile fly-by of film sound design. Speed sets the pass duration, Amount the pitch-bend depth (how fast the source moves), Distance the closest approach (level and tone contrast), and Mix blends against dry. in0 = Audio, in1 = Trigger.

FreqShift [PIT] [FX] [SYNTH] in: Audio out: Audio

Bode-style single-sideband frequency shifter: splits the input at in0 into in-phase and 90-degree branches via a polyphase IIR Hilbert allpass pair, then heterodynes against an internal carrier to shift every partial by a fixed Hz amount. Shift sets the offset (-1000 to +1000 Hz) and Mix blends the shifted signal against the dry input. Because the shift is in Hz rather than ratio, harmonic relationships break, giving inharmonic, metallic, clangorous tones.

H910 [PIT] [FX] [SYNTH] in: Audio out: Audio

Harmonizer: a pitch shifter feeding a feedback delay, so each repeat is pitched again into a rising or falling cascade (the classic H910 fused pitch+delay).

Harmonizer [PIT] [FX] [SYNTH] in: Audio out: Audio

Single-voice harmonizer that pitch-shifts the input by a chosen musical interval using overlapping windowed delay-line reads, then adds it back to the dry signal. Interval sets the transposition (+/-24 semitones), Detune adds up to 30 cents of offset for a less rigid blend, and Level sets the harmony voice gain. Mix scales the added voice into the output; useful for parallel harmonies and octave doubling.

MicroShift [PIT] [FX] [SYNTH] in: Audio out: Audio

Micro-pitch doubler that generates two delay-line voices detuned slightly up and slightly down, then sums them with the dry signal to widen the source. Detune sets the symmetric pitch offset (0-50 cents) and Delay sets the base tap time

(0-40 ms) before the shifted voices. Mix sets dry/wet; small Detune thickens, larger Detune broadens into a chorus-like spread.

Octaver [PIT][FX][SYNTH] in: Audio out: Audio

Sub-octave generator: a flip-flop toggled at each rising zero crossing produces a half-rate square tracked by the input envelope, low-passed by Tone for warmth and mixed under the Dry signal at Sub. Monophonic, analog-pedal style - best on clean single notes and bass. It glitches on chords, as expected of the technique.

Octavox [PIT][FX][SYNTH] in: Audio out: Audio

A cloud of four pitch-shifted voices at diatonic intervals, each on its own delay tap, summed into a shimmering harmonized pitch-delay (Octavox/Quadravox class).

Pitch2Midi [PIT][FX][SYNTH] in: Audio out: Audio

Monophonic pitch tracker that measures the period between rising zero-crossings, converts it to a MIDI note number, and emits it as a control value. Glide smooths the tracked pitch over time for portamento, while Out switches the output between the normalized pitch CV and a simple gate that goes high whenever the input is active. Intended to drive other modules from a played signal rather than to process audio.

PitchCorrect [PIT][FX][SYNTH] in: Audio out: Audio

Rough auto-tune that detects the input period via zero-crossings, finds the nearest semitone, and applies a crossfaded two-tap windowed pitch shift to pull the note onto pitch. Amount scales how far the signal is moved toward the target semitone, from no correction to full snapping, and Mix blends the corrected voice against the dry input. Best on clean monophonic sources; artifacts increase with stronger correction.

PitchShift [PIT][FX][SYNTH] in: Audio out: Audio

Granular pitch shifter using two overlapping, cross-faded grains (Window 20-120 ms) to transpose +/-24 semitones without changing length. Feedback re-injects the shifted output for cascading and shimmer effects, and Mix sets dry/wet. Shorter windows tighten transients but add warble; longer windows smooth the tone at the cost of latency.

Shifter [PIT][FX][SYNTH] in: Audio out: Audio

Pitch / frequency / ring shifter in one (Ableton Shifter-style). Mode switches between granular Pitch shift (transpose by Coarse semitones + Fine cents, length preserved), Bode Frequency shift (Coarse/Fine reinterpreted as Hz via a polyphase-IIR Hilbert SSB shifter, breaking harmonics into inharmonic/metallic tones), and Ring modulation (multiply by an internal sine carrier at the Coarse/Fine frequency). Window sets the pitch-mode grain size; Mix blends dry/wet.

Spinback [PIT][FX][SYNTH] in: Audio, Gate out: Audio

Turntable brake: a gate on in1 starts reading the captured buffer at steadily falling speed, so playback drops in pitch and slows to a dead stop like braking a record. Time sets how long the brake takes to reach a halt (50..3000 ms) and Mix blends the braked signal against the dry input. Releasing the gate stops braking and returns to live audio.

TimeStretch [PIT][FX][SYNTH] in: Audio out: Audio

Granular time-smear that writes the input into a delay line and reads it back with two overlapping Hann-windowed grains advancing slower than real time. Stretch sets how slowly the read position moves (lower values smear the sound out

further) and Grain sets the grain length in milliseconds, trading smoothness against fluttering artifacts. Mix blends the stretched texture against the dry signal for frozen, drifting timbres.

Unison [PIT] [FX] [SYNTH] in: Audio out: Audio

Unison thickener: turns a mono input into up to 16 pitch-detuned voices (the supersaw sound) using overlapping ramped-delay pitch shifters at symmetric cent offsets, so the centre stays at pitch and the outer voices spread apart. Detune sets the spread, Blend the outer-voice level and Mix dry/wet. Wide and lush on synths, pads and backing vocals.

Reverb (26)

Aetherizer [REV] [FX] [SYNTH] in: Audio out: Audio

Grain cloud (Absynth Aetherizer-style): continuously records the input and sprays a swarm of overlapping Hann-windowed grains read back from random recent positions, each at a randomized pitch, so a held sound dissolves into an evolving shimmering cloud. Size sets grain length, Density the grains per second, Pitch the centre transpose, Spread the random pitch scatter, Scatter how far back grains are picked, and Mix the wet amount. A texture/sound-design effect distinct from the granular delay and granular reverb.

Ascend [REV] [FX] [SYNTH] in: Audio out: Audio

Pitch-rising shimmer reverb: a long delay whose feedback is pitch-shifted up an octave (granular two-tap) and damped, so the tail ascends and blooms into ethereal pads. Size sets the delay length, Shimmer the octave-up feedback amount and Damp the tail brightness. Lush on pads, vocals and ambient guitar - see Crystals for reverse+pitch and Gravity for huge inverted tails.

Convolution [REV] [FX] [SYNTH] in: Audio out: Audio

Convolution reverb: input is buffered into blocks and convolved with an impulse response via partitioned FFT, then streamed back with block latency. The IR comes from the node config (an audio file path loads that real IR, otherwise a decay time in seconds generates a decaying-noise tail); PreDelay offsets the wet by 0 to 200 ms, Tone is a one-pole low-pass on the wet, and Mix blends dry/wet. Use it to place sounds in real spaces or to apply any captured IR.

Crystals [REV] [FX] [SYNTH] in: Audio out: Audio

Shimmer reverb: a 4-line FDN whose output is pitch-shifted an octave up and re-injected into the network, building rising crystalline overtones. Size scales the base delay times up to 6x, Shimmer sets how much octave-up signal feeds back in, and Damp sets the per-line low-pass that darkens repeats. Mix blends the wet sum against the dry; higher Shimmer ascends further, higher Damp tames the brightness.

Diffuser [REV] [FX] [SYNTH] in: Audio out: Audio

Allpass diffuser: a cascade of four Schroeder all-pass sections with prime-spaced delays smears transients into a short, dense burst without adding a reverb tail or colouring the magnitude spectrum - the diffusion stage that lives inside reverbs, exposed on its own to thicken percussion, blur clicks, or pre-soften a signal before further processing. Amount sets the all-pass coefficient (smear density), Size scales the delay times, and Mix blends against the dry signal.

DuckVerb [REV] [FX] [SYNTH] in: Audio out: Audio

Reverb whose wet signal is attenuated by an envelope follower tracking the dry input, so the tail dips while you play and swells back in the gaps. Size sets the room length and Damp the high-frequency decay, Duck sets how strongly the

dry level suppresses the wet, and Mix blends the ducked reverb against the dry signal. Keeps the reverb from washing out a busy performance while preserving the tail between phrases.

ErbeVerb [REV][FX][SYNTH] in: Audio out: Audio

Modeless morphing reverb (Make Noise / Soundhack Erbe-Verb): a continuously-variable feedback-delay-network reverb with no presets - dial Size and Decay anywhere from a tight room through a cavernous hall, and Tilt from dark to bright. Mod animates the delay network for chorused, evolving and unreal spaces, and Mix blends wet against dry. One reverb that morphs smoothly across the whole space rather than switching between fixed types.

Freezer [REV][FX][SYNTH] in: Audio out: Audio

Audio freezer that continuously buffers the input and, when Freeze is engaged, loops the most recently captured window indefinitely. Size sets the length of the looped window in milliseconds, trading a short stuttering grain against a longer evolving pad, and Mix blends the frozen loop against the dry signal. With Freeze off it passes the input through while keeping the buffer primed for an instant capture.

FreezeVerb [REV][FX][SYNTH] in: Audio out: Audio

Reverb that can latch into an infinite-hold freeze mode, sustaining the current tail indefinitely instead of decaying. Size sets the room length and Damp the high-frequency decay, Freeze above its midpoint engages the infinite hold, and Mix blends the reverb against the dry signal. Use the freeze to build sustained drones and pads from a single moment of input.

GatedVerb [REV][FX][SYNTH] in: Audio out: Audio

Reverb whose wet tail is muted by a fast envelope-driven gate, so the reverb only passes while the dry input stays above a threshold. Size sets the room length and Damp the high-frequency decay, Threshold sets the level below which the tail is cut, and Mix blends the gated reverb against the dry signal. Reproduces the abrupt, chopped-off reverb of 80s drum production.

GrainVerb [REV][FX][SYNTH] in: Audio out: Audio

Granular reverb that windows the input with a moving Hann grain and injects it into a 4-line feedback delay network for diffusion. Size scales the four delay lengths up to 6x for longer tails, Grain sets the grain rate in milliseconds, and Damp applies a low-pass in each feedback line to darken successive reflections. Mix blends the diffused tail against the dry input for a smeared, granular ambience.

Gravity [REV][FX][SYNTH] in: Audio out: Audio

Oversized 4-line feedback delay network (FDN) reverb, each line damped by a low-pass and length-modulated by a shared LFO. Size stretches the base delay times up to 9x, Gravity raises feedback toward unity for near-infinite tails, Mod sets the LFO modulation depth, and Freeze pins feedback to 1.0 while muting new input. Mix blends the Hadamard-mixed wet sum against the dry; pushed hard it yields huge, slowly-evolving, freezable spaces.

Iceverb [REV][FX][SYNTH] in: Audio out: Audio

Four lowpass-damped comb filters form the reverb body, then a self-oscillating resonant state-variable filter is applied to the tail for a cold, ringing sheen. Size sets the comb feedback/decay (up to 0.95), Color sets the resonant filter frequency (~100 Hz..14 kHz), Icing sets its resonance toward self-oscillation, and Mix blends wet against dry. High Icing makes the tail sing into a metallic, icy ring.

MangledVerb [REV] [FX] [SYNTH] in: Audio out: Audio

Reverb whose fully wet output is fed through a tanh saturation stage for gritty, broken ambience. Size sets the room size and tail length, Damp rolls off high frequencies in the decay, and Drive pushes the reverb output harder into the nonlinearity for increasing crush. Mix blends the distorted tail against the dry signal, ranging from a lightly dirtied space to a heavily mangled wash.

Massive [REV] [FX] [SYNTH] in: Audio out: Audio

Feedback-delay-network reverb (Valhalla Supermassive style): four modulated delay lines mixed through a unitary Hadamard matrix give huge, smooth, near-infinite tails. Size scales delay length up to multi-second, Decay sets feedback, Damp absorbs highs in the loop, and Mod choruses the lines for shimmer. Mode picks Lush / Huge / Cosmos voicings, from tight to cathedral to cosmic.

ModEchoVerb [REV] [FX] [SYNTH] in: Audio out: Audio

Fused reverb and modulated delay: the input feeds a wow-modulated feedback delay and a short comb reverb tank at once, blending echo and space in one block.

ModVerb [REV] [FX] [SYNTH] in: Audio out: Audio

Reverb whose room size is continuously modulated by a sine LFO, detuning the tail for a chorused, shimmering character. Size sets the base room length and Damp the high-frequency decay, Rate sets the LFO speed (0.05-5 Hz) and Depth how far it sweeps the size, and Mix blends the moving reverb against the dry signal. Adds motion and width to otherwise static reverb tails.

NonlinVerb [REV] [FX] [SYNTH] in: Audio out: Audio

Nonlinear 4-line FDN reverb whose wet tail is gated by an envelope follower: a transient above the running level retriggers a hold, then the gain holds flat before cutting off. Size scales the short base delay times up to 5x, while Hold sets how long (10-500 ms) the tail sustains at full level before it decays away. Mix sets dry/wet; the held-then-cut behaviour gives gated, non-natural reverb bursts rather than a smooth decay.

Plate [REV] [FX] [SYNTH] in: Audio out: Audio

Plate reverb: the input runs through four series allpass diffusers and then into four parallel damped feedback combs that are summed for the wet tail. Decay sets the comb feedback (0 to 0.95), Damp is a one-pole low-pass inside the feedback that darkens later reflections, Size scales the delay-line lengths, and Mix blends dry/wet. Dense, smooth metallic decay suited to plates and tight ambiences.

Plonk [REV] [FX] [SYNTH] in: Audio out: Audio

Modal resonator (Rings/Plonk-style): excites a bank of five tuned band-pass resonators with the input, imposing the ringing modes of a struck object - bar, plate, bell, drumhead - onto any signal. Tune sets the fundamental, Structure morphs the partials from a harmonic stack toward inharmonic metallic ratios, Decay sets the ring time (resonator Q), and Mix the wet blend. Feed it drums, noise or a synth for plucked, struck and resonated tones. Distinct from the single-mode Resonator and the self-struck Modal oscillator.

Reverb [REV] [FX] [SYNTH] in: Audio out: Audio

Algorithmic room reverb (Freeverb-style comb/all-pass network) with Size scaling the decay time and Damp rolling off the highs in the tail. Width sets the stereo spread and Mix the dry/wet blend. Large Size with low Damp gives long bright halls; high Damp yields short dark rooms - see Massive, Plate, Spring and Shimmer for character-specific spaces.

ReverseVerb [REV] [FX] [SYNTH] in: Audio out: Audio

Reverb whose wet level swells up from silence after each detected onset, fading the tail in rather than out for a backward, blooming effect. Size sets the room length and Damp the high-frequency decay, Swell sets the fade-in time (1-500 ms) restarted on every new transient, and Mix blends the swelling reverb against the dry signal. Produces the rising, sucked-in quality of reversed reverb.

Shimmer [REV] [FX] [SYNTH] in: Audio out: Audio

Shimmer reverb: a delay line whose feedback path is pitch-shifted by a two-window granular shifter so repeats climb in pitch each pass. Shift sets the transposition in semitones (-12 to +24), Feedback (0 to 0.95) controls how long the tail sustains, Size sets the delay time in ms, Damp low-passes the feedback, and Mix blends dry/wet. With Shift at +12 it builds the classic ethereal rising-octave wash.

Spring [REV] [FX] [SYNTH] in: Audio out: Audio

Spring-reverb approximation: a short (~30 ms) delay loop diffused through an all-pass cascade for the characteristic dispersive boing, with a Tone low-pass in the feedback. Decay sets the tail length and Mix the blend. The classic guitar-amp and dub reverb - splashy on transients, drippy at high Decay.

SpringReverb [REV] [FX] [SYNTH] in: Audio out: Audio

Spring-tank reverb: a feedback delay whose loop runs through a chain of first-order all-pass sections, giving the frequency-dependent (dispersive) delay that produces a real spring's characteristic 'boing' and metallic chirp - distinct from the dense diffusion of plate or hall reverbs. Time sets the tank length, Decay the tail, Dispersion the all-pass chirp amount, Damp the high-frequency loss, and Mix the wet/dry blend.

Sympathetic [REV] [FX] [SYNTH] in: Audio out: Audio

Sympathetic-string resonator bank: four high-Q tuned resonators (like the drone strings of a sitar or the undamped strings of a piano) ring in sympathy with the input, voiced as a chord above the Tune root. Tune sets the root pitch, Decay how long the strings ring (resonator Q), Spread the chord voicing, and Mix the resonated blend. Feed it a plucked or percussive source for shimmering resonant tails - distinct from reverb and from a single modal resonator.

Routing (1)

SeqSwitch [RTE] [FX] [SYNTH] in: Clock, In A, In B, In C, In D out: Audio

Sequential switch: a clock on in0 steps the output through the In A..D signal inputs in turn, wrapping after Steps - route four sources into one in a repeating cycle, or scan CVs into a sequence. Like a rotary switch advanced by a clock instead of by hand.

Sequencing (186)

▪▫▪▫ **Abundant** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Abundant-number gate (a first as a synth block): a step counter advances on each in0 clock and the output goes high when the count is an abundant number - one whose proper divisors sum to MORE than itself (12: 1+2+3+4+6 = 16 > 12). These are the 'over-rich' integers, the opposite of the deficient majority, with the perfect numbers sitting exactly on the boundary. Abundant numbers cluster around the highly-composite values, so the gate fires in factor-rich bursts - a number-theoretic rhythm tied to divisor structure, distinct from the digit-based Harshad. A rising edge on in1 resets.

▪▫▪▫ **Achilles** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Achilles-number sequencer (a first as a synth block): steps through the Achilles numbers 72, 108, 200, 288, 392, 432, 500, 648… - integers that are POWERFUL (every prime factor appears at least squared) yet are NOT themselves a perfect power. Like the hero, they are strong but imperfect - 72 = 2^3 * 3^2 cannot be written as a single base to a single exponent. Each clock advances one term, folded modulo Base. A strong-but-imperfect class distinct from the plain powerful sequencer. A rising edge on in1 resets.

▪▫▪▫ **Aliquot** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Aliquot-sequence sequencer (a first as a synth block): each in0 clock advances the step n and outputs how many steps its aliquot sequence runs before it terminates - the sequence where each term is the sum of the PROPER divisors of the last (12 -> 16 -> 15 -> 9 -> 4 -> 3 -> 1). Most chains fall to 1, but the PERFECT numbers (6, 28…) are fixed points that never move, the AMICABLE pairs cycle forever, and some chains climb without any known end - one of number theory's great open questions. The output is the chain length (capped), spiking at the perfect and untouchable numbers. A divisor-iteration melody distinct from the single-step Sigma. A rising edge on in1 resets.

▪▫▪▫ **Amicable** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Amicable-number sequencer (a first as a synth block): steps through the members of amicable pairs 220, 284, 1184, 1210, 2620, 2924… - two numbers each equal to the sum of the OTHER'S proper divisors (the divisors of 220 sum to 284 and vice versa). Known to the Pythagoreans as a symbol of friendship, these pairs are rare and were hunted for centuries. Each clock advances one amicable number, folded modulo Base. A mutual-divisor-sum class distinct from the self-referential perfect numbers. A rising edge on in1 resets.

▪▫▪▫ **Apery** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Apery-number sequencer (a first as a synth block): steps through the Apery numbers 1, 5, 73, 1445, 33001, 819005… - the extraordinary integers Roger Apery used in 1979 to prove that zeta(3) is irrational, a result that had eluded everyone for centuries. They satisfy a deep three-term recurrence with cubic coefficients and are sums of products of squared binomial coefficients. The exact value is folded modulo Base, giving a fast, wide-leaping climb. A zeta-irrationality witness distinct from the polynomial figurate sequencers. A rising edge on in1 resets.

▪▫▪▫ **Arrangement** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Arrangement sequencer (a first as a synth block): steps through the total number of arrangements 1, 2, 5, 16, 65, 326, 1957… - the count of ALL ordered selections (of any length) from n items, equal to the sum of n!/k! over k. It obeys the tidy rule a(n) = na(n-1) + 1, and the values are the nearest integers to n!e. Folded modulo Base. A partial-permutation total distinct from the full-factorial and derangement sequencers. A rising edge on in1 resets.

▪▫▪▫ **Automaton** [SEQ] [CV] [FX] [SYNTH] in: Clock, Reset out: CV

Elementary cellular-automaton sequencer (a first as a synth block): a 16-cell row of one-bit cells evolves one generation on every rising edge of the in0 clock, each cell's next state set by the 8-bit Rule applied to its left/centre/right

neighbours (Wolfram's elementary CA, wrapped). Rule 90 paints a fractal Sierpinski pattern, 30 is chaotic, 110 is Turing-complete. The output is the live cell density (0..1 stepped CV) - a deterministic yet endlessly evolving pattern, unlike the random shift-register of Turing or Marbles. A rising edge on in1 reseeds a single centre cell.

▪▫▪▫ **Automorphic** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Automorphic-number gate (a first as a synth block): the output goes high when the step n is automorphic - its SQUARE ends in n itself (5 squared is 25, 6 squared is 36, 25 squared is 625, 76 squared is 5776…). These 'curious' self-reproducing numbers are extraordinarily rare - only a handful below each power of ten - so the gate fires on a very sparse, irregular pulse. A self-squaring digit rhythm distinct from the figurate and prime gates. A rising edge on in1 resets.

▪▫▪▫ **BakSneppen** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Bak-Sneppen evolution source (a first as a synth block): sixteen species sit in a ring, each with a random fitness; every clock the least-fit species - and its two neighbours - are wiped out and replaced with new random fitnesses. Driving out the weakest drags the whole ecosystem upward in fits and starts: long calm stretches of slow improvement shattered by sudden cascades of extinction, the punctuated equilibrium of self-organised criticality. The output is the current minimum fitness, climbing toward a critical threshold then collapsing. A rising edge on in1 reseeds.

▪▫▪▫ **Ballot** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Ballot-triangle sequencer (a first as a synth block): reads Catalan's ballot triangle row by row - the number of ways a count can stay ahead in an election where each entry is the sum of the one to its left and the one above (1; 1,1; 1,2,2; 1,3,5,5; 1,4,9,14,14…) - modulo Base. Built by C(n,k) = C(n,k-1) + C(n-1,k), so mod Base is exact, and its right edge IS the Catalan numbers. The combinatorics of never-falling-behind paths as a melody, distinct from the Pascal and Stirling triangles. A rising edge on in1 resets.

▪▫▪▫ **BaumSweet** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Baum-Sweet gate (a first as a synth block): the output goes high when the step n is a Baum-Sweet number - one whose binary representation contains NO block of consecutive 0s of odd length (n = 0 counts as high by convention). It is one of the classic automatic sequences (computable by a tiny finite automaton reading n's bits) yet its pattern of 1s and 0s looks irregular and unpredictable - 1,1,0,1,1,0,0,1,0,1… A deterministic, self-similar gate built purely from the shape of the zero-runs in binary, distinct from the bit-COUNT sequences. A rising edge on in1 resets.

▪▫▪▫ **Beatty** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Golden-ratio (Beatty) rhythm gate (a first as a synth block): fires high when the clock step lands on floor(n * Ratio) for n = 1, 2, 3… With Ratio at the golden mean (~1.618) the hits fall on 1, 3, 4, 6, 8, 9… - a quasi-periodic pattern that never settles into a loop, the irrational cousin of the Euclidean rhythm. By Beatty's theorem two such sequences with complementary ratios partition every beat exactly once. Use it for organic, non-repeating grooves. A rising edge on in1 resets.

▪▫▪▫ **Bell** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Bell-number sequencer (a first as a synth block): outputs the Bell numbers - 1,1,2,5,15,52,203,877… - the count of ways to partition a set of n elements, taken modulo Base, one per in0 clock. They are built here by Aitken's array (pure additions, the analogue of Pascal's triangle for set partitions), so taking them mod Base is exact. The values explode combinatorially, so mod Base they scramble into a busy, evenly-spread pattern - a melody from the deep counting numbers of combinatorics, distinct from the additive recurrences. A rising edge on in1 resets to the top.

▪▫▪▫ **BinaryPalindrome** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Binary-palindrome sequencer (a first as a synth block): steps through the numbers that read the same forwards and backwards in BINARY 0, 1, 3, 5, 7, 9, 15, 17, 21, 27… (5 = 101, 9 = 1001, 21 = 10101). Mirror symmetry in base two rather than base ten, so the pattern is quite different from the decimal palindromes. Each clock advances one term, folded modulo Base. A base-two mirror class distinct from the decimal Palindrome sequencer. A rising edge on in1 resets.

▪▫▪▫ **BitReversal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Bit-reversal sequencer (a first as a synth block): emits the bit-reversal permutation - count up 0, 1, 2, 3… but flip the binary digits end-for-end before reading the value (with 4 bits: 0, 8, 4, 12, 2, 10, 6, 14…). This is the scrambled order in which the fast Fourier transform visits its data, a perfect shuffle that maximally spreads consecutive indices apart. Bits sets the word length (and so the loop length, 2^Bits). A deterministic maximal-spread permutation distinct from the random and quasi-random sources. A rising edge on in1 resets.

▪▫▪▫ **Boustrophedon** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Boustrophedon-triangle sequencer (a first as a synth block): reads out the Seidel-Entringer-Arnold triangle one cell at a time, row by row. The triangle is built ox-plough style - each row is filled by snaking left-to-right then right-to-left, accumulating the row above - and its diagonal is the Euler zigzag sequence. Walking the interior cells instead of just the diagonal gives a rippling, terraced contour folded modulo Base, distinct from the single-line Euler, Tangent and Secant sequencers that only sample its edges. A rising edge on in1 resets.

▪▫▪▫ **BrianBrain** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Brian's Brain cellular automaton (a first as a synth block): a 4x4 torus grid of three-state cells - ready, firing, dying - evolves on every rising edge of the in0 clock. A ready cell ignites only when exactly two neighbours are firing; a firing cell always passes to dying; a dying cell falls back to ready. Where Conway's Game of Life has two states, this refractory third state keeps structures restless - they almost never settle, throwing off gliders and sparks. Output is the firing-cell density as a 0..1 stepped CV. A rising edge on in1 reseeds; Seed sets the random fill.

▪▫▪▫ **Cantor** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Cantor-set rhythm gate (a first as a synth block): the step counter is read in base 3 and the output goes high only when NO ternary digit is 1 - exactly the membership rule of the Cantor middle-thirds set. The result is a self-similar fractal on/off pattern: dense clusters of hits separated by silences of every scale, the same gappy structure repeating inside itself at 1/3, 1/9, 1/27… A deeply uneven yet deterministic rhythm with built-in fractal phrasing, unlike the even fair-share of Thue-Morse. A rising edge on in1 resets the counter.

▪▫▪▫ **Catalan** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Catalan-number sequencer (a first as a synth block): outputs the Catalan numbers - 1,1,2,5,14,42,132,429,1430… - taken modulo Base, one per in0 clock. They count an astonishing range of things (the ways to balance n pairs of brackets, to triangulate a polygon, the paths that never cross the diagonal) and are built here by the convolution C(n) = sum C(i)C(n-1-i), so taking them mod Base is exact. They explode faster than 2^n, so mod Base they scramble into a busy pattern - a melody from the most ubiquitous numbers in combinatorics, distinct from the Bell and Motzkin counts. A rising edge on in1 resets.

▪▫▪▫ **CenteredHexagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Centered-hexagonal-number sequencer (a first as a synth block): steps through the centered hexagonal numbers 1, 7, 19, 37, 61, 91, 127, 169, 217… = 3n(n+1) + 1 - a central dot ringed by hexagons (the hex or honeycomb numbers). Their partial sums are the perfect cubes, and the gaps between them are the multiples of six. Each clock advances one term, folded modulo Base. A honeycomb figurate distinct from the star and pyramidal sequencers. A rising edge on in1 resets.

▪▫▪▫ **CenteredSquare** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Centered-square-number sequencer (a first as a synth block): steps through the centered square numbers 1, 5, 13, 25, 41, 61, 85, 113, 145… = 2n^2 + 2n + 1 - a central dot ringed by successive square frames (the pattern of a diamond growing outward). They are the sums of two consecutive squares, and the gaps between them run through the multiples of four. Each clock advances one term, folded modulo Base. A centered figurate distinct from the ordinary square sequencer. A rising edge on in1 resets.

▪▫▪▫ **CenteredTriangular** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Centered-triangular-number sequencer (a first as a synth block): steps through the centered triangular numbers 1, 4, 10, 19, 31, 46, 64, 85, 109… = (3n^2 + 3n + 2)/2 - a central dot surrounded by growing triangular rings. The gaps between terms run through the multiples of three. Each clock advances one term, folded modulo Base. A centered figurate distinct from the ordinary triangular sequencer. A rising edge on in1 resets.

▪▫▪▫ **CentralBinomial** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Central-binomial sequencer (a first as a synth block): outputs the central binomial coefficients C(2n, n) - 1,2,6,20,70,252,924… - the biggest number in each EVEN row of Pascal's triangle (the count of equal-length up/down paths, the heart of the random walk). They are built here straight from Pascal's additive triangle, so modulo Base is exact, and they grow like 4^n so mod Base they scramble busily. The combinatorial spine of Pascal's triangle as a melody, distinct from the Catalan numbers that are derived from them. A rising edge on in1 resets.

▪▫▪▫ **Champernowne** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Champernowne-constant sequencer (a first as a synth block): walks the decimal digits of Champernowne's constant 0.12345678910111213141 5… - simply the counting numbers written out and concatenated - emitting one digit per in0 clock as a 0..1 stepped melody (digit / 9). Because the constant is provably NORMAL, the digit stream eventually contains every finite pattern, every motif, infinitely often: it climbs 1..9 then folds into the rolling two- and three-digit runs of 10,11,12…, a melody that is rigidly deterministic yet endlessly inventive. Distinct from the integer sequences - this plays the digits themselves. A rising edge on in1 resets.

▪▫▪▫ **ChenPrime** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Chen-prime sequencer (a first as a synth block): steps through the Chen primes - primes p for which p+2 is either prime OR a product of two primes (a semiprime): 2, 3, 5, 7, 11, 13, 17, 19, 23, 29… Chen Jingrun proved there are infinitely many, a celebrated partial result toward the twin-prime and Goldbach conjectures. They are denser than the twin primes but still a proper prime subset. Each clock advances one term, folded modulo Base. A near-twin prime class distinct from the strict twin-prime sequencer. A rising edge on in1 resets.

▪▫▪▫ **CircularPrime** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Circular-prime sequencer (a first as a synth block): steps through the circular primes 2, 3, 5, 7, 11, 13, 17, 31, 37, 71, 73, 79, 97, 113… - primes that stay prime under EVERY cyclic rotation of their digits (197 -> 971 -> 719 are all prime). A rare and elegant prime property combining primality with digit rotation. Each clock advances one term, folded modulo Base. A rotation-stable prime class distinct from the twin and Sophie-Germain sequencers. A rising edge on in1 resets.

▪▫▪▫ **Collatz** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Collatz-conjecture sequencer (a first as a synth block): walks the famous 3n+1 trajectory - on each rising edge of the in0 clock the number halves if even or becomes 3n+1 if odd, and the output is its altitude (log2 of the value, 0..1)

so you hear the trajectory's jagged climbs and plunges. When it reaches 1 the tour restarts from Start. A rising edge on in1 also restarts. Different Start values give wildly different melodic contours from one deterministic rule.

▪▫▪▫ **CollatzPeak** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Collatz-peak sequencer (a first as a synth block): each in0 clock advances the step n and outputs the HIGHEST value the Collatz trajectory of n ever climbs to before falling to 1, folded into Steps. Some starting numbers shoot up to enormous heights before collapsing (27 soars past 9000 on its way down), and the peak heights leap about unpredictably from one n to the next. Where CollatzSteps counts the journey's LENGTH, this measures its greatest ALTITUDE - a different chaotic contour from the same famous iteration. A rising edge on in1 resets.

▪▫▪▫ **CollatzSteps** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Collatz-stopping-time sequencer (a first as a synth block): each in0 clock advances the step n and outputs how many steps n takes to reach 1 under the Collatz rule (halve it if even, triple-plus-one if odd) - the total stopping time, folded into Steps. Whether EVERY number reaches 1 is the famous unsolved Collatz conjecture; the step counts jump around wildly with no pattern (n=27 takes 111 steps). Where the Collatz block plays the trajectory itself, this plays its LENGTH - a chaotic-looking melody from an unproven theorem. A rising edge on in1 resets.

▪▫▪▫ **ContinuedFraction** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Continued-fraction sequencer (a first as a synth block): emits the partial quotients of the square root of N - the integers a0; a1, a2… in sqrt(N) = a0 + 1/(a1 + 1/(a2 + …)). For any non-square N this expansion is eventually PERIODIC (sqrt(7) = 2; 1,1,1,4 repeating; sqrt(23) = 4; 1,3,1,8…), and the periodic block is palindromic, so the sequencer produces a clean repeating melodic loop whose shape is fixed by N. A number-theoretic period distinct from the digit-orbit and Farey sequencers. A rising edge on in1 resets.

▪▫▪▫ **Conway** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Conway-Hofstadter sequencer (a first as a synth block): the recurrence a(n) = a(a(n-1)) + a(n - a(n-1)) with a(1)=a(2)=1 - Conway's '$10000 sequence', so named for the prize he offered to anyone who could tame its wild early behaviour. The output is a(n)/n, which lurches chaotically near the start, swinging widely above and below 0.5, then (as Mallows proved) gradually settles toward exactly 0.5 - a turbulence that calms as it goes. Each in0 clock advances one term. A famous self-referential drift distinct from the Hofstadter Q-sequence. A rising edge on in1 resets; the first 512 terms then loop.

▪▫▪▫ **CopelandErdos** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Copeland-Erdos sequencer (a first as a synth block): reads out the digits of the Copeland-Erdos constant 0.235711131719232931… - formed by writing the prime numbers one after another. Copeland and Erdos proved this constant is normal in base ten (its digits are perfectly evenly distributed), so the melody is a statistically uniform digit stream that nonetheless encodes the primes in order. Each clock advances one decimal digit, output as a 0..1 pitch step. A prime-digit stream distinct from the Champernowne and prime-gap sequencers. A rising edge on in1 resets.

▪▫▪▫ **CyclicCA** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Cyclic cellular automaton (a first as a synth block): every cell holds one of N colours arranged in a cycle, and a cell advances to the next colour if at least Threshold neighbours already wear it - rock beats scissors beats paper beats rock. From noise it self-organises into rotating spiral waves that endlessly consume one another. Each rising edge of the in0 clock steps one generation; the output is the grid's mean colour as a smoothly cycling CV. A demolition-derby of colours quite unlike the Game-of-Life family. A rising edge on in1 reseeds.

▪▫▪▫ **DeBruijn** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

De Bruijn sequence gate (a first as a synth block): plays a cyclic binary sequence in which every possible 5-bit pattern appears exactly once before the 32-step cycle repeats - the shortest sequence that tours all sub-patterns. Advancing on the in0 clock it fires a dense, structured, maximally-varied rhythm that never presents the same five-step window twice within a bar. Where Euclid spreads pulses evenly and ThueMorse is self-similar, the de Bruijn cycle is exhaustive. A rising edge on in1 resets to the start.

▪▫▪▫ **Decagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Decagonal-number sequencer (a first as a synth block): steps through the ten-sided polygonal numbers 1, 10, 27, 52, 85, 126, 175, 232… = n(4n-3) - dots arranged in nested ten-gons, the gaps between terms growing by 8 each step. Each clock advances one term, folded modulo Base. A ten-gon figurate climb distinct from the octagonal and nonagonal sequencers. A rising edge on in1 resets.

▪▫▪▫ **Dedekind** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Dedekind-psi sequencer (a first as a synth block): each in0 clock advances the step n and outputs psi(n)/n - 1, where psi is the Dedekind psi function, n times the product of (1 + 1/p) over the primes p dividing n (the count of points on a certain modular curve). It is the mirror image of the totient: where the totient REMOVES a fraction for each prime, psi ADDS one, so the output sits near zero at the primes and rises at the factor-rich numbers - the inverse contour of the Jordan and Totient curves. A multiplicative-growth melody distinct from the totient-family dips. A rising edge on in1 resets.

▪▫▪▫ **Delannoy** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Delannoy-number sequencer (a first as a synth block): outputs the central Delannoy numbers - 1,3,13,63,321,1683… - which count the paths a KING takes across a chessboard from one corner to the other, moving only right, up or diagonally. They are built here by the lattice recurrence D(i,j) = D(i-1,j) + D(i,j-1) + D(i-1,j-1) read down the diagonal, so taking them modulo Base is exact (pure additions). A king-path melody from two-dimensional lattice combinatorics, distinct from the one-dimensional recurrences. A rising edge on in1 resets.

▪▫▪▫ **Derangement** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Derangement sequencer (a first as a synth block): steps through the subfactorials 1, 0, 1, 2, 9, 44, 265, 1854… - the number of ways to shuffle n items so that NONE ends up in its own place (the hat-check problem). They satisfy D(n) = (n-1)(D(n-1) + D(n-2)) and the ratio D(n)/n! homes in on 1/e, so almost exactly 37 percent of all shufflings are derangements. Folded modulo Base. A fixed-point-free permutation count distinct from the factorial and Bell sequencers. A rising edge on in1 resets.

▪▫▪▫ **DigitCube** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Digit-cube orbit sequencer (a first as a synth block): iterates the map that replaces a number by the sum of the CUBES of its digits, whose orbits settle on the fixed points 1, 153, 370, 371, 407 (the three-digit narcissistic numbers) or short cycles such as 55 -> 250 -> 133 -> 55 and 136 -> 244 -> 136. Each clock advances one step and emits the value folded into a pitch, reseeding to tour fresh orbits. A cube-of-digits dynamic distinct from the factorial and reverse-add orbits. A rising edge on in1 resets.

▪▫▪▫ **DigitFactorial** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Digit-factorial orbit sequencer (a first as a synth block): iterates the factorion map - replace a number by the sum of the factorials of its digits - whose orbits famously fall into the fixed points 1, 2, 145, 40585 or the cycle 169 -> 363601 -> 1454 -> 169. Each clock advances one step and emits the value folded into a pitch, reseeding every so often

to tour fresh orbits. A factorial-of-digits dynamic distinct from the reverse-add and cube orbits. A rising edge on in1 resets.

▪▫▪▫ **DigitProduct** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Digit-product sequencer (a first as a synth block): each in0 clock advances the step n and outputs the product of n's decimal digits (24 -> 2*4 = 8, 39 -> 27), folded into Steps. Unlike the steadily-climbing digit SUM, the product swings wildly and collapses to ZERO whenever any digit is 0 (every tenth number, all the hundreds…), punching rhythmic holes into the melody. A multiplicative digit contour with its own jagged, gap-ridden shape distinct from the digit sum and reversal. A rising edge on in1 resets.

▪▫▪▫ **DigitReverse** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Digit-reversal sequencer (a first as a synth block): each in0 clock advances the step n and outputs n with its decimal digits written backwards (123 -> 321, 250 -> 52), folded into Steps. The reversal scrambles the steady count into a jagged, self-similar permutation - the ones digit becomes the loudest place, so the melody leaps by big jumps within each block of ten and resets at each new power of ten. A digit-permutation contour distinct from the digit-SUM and the value-based sequences. A rising edge on in1 resets.

▪▫▪▫ **DigitSum** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Digit-sum sequencer (a first as a synth block): each in0 clock advances the step n and outputs the sum of n's digits in base Base, folded into Steps as a 0..1 melody. As n counts up, the digit sum climbs steadily then drops sharply at every carry (9 -> 10, 99 -> 100), tracing a self-similar sawtooth whose teeth get longer in higher place values - the fingerprint of positional notation itself. Base reshapes the pattern (base 2 gives the popcount/binary-weight contour, base 10 the familiar decimal roll). A digit-structure melody distinct from the value-based recurrences. A rising edge on in1 resets.

▪▫▪▫ **DistinctParts** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Distinct-partition sequencer (a first as a synth block): steps through the number of ways to write n as a sum of DISTINCT positive integers 1, 1, 1, 2, 2, 3, 4, 5, 6, 8, 10, 12, 15… (4 = 4 = 3+1, so two ways). Euler proved this equals the count of partitions into ODD parts, a famous identity. It grows smoothly and sub-exponentially, so folded modulo Base it gives a gentle, slowly-rising organic contour distinct from the explosive zigzag sequencers and the unrestricted-partition family. A rising edge on in1 resets.

▪▫▪▫ **Divisors** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Divisor-count sequencer (a first as a synth block): each rising edge of the in0 clock advances the step n and outputs d(n), the number of divisors of n, folded into Steps as a 0..1 melody. Primes drop to the floor (d = 2) while the highly-composite numbers (12, 24, 36, 48, 60…) leap up with many divisors, so the line is a spiky staircase that spotlights the most factor-rich integers - the arithmetic opposite of the Totient dip. A melody driven by raw divisibility, distinct from the additive and word sequences. A rising edge on in1 resets.

▪▫▪▫ **Dragon** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Dragon-curve (paperfolding) sequencer (a first as a synth block): outputs the regular paperfolding sequence - the fold directions of the famous dragon-curve fractal - as a 0/1 gate that advances on the in0 clock (1,1,0,1,1,0,0,1…). Strip the trailing zeros from the step counter and the next bit decides the turn, giving a sequence that is perfectly self-similar (it contains scaled copies of itself) yet never periodic. Between Euclid's even spread and ThueMorse's parity, the dragon fold is the fractal one. A rising edge on in1 resets.

▪▫▪▫ **EKG** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

EKG-sequence sequencer (a first as a synth block): walks the EKG (or electrocardiogram) sequence 1, 2, 4, 6, 3, 9, 12, 8, 10, 5, 15… where each term is the smallest number not yet used that shares a common factor with the previous one. Plotted, it traces a jagged heartbeat-like trace, and it is a proved permutation of the positive integers with a deep three-line structure. Each clock advances one term, folded modulo Base into a pitch. A gcd-chained permutation distinct from the digit and prime sequencers. A rising edge on in1 resets.

▪▫▪▫ **EuclidGate** [SEQ][CV][FX][SYNTH] in: Clock out: CV

Euclidean gate generator: distributes Pulses as evenly as possible across Steps and emits that rhythm, advancing one step on each rising edge of the in0 clock - the maximally-even Euclidean patterns (e.g. 3-in-8 = the tresillo) behind so much generative rhythm. Rotate shifts the pattern's starting point.

▪▫▪▫ **Euler** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Euler zigzag sequencer (a first as a synth block): steps through the up-down (alternating-permutation) numbers 1, 1, 1, 2, 5, 16, 61, 272, 1385… that count the ways to arrange 1..n so the values go up, down, up, down. Built from the boustrophedon triangle that snakes left-then-right across each row, it is the combinatorial heart shared by the tangent and secant functions. The term is folded modulo Base into a stepped pitch, giving a fast-accelerating melodic climb distinct from the factorial Pisano and Catalan sequencers. A rising edge on in1 resets.

▪▫▪▫ **Eulerian** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Eulerian-number sequencer (a first as a synth block): reads the triangle of Eulerian numbers row by row - A(n,k), the number of permutations of n items with exactly k ascents (1; 1,1; 1,4,1; 1,11,11,1; 1,26,66,26,1…) - modulo Base. Built by A(n,k) = (k+1)A(n-1,k) + (n-k)A(n-1,k-1), so mod Base is exact. The rows are symmetric and sum to a factorial, and they are the coefficients that connect powers to binomial sums. A permutation-ascent triangle melody distinct from the Stirling and Pascal triangles. A rising edge on in1 resets.

▪▫▪▫ **Farey** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Farey-sequence sequencer (a first as a synth block): walks the Farey sequence of order N - every fraction in 0..1 whose denominator is at most N, listed in increasing size (for N=5: 0, 1/5, 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 1). It steps with the exact integer mediant recurrence, so each clock outputs the next fraction directly as a control voltage and loops back at 1. A rising, unevenly-spaced rational staircase whose gaps mirror the deep structure of the rationals, distinct from the digit-orbit sequencers. A rising edge on in1 resets.

▪▫▪▫ **FemaleMale** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hofstadter Female-Male sequencer (a first as a synth block): outputs the 'Female' half of Hofstadter's famous pair of INTERTWINED sequences, F(n) = n - M(F(n-1)) and M(n) = n - F(M(n-1)) - two sequences each defined in terms of the OTHER, an elegant mutual recursion. F grows smoothly (close to the golden-ratio staircase) while leaning on M at every step. Each in0 clock advances one term, folded into Steps. A mutually-recursive melody distinct from the single self-referential Hofstadter sequences. A rising edge on in1 resets.

▪▫▪▫ **Fibbinary** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Fibbinary gate (a first as a synth block): the output goes high when the step n is a fibbinary number - one whose binary representation has NO two adjacent 1-bits (0,1,2,4,5,8,9,10,16…). These are exactly the numbers expressible as a sum of non-consecutive powers of two, the base-2 mirror of Zeckendorf's non-consecutive Fibonacci sums. The gate fires in a sparse, self-similar pattern whose density follows the golden ratio, distinct from the prime and happy-number gates. A rising edge on in1 resets.

▪▫▪▫ **Fibonacci** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Fibonacci-number gate (a first as a synth block): the output goes high when the step n is itself a Fibonacci number - 0, 1, 2, 3, 5, 8, 13, 21, 34, 55… Because each Fibonacci number is roughly the golden ratio times the last, the gaps grow GEOMETRICALLY, so the gate fires fast and densely at first then thins out exponentially - a self-similar, golden-spaced rhythm quite unlike the polynomial slow-down of the square and triangular gates. The test is Gessel's: n is Fibonacci exactly when 5n^2+4 or 5n^2-4 is a perfect square. A rising edge on in1 resets.

▪▫▪▫ **FibonacciWord** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Fibonacci-word sequencer (a first as a synth block): the infinite binary word grown by the substitution 0 -> 01, 1 -> 0, giving 0100101001001010010100100… - the most-ordered aperiodic sequence there is, the symbolic shadow of the golden ratio. The 1s land exactly where the golden-ratio Beatty sequence says, so it is a self-similar two-note rhythm that never repeats yet is utterly deterministic. Each clock advances one symbol, output as a 0 or 1 gate. A golden-ratio word distinct from the Thue-Morse and Rudin-Shapiro sequencers. A rising edge on in1 resets.

▪▫▪▫ **FibWord** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Fibonacci-word sequencer (a first as a synth block): the infinite Fibonacci word over {0,1} grown by the substitution 0 -> 0 1, 1 -> 0 (its own fixed point) - 0,1,0,0,1,0,1,0,0,1,0,0,1… - emitted as a 0/1 gate, one symbol per in0 clock. It is the canonical Sturmian sequence: the 1s fall at the golden-ratio spacing, the quasicrystal of one dimension, balanced so any two windows of equal length hold the same count of 1s to within one. A structured aperiodic gate built on phi, distinct from the self-describing Kolakoski. A rising edge on in1 resets; the first 256 symbols then loop.

▪▫▪▫ **Fubini** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Fubini-number sequencer (a first as a synth block): steps through the ordered Bell (Fubini) numbers 1, 1, 3, 13, 75, 541, 4683… - the number of ways to rank n items allowing ties (the outcomes of a race with photo finishes), equivalently the number of ordered set partitions. They grow faster than the plain Bell numbers because the blocks are ordered. The exact value is folded modulo Base. A weak-ordering count distinct from the unordered Bell sequencer. A rising edge on in1 resets.

▪▫▪▫ **Galton** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Galton-board (bean machine) source (a first as a synth block): each rising edge of the in0 clock drops a bean through Rows rows of pins, bouncing left or right on a fair coin at every pin; the output is the bin it settles in, 0..1. Because that bin is the SUM of Rows coin flips it is binomially distributed - clustered around the centre and rare at the edges, the discrete bell curve - unlike the flat, uniform spread of the Random source. Rows sets the curve's sharpness (more rows = tighter central bias). A Gaussian-weighted random step for natural-feeling movement. A rising edge on in1 reseeds.

▪▫▪▫ **GameOfLife** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Conway's Game of Life sequencer (a first as a synth block): a 32-cell torus grid (8 wide x 4 tall) evolves one Conway generation on every rising edge of the in0 clock - a live cell with 2 or 3 neighbours survives, a dead cell with exactly 3 is born (the classic B3/S23) - and the output is the live population density as a 0..1 stepped CV. Where the 1-D Automaton runs a row rule, this is full 2-D Life with its gliders, blinkers and still-lifes: the population breathes, oscillates or settles into stable colonies. A rising edge on in1 reseeds the grid; Seed sets the random fill. Genuinely alive modulation.

▪▫▪▫ **GoldenAngle** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Golden-angle (phyllotaxis) sequencer (a first as a synth block): each in0 clock adds the golden ratio's fractional part (~0.618) to a running position wrapped into 0..1 - the additive recurrence that places sunflower seeds and pinecone scales at the 137.5-degree golden angle, the most irrational rotation there is. The result is a maximally even, low-discrepancy melody: successive notes land as far from all previous notes as possible, filling the range without ever repeating or clustering. The optimal spread, distinct from the bit-reversal Van der Corput. A rising edge on in1 resets to the start.

■□■□ **Golomb** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Golomb self-describing sequencer (a first as a synth block): outputs Golomb's sequence - 1,2,2,3,3,4,4,4,5,5,5… - the unique non-decreasing sequence that DESCRIBES ITSELF: the number n appears in it exactly a(n) times (1 appears once, 2 appears twice, 3 appears three times, and so on). It climbs in ever-longer plateaus whose lengths are given by the sequence's own earlier values. Each in0 clock advances one term, folded into Steps, giving a gently-rising staircase of stretching steps. A self-describing melody distinct from the self-referential Hofstadter recurrences. A rising edge on in1 resets.

■□■□ **Gould** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Gould-sequence sequencer (a first as a synth block): outputs Gould's sequence - 2 raised to the number of 1-bits of the step n - folded into Steps, one per in0 clock. By Kummer's theorem this is exactly the count of ODD entries in row n of Pascal's triangle, so plotting it draws the Sierpinski-triangle skyline: it leaps to a new power of two on the dense numbers and collapses to 1 at the powers of two. A doubling, self-similar contour distinct from the plain popcount it is built on. A rising edge on in1 resets.

■□■□ **GrayCode** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Gray-code sequencer (a first as a synth block): advances a counter on each rising edge of the in0 clock and outputs its reflected binary Gray code (n XOR n»1), folded into 16 steps - so successive values always differ by exactly one bit. The result is a stepped CV that walks 0, 1, 3, 2, 6, 7, 5, 4… visiting levels in an order where every move is a single minimal change, giving smooth one-step contours that still tour the whole range without repeating until the cycle completes. A rising edge on in1 resets.

■□■□ **Halton** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Halton-sequence sequencer (a first as a synth block): a quasi-random low-discrepancy sequence built from the radical inverse - take the index, write it in base b, then flip the digits across the decimal point (1,2,3 in base 2 give .1, .01, .11 = 0.5, 0.25, 0.75). Unlike true randomness it fills the interval evenly, never clumping or leaving gaps, the workhorse of quasi-Monte-Carlo sampling. As a melody it sounds scattered yet always lands in the holes it left before. Base picks the digit base. A deterministic gap-filling scatter distinct from the pseudo-random generators. A rising edge on in1 resets.

■□■□ **Hamming** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hamming-number sequencer (a first as a synth block): steps through the regular or 5-smooth numbers 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 27… - the integers whose only prime factors are 2, 3 and 5. Famous from Dijkstra's programming exercise, they are exactly the just-intonation frequency ratios, so the sequence is a ladder of harmonically pure intervals. Each clock advances one term, folded modulo Base. A smooth-number ladder distinct from the prime and figurate sequencers. A rising edge on in1 resets.

■□■□ **Happy** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Happy-number gate (a first as a synth block): a step counter advances on each in0 clock and the output goes high when the count is a happy number - one that reaches 1 when you repeatedly replace it by the sum of the squares of its digits (7 -> 49 -> 97 -> 130 -> 10 -> 1). The unhappy numbers instead fall forever into the cycle 4,16,37,58,89,145,42,20. The

happy numbers are scattered with no pattern (1,7,10,13,19,23,28,31,32,44…), so the gate fires on a sparse, irregular, deterministic rhythm distinct from the primes. A rising edge on in1 resets.

▪▫▪▫ **Harshad** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Harshad-number gate (a first as a synth block): a step counter advances on each in0 clock and the output goes high when the count is a Harshad (Niven) number - one divisible by the sum of its own digits (18 is, since 1+8=9 divides 18; 19 is not). Harshad numbers are common among small values then thin out gradually, so the gate fires densely at first and slowly sparsens - a denser, more regular cousin of the prime gate, with little runs and gaps tied to the decimal digits. A rising edge on in1 resets.

▪▫▪▫ **Heptagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Heptagonal-number sequencer (a first as a synth block): steps through the seven-sided polygonal numbers 1, 7, 18, 34, 55, 81, 112, 148… = n(5n-3)/2 - dots arranged in nested heptagons. Like all polygonal numbers they are second differences constant (here the gaps grow by 5 each time). Each clock advances one term, folded modulo Base. A seven-gon figurate climb distinct from the triangular, square and pentagonal sequencers. A rising edge on in1 resets.

▪▫▪▫ **Hexagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hexagonal-number sequencer (a first as a synth block): steps through the six-sided polygonal numbers 1, 6, 15, 28, 45, 66, 91, 120… = n(2n-1) - dots in nested hexagons. They are exactly the odd-indexed triangular numbers, and every perfect number is hexagonal. Each clock advances one term, folded modulo Base. A six-gon figurate climb distinct from the triangular and pentagonal sequencers. A rising edge on in1 resets.

▪▫▪▫ **HighlyComposite** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Highly-composite-number sequencer (a first as a synth block): steps through the highly composite numbers 1, 2, 4, 6, 12, 24, 36, 48, 60, 120… - each having MORE divisors than any smaller number, the record-breakers of factor-richness studied by Ramanujan. They are the anti-primes (12 and 60 and 360 are why clocks and circles are divided as they are). Each clock advances one record-setter, folded modulo Base. A divisor-maximising class distinct from the prime and figurate sequencers. A rising edge on in1 resets.

▪▫▪▫ **Hipparchus** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hipparchus sequencer (a first as a synth block): steps through the little Schroeder (super-Catalan) numbers 1, 1, 3, 11, 45, 197, 903, 4279… which count the ways to insert non-crossing brackets into a row of n items, or to subdivide a polygon by non-crossing diagonals. Plutarch records that Hipparchus counted the tenth term (103049) two thousand years before they were rediscovered. The exact value is folded modulo Base. A bracketing count distinct from the Catalan and Motzkin sequencers. A rising edge on in1 resets.

▪▫▪▫ **Hofstadter** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hofstadter Q-sequence source (a first as a synth block): the chaotic meta-Fibonacci recurrence Q(n) = Q(n - Q(n-1)) + Q(n - Q(n-2)) with Q(1)=Q(2)=1 - but where Fibonacci looks a fixed distance back, this looks back by its OWN recent values, so it never settles and wanders erratically around n/2. Each rising edge of the in0 clock advances one term; the output is Q(n)/n, a turbulent drift hovering near 0.5 with unpredictable excursions - deterministic chaos from pure integer recursion, distinct from the smooth Fibonacci-period Pisano. A rising edge on in1 resets; the first 512 terms then loop.

▪▫▪▫ **HofstadterG** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hofstadter G-sequence sequencer (a first as a synth block): the self-referential recurrence G(n) = n - G(G(n-1)) with G(0)=0, which folds the integers down by feeding the sequence's own output back into itself TWICE. Despite the tangled recursion it grows smoothly at the golden-ratio rate (G(n) is almost exactly floor(n/phi)), so it makes a gently-climbing staircase with an occasional flat step where the recursion catches up. Each in0 clock advances one term, folded into Steps. A self-referential melody distinct from the chaotic Q-sequence. A rising edge on in1 resets.

▪▫▪▫ **HofstadterH** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hofstadter H-sequence sequencer (a first as a synth block): the recurrence H(n) = n - H(H(H(n-1))) with H(0)=0 - the same self-referential idea as the G-sequence but nesting the sequence inside itself THREE deep, so it grows at the 'plastic number' rate (~n times 0.6823) rather than the golden ratio. The result is a smoothly-climbing staircase that rises a touch slower than G, with its own pattern of flat treads. Each in0 clock advances one term, folded into Steps. A deeper self-recursion distinct from the G-sequence. A rising edge on in1 resets.

▪▫▪▫ **HofstadterQ** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Hofstadter Q-sequencer (a first as a synth block): the chaotic meta-Fibonacci sequence Q(n) = Q(n - Q(n-1)) + Q(n - Q(n-2)), seeded Q(1) = Q(2) = 1, giving 1, 1, 2, 3, 3, 4, 5, 5, 6, 6, 6, 8… Unlike Fibonacci it looks BACK by amounts that the sequence itself decides, so it wobbles unpredictably and it is unknown whether it stays defined forever. A self-indexing, semi-chaotic climb folded modulo Base. A strange-loop recurrence distinct from the smooth linear sequencers. A rising edge on in1 resets.

▪▫▪▫ **Ikeda** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Ikeda-map chaos sequencer (a first as a synth block): iterates the Ikeda map - a model of light circulating in a nonlinear optical cavity - whose state rotates by an angle that itself depends on the state, folding the plane into an intricate strange attractor. On each rising edge of the in0 clock it advances one step and outputs the x coordinate as a stepped CV that hops chaotically around the attractor's hooked arms. U sets how deep into chaos it runs. A different flavour again from the angular Henon, smooth Rossler or tumbling pendulum. A rising edge on in1 reseeds.

▪▫▪▫ **Jacobsthal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Jacobsthal-sequence sequencer (a first as a synth block): the recurrence J(n) = J(n-1) + 2*J(n-2) - giving 0,1,1,3,5,11,21,43,85,171… - a Fibonacci cousin whose doubled second term makes successive ratios tend to 2 instead of the golden ratio. Each rising edge of the in0 clock advances one term, taken modulo Steps. Its faster, near-doubling growth gives a melody that leaps up the scale more aggressively than Fibonacci, a distinct integer-recurrence line from the Pisano, Padovan and Pell sequencers. A rising edge on in1 resets.

▪▫▪▫ **JacobsthalLucas** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Jacobsthal-Lucas sequencer (a first as a synth block): steps through the Jacobsthal-Lucas numbers 2, 1, 5, 7, 17, 31, 65, 127, 257… defined by a(n) = a(n-1) + 2*a(n-2), the companion to the Jacobsthal sequence. Their values hug the powers of two (each is 2^n plus or minus one), so the sequence is a wobble around a clean octave doubling. Folded modulo Base. A near-power-of-two companion distinct from the Jacobsthal and Mersenne sequencers. A rising edge on in1 resets.

▪▫▪▫ **Jordan** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Jordan-totient sequencer (a first as a synth block): each in0 clock advances the step n and outputs J2(n)/n^2, where J2 is Jordan's totient - a generalisation of Euler's totient that counts pairs coprime to n rather than single numbers, given by n^2 times the product of (1 - 1/p^2) over the primes p dividing n. The output rides high (near 1) at the primes and dips at the factor-rich numbers, a SHARPER version of the totient curve because each prime cuts by 1/p^2. A second-order coprimality melody distinct from the ordinary Totient. A rising edge on in1 resets.

▪▫▪▫ **Kaprekar** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Kaprekar-routine sequencer (a first as a synth block): each in0 clock advances the step n and counts how many rounds of Kaprekar's routine its four-digit form takes to reach 6174 - the magic Kaprekar constant. One round sorts the digits up and down and subtracts the smaller from the larger (e.g. 3524 -> 5432 - 2345 = 3087 -> … -> 6174); EVERY four-digit number with at least two different digits funnels to 6174 in at most seven rounds, while repeated-digit numbers fall to zero. The output is that round count over 7, a strange staircase rising and falling with no obvious pattern. A rising edge on in1 resets.

▪▫▪▫ **Keith** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Keith-number gate (a first as a synth block): the output goes high when the step n is a Keith number (14, 19, 28, 47, 61, 75, 197…). To test n, seed a Fibonacci-like sequence with its digits - then each new term is the sum of the previous (digit-count) terms; n is a Keith number if that sequence eventually lands exactly on n. They are far rarer than the primes (only a hundred or so below a trillion), so the gate fires on a very sparse, irregular pulse - a deep, hard-to-find numerical rhythm distinct from the prime, happy and lucky gates. A rising edge on in1 resets.

▪▫▪▫ **Kolakoski** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Kolakoski self-describing sequencer (a first as a synth block): the unique sequence over {1,2} that is its OWN run-length encoding - 1,2,2,1,1,2,1,2,2,1,2,2… - so reading off the lengths of its own runs reproduces it exactly. Each rising edge of the in0 clock emits the next symbol as a two-level CV (1 low, 2 high): a quasi-periodic gate pattern that never settles into a loop and has no underlying period, aperiodic yet fully deterministic. A rhythmic counterpart to the number-theoretic pitch sequences. A rising edge on in1 resets; the first 256 symbols are generated, then the phrase repeats.

▪▫▪▫ **LaggedFibonacci** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Lagged-Fibonacci sequencer (a first as a synth block): generalises the Fibonacci rule by adding two FAR-apart earlier terms - x(n) = x(n-7) + x(n-10) modulo a power of two - keeping a short ring of past values. This classic pseudo-random generator has an enormously long period and the additive, memory-of-the-past structure gives it a subtly different texture from the bit-twiddling generators. It plays a deterministic scrambled melody that drifts and never quite repeats. Bits sets the pitch range. An additive-recurrence noise distinct from the shift-register ones. A rising edge on in1 resets.

▪▫▪▫ **Lah** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Lah-number sequencer (a first as a synth block): reads the triangle of unsigned Lah numbers row by row - L(n,k), the number of ways to partition n items into k non-empty ORDERED lists (1; 2,1; 6,6,1; 24,36,12,1…) - modulo Base. Built by L(n,k) = (n+k-1)*L(n-1,k) + L(n-1,k-1), so mod Base is exact. The Lah numbers are the 'Stirling numbers of the third kind' that convert rising factorials into falling ones. An ordered-partition triangle melody distinct from the two Stirling triangles. A rising edge on in1 resets.

▪▫▪▫ **Langton** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Langton's Ant turmite sequencer (a first as a synth block): a single 'ant' walks an 8x4 torus of cells - turning right on a white cell, left on a black one, flipping each cell it leaves, then stepping forward. From a blank grid it scribbles chaotically for a while, then abruptly locks into a periodic 'highway' - emergent order from one trivial rule. Each rising edge of the in0 clock advances the ant Steps cells; the output is the ant's column position as a 0..1 stepped CV. A rising edge on in1 resets the ant to the centre of a clear grid. Unlike the cellular automata this is a single moving agent, not a population.

▪▫▪▫ **Leonardo** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Leonardo-number sequencer (a first as a synth block): steps through the Leonardo numbers 1, 1, 3, 5, 9, 15, 25, 41, 67, 109… defined by L(n) = L(n-1) + L(n-2) + 1 - the Fibonacci rule with a plus-one twist. They are the sizes of the balanced binary trees used in Dijkstra's smoothsort, and each is one less than twice a Fibonacci number. A nearly-Fibonacci climb, slightly steeper, folded modulo Base. A rising edge on in1 resets.

▪▫▪▫ **LFSR** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Linear-feedback shift-register sequencer (a first as a synth block): clocks a 16-bit Galois LFSR with maximal-length feedback taps, the classic hardware pseudo-random generator behind scramblers, CRCs and chip-tune noise. It marches through all 65535 non-zero states in a fixed, repeatable order before looping, so it sounds random yet plays the exact same long pattern every time - a deterministic random melody. Bits sets how many low bits are read out as the pitch CV. A shift-register noise distinct from the word-mixing Xorshift. A rising edge on in1 resets the register.

▪▫▪▫ **Liouville** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Liouville-function gate (a first as a synth block): each rising edge of the in0 clock advances the step n and the output goes high when lambda(n) = +1, low when -1 - lambda being (-1) raised to the TOTAL number of prime factors of n counted with multiplicity. It is the multiplicative cousin of Thue-Morse (which counts bits, this counts prime factors): a deeply structured, conjecturally-balanced two-level pattern tied to the Riemann hypothesis through its running sum. An aperiodic gate built from the deepest texture of the primes. A rising edge on in1 resets.

▪▫▪▫ **LookSay** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Look-and-say sequencer (a first as a synth block): each in0 clock advances one term of Conway's look-and-say sequence - 1, 11, 21, 1211, 111221, 312211… - where each term is read aloud to make the next ('one 1' -> 11, 'two 1s' -> 21, 'one 2 one 1' -> 1211). The output is the LENGTH of each term, folded into Steps; those lengths grow by Conway's constant (~1.303685) each step, so the melody climbs in a fixed geometric ratio - an 'audioactive' sequence whose only digits are ever 1, 2 and 3. A self-describing melody distinct from the Kolakoski self-description. A rising edge on in1 resets; the first 16 terms then loop.

▪▫▪▫ **Lucas** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Lucas-number sequencer (a first as a synth block): the companion of the Fibonacci sequence - same add-the-last-two rule but seeded 2, 1 instead of 0, 1, giving 2,1,3,4,7,11,18,29,47,76… Its ratios converge on the very same golden ratio, so it shares Fibonacci's growth while landing on different values (the Lucas numbers turn up in primality testing and the closed form for Fibonacci itself). Each in0 clock advances one term, taken modulo Steps - a golden-growth melody with its own distinct contour. A rising edge on in1 resets.

▪▫▪▫ **Lucky** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Lucky-number gate (a first as a synth block): the output goes high when the step count is a 'lucky number' (1,3,7,9,13,15,21,25,31…) - survivors of a sieve like the prime sieve but which crosses out by POSITION instead of by value: keep every number, delete every 2nd, then from the survivors delete every 3rd, then every 7th, and so on. Astonishingly the luckies share many statistical traits with the primes (twin luckies, a similar density) despite being built from counting alone, not divisibility. A different deterministic sparse rhythm from the prime gate. A rising edge on in1 resets; the first 256-step phrase then loops.

▪▫▪▫ **LyndonWords** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Lyndon-word sequencer (a first as a synth block): steps through the number of binary Lyndon words of length n 2, 1, 2, 3, 6, 9, 18, 30, 56, 99… - the aperiodic necklaces, strings that are strictly smallest among all their rotations. Every string factors uniquely into a descending sequence of Lyndon words (the Chen-Fox-Lyndon theorem), making them a

basis for free Lie algebras. Counted by Moebius inversion of the powers of two, the exact value is folded modulo Base. A primitive-string count distinct from the full necklace sequencer. A rising edge on in1 resets.

■□■□ **Markov** [SEQ][CV][FX][SYNTH] in: In, Clock out: CV

Style-learning sequencer (a first as a synth block): quantises the input at in0 into 4 states and continuously learns the transition probabilities between them (a Markov chain; Memory sets how fast old transitions fade). On each rising edge of the in1 clock it samples the learned transitions from its current state to pick the next, improvising a NEW sequence in the style of what it heard - feed it a melody or CV and it riffs endless variations that obey the same move-to-move statistics. Output is the generated state as a 0..1 stepped CV.

■□■□ **MephistoWaltz** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Mephisto-waltz sequencer (a first as a synth block): the binary word grown by the substitution 0 -> 001, 1 -> 110, giving 001001110001001110110… - named after Liszt's waltz for its restless triple-time feel. It is an automatic sequence with curious correlation properties, closely related to the ternary expansion of position. Each clock advances one symbol, output as a 0 or 1 gate, giving a lurching three-against-two rhythm. A triple-time word distinct from the Fibonacci and Thue-Morse sequencers. A rising edge on in1 resets.

■□■□ **Mersenne** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Mersenne-number sequencer (a first as a synth block): steps through the Mersenne numbers 2^n - 1 = 1, 3, 7, 15, 31, 63, 127, 255… - the numbers that are all-ones in binary. When the exponent is prime these are the candidates for Mersenne PRIMES, the form that has held the record for the largest known prime for decades, hunted by the GIMPS distributed search. The exact value 2^n - 1 is folded modulo Base, giving a doubling-then-wrapping staircase. A power-of-two-minus-one climb distinct from the additive sequencers. A rising edge on in1 resets.

■□■□ **Mertens** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Mertens-function source (a first as a synth block): each in0 clock advances the step n and outputs the running sum of the Mobius function, M(n) = mu(1) + mu(2) + … + mu(n) - a famous slowly-staggering walk that creeps up and down by +/-1 and 0 as squarefree numbers of even and odd prime-count alternate. Whether it stays bounded by sqrt(n) (the disproved Mertens conjecture) is tied to the Riemann hypothesis. The output is centred on 0.5, drifting either side like a number-theoretic Brownian path that is in fact fully deterministic. Distinct from the per-step Mobius block. A rising edge on in1 resets.

■□■□ **MianChowla** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Mian-Chowla sequencer (a first as a synth block): the greedy Sidon sequence 1, 2, 4, 8, 13, 21, 31, 45, 66, 81… - built by always taking the smallest next integer such that ALL the pairwise sums stay distinct (no two pairs add to the same value). Sidon sets like this are prized in signal design and radio astronomy for their flat autocorrelation. The terms spread apart ever wider as collisions become harder to avoid. Folded modulo Base. A distinct-sums greedy set distinct from the prime and figurate sequencers. A rising edge on in1 resets.

■□■□ **MiddleSquare** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Middle-square-Weyl sequencer (a first as a synth block): a modern repair of von Neumann's 1949 middle-square method - square the number and keep the middle digits - which on its own quickly collapses to zero. Adding a Weyl sequence (a steadily advancing counter) each step cures the collapse, yielding a fast, high-quality pseudo-random stream that passes stringent statistical tests. It plays a deterministic but thoroughly scrambled melody. Bits sets the read-out pitch range. A squared-digit generator distinct from the shift-register and congruential ones. A rising edge on in1 resets.

▪▫▪▫ **Mobius** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Mobius-function source (a first as a synth block): each rising edge of the in0 clock advances the step n and outputs the Mobius function mu(n) as a three-level CV - high for a squarefree number with an even count of prime factors (+1), centre for a non-squarefree number (0, it has a repeated prime), low for squarefree with an odd count (-1). The squarefree/squareful flicker and the parity swings produce a jittery three-state pattern that encodes the prime-factor structure of each integer. A number-theoretic trit stream found nowhere else in modular gear. A rising edge on in1 resets.

▪▫▪▫ **Motzkin** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Motzkin-number sequencer (a first as a synth block): outputs the Motzkin numbers - 1,1,2,4,9,21,51,127,323… - taken modulo Base, one per in0 clock. They count the ways to draw non-crossing chords between points on a circle (the chords-and-non-edges cousin of the bracket-counting Catalan), and are built here by the convolution M(n) = M(n-1) + sum M(i)M(n-2-i), so mod Base is exact. A combinatorial melody with its own growth rate (~3^n), distinct from the Catalan and Bell counts. A rising edge on in1 resets.

▪▫▪▫ **MultRoot** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Multiplicative-digital-root sequencer (a first as a synth block): each in0 clock advances the step n and repeatedly replaces it by the product of its digits until a single digit is left - the multiplicative digital root (39 -> 27 -> 14 -> 4). The output is that final digit over 9. Because any number containing a 0 (or that ever reaches one) collapses to 0, the melody is dotted with zeros among the 1..9 values, a sparse fingerprint of the multiplicative structure of each integer. Distinct from the additive digital root, which simply cycles 1..9. A rising edge on in1 resets.

▪▫▪▫ **Narayana** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Narayana's-cows sequencer (a first as a synth block): the 14th-century recurrence N(n) = N(n-1) + N(n-3) - giving 1,1,1,2,3,4,6,9,13,19,28… - from the Indian problem of how a herd grows if each cow bears a calf every year from its fourth year on. Its ratios converge on the SUPERGOLDEN ratio (~1.4656). Each rising edge of the in0 clock advances one term, taken modulo Steps. Its three-step memory gives a gentler, more loping climb than Fibonacci, distinct from the Padovan (N(n-2)+N(n-3)) it is often confused with. A rising edge on in1 resets.

▪▫▪▫ **Necklace** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Necklace sequencer (a first as a synth block): steps through the number of distinct two-colour necklaces of n beads 1, 2, 3, 4, 6, 8, 14, 20, 36, 60… - binary strings of length n counted as the same when rotated into one another. Burnside's counting lemma gives the count as the average over rotations, mixing Euler's totient with powers of two. The exact value is folded modulo Base. A cyclic-symmetry count distinct from the linear word sequencers. A rising edge on in1 resets.

▪▫▪▫ **Nonagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Nonagonal-number sequencer (a first as a synth block): steps through the nine-sided polygonal numbers 1, 9, 24, 46, 75, 111, 154, 204… = n(7n-5)/2 - dots arranged in nested nine-gons, the gaps between terms growing by 7 each step. Each clock advances one term, folded modulo Base. A nine-gon figurate climb distinct from the lower polygonal sequencers. A rising edge on in1 resets.

▪▫▪▫ **Octagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Octagonal-number sequencer (a first as a synth block): steps through the eight-sided polygonal numbers 1, 8, 21, 40, 65, 96, 133, 176… = n(3n-2) - dots arranged in nested octagons, the gaps between terms growing by 6 each step. Each

clock advances one term, folded modulo Base. An eight-gon figurate climb distinct from the lower polygonal sequencers. A rising edge on in1 resets.

■□■□ **Octahedral** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Octahedral-number sequencer (a first as a synth block): steps through the octahedral numbers 1, 6, 19, 44, 85, 146… = n(2nn + 1)/3 - the count of spheres stacked into a regular octahedron (two square pyramids base to base). Each is the sum of two consecutive square-pyramidal numbers. Each clock advances one term, folded modulo Base. A different polyhedral packing distinct from the tetrahedral and pyramidal sequencers. A rising edge on in1 resets.

■□■□ **Padovan** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Padovan-sequence sequencer (a first as a synth block): the plastic-number analogue of Fibonacci - P(n) = P(n-2) + P(n-3), giving 1,1,1,2,2,3,4,5,7,9,12,16,21… - whose ratio of successive terms tends to the plastic number ~1.3247 instead of the golden ratio. Each rising edge of the in0 clock advances one term, taken modulo Steps so it stays in range. Its slower, gentler growth makes a melody that climbs more lazily than Fibonacci, distinct from the Pisano (Fibonacci mod m) and Perrin recurrences. A rising edge on in1 resets.

■□■□ **Palindrome** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Palindrome gate (a first as a synth block): the output goes high when the step n reads the same backwards as forwards in decimal (1, 2, …, 9, 11, 22, …, 99, 101, 111, 121…). The palindromes thin out in a self-similar way - dense among the small numbers, then clustering near each new power of ten - so the gate fires in rhythmic bursts that stretch apart as the count climbs. A mirror-symmetry digit rhythm distinct from the divisibility and prime gates. A rising edge on in1 resets.

■□■□ **Partition** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Partition-number sequencer (a first as a synth block): outputs p(n), the number of ways to write n as a sum of positive integers (4 = 4, 3+1, 2+2, 2+1+1, 1+1+1+1 so p(4)=5), taken modulo Base, one per in0 clock. The partition numbers - 1,1,2,3,5,7,11,15,22,30,42… - grow almost as fast as the primes thin out (Hardy-Ramanujan), and are built here by Euler's pentagonal-number recurrence (additions and subtractions only), so mod Base is exact. A melody from the deep additive combinatorics of the integers, distinct from the multiplicative divisor functions. A rising edge on in1 resets.

■□■□ **PartitionsIntoPrimes** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Prime-partition sequencer (a first as a synth block): steps through the number of ways to write n as a sum of PRIME numbers 1, 0, 1, 1, 1, 2, 2, 3, 3, 4, 5, 6, 7… (7 = 7 = 5+2 = 3+2+2, so three ways). It restricts the famous partition function to prime parts only, tying the additive world of partitions to the multiplicative primes. Computed by the exact prime-restricted partition recurrence, folded modulo Base. A prime-restricted partition count distinct from the full partition and distinct-parts sequencers. A rising edge on in1 resets.

■□■□ **PartitionsIntoSquares** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Square-partition sequencer (a first as a synth block): steps through the number of ways to write n as a sum of perfect squares 1, 1, 1, 1, 2, 2, 2, 2, 3, 4… (allowing repeats, order ignored: 4 = 4 = 1+1+1+1, so two ways). It connects the additive partition world to the squares, and is bounded above by the four-squares theorem that says four are always enough. Folded modulo Base. A square-part partition count distinct from the prime-part and ordinary partition sequencers. A rising edge on in1 resets.

■□■□ **PartitionsIntoTriangular** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Triangular-partition sequencer (a first as a synth block): steps through the number of ways to write n as a sum of triangular numbers 1, 1, 1, 2, 2, 2, 4, 4, 4, 6… (the parts drawn from 1, 3, 6, 10, 15…). Gauss proved every number is a sum of at most three triangular numbers (his EUREKA theorem), and this sequence counts all the ways. Folded modulo Base. A triangular-part partition count distinct from the square-part and prime-part sequencers. A rising edge on in1 resets.

■□■□ **Pascal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pascal's-triangle sequencer (a first as a synth block): reads Pascal's triangle row by row - 1; 1,1; 1,2,1; 1,3,3,1… - taking each binomial coefficient modulo Base and emitting it as a 0..1 stepped value, one per in0 clock. Modulo 2 the pattern IS the Sierpinski triangle (Lucas' theorem): a self-similar fractal of 1s and 0s; higher Base reveals the richer nested structure of binomials mod a number. A fractal melody/gate from the most elementary combinatorics, distinct from the cellular-automaton fractals. A rising edge on in1 resets to the top of the triangle.

■□■□ **PCG** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Permuted-congruential sequencer (a first as a synth block): the modern PCG generator - a plain linear-congruential engine (the oldest pseudo-random method) whose weak low bits are fixed by an output permutation that xor-shifts and then bit-rotates the state. The result is small, fast and statistically excellent, far better than the bare congruential generator it is built on. It plays a deterministic, very thoroughly scrambled melody. Bits sets the pitch range. A permuted-LCG noise distinct from the shift-register and squared-digit generators. A rising edge on in1 resets.

■□■□ **Pell** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pell-sequence sequencer (a first as a synth block): the recurrence P(n) = 2*P(n-1) + P(n-2) - giving 0,1,2,5,12,29,70,169,408… - whose ratios converge on the SILVER ratio (1 + sqrt2 ~ 2.414), the silver-mean analogue of Fibonacci's golden. The Pell numbers also give the best rational approximations to sqrt2 (the side-and-diagonal numbers). Each rising edge of the in0 clock advances one term, taken modulo Steps - a faster-climbing, silver-ratio melody distinct from the golden Fibonacci/Pisano and the plastic Padovan. A rising edge on in1 resets.

■□■□ **PellLucas** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pell-Lucas sequencer (a first as a synth block): steps through the companion Pell numbers 2, 2, 6, 14, 34, 82, 198, 478… defined by Q(n) = 2*Q(n-1) + Q(n-2) - the Pell recurrence (doubling the previous term) seeded to give the numerators of the rational approximations to the square root of 2. They grow by the silver ratio 1 + sqrt(2), a faster climb than the golden Fibonacci. Folded modulo Base. A silver-ratio companion sequence distinct from the Pell and Fibonacci sequencers. A rising edge on in1 resets.

■□■□ **Pentagonal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pentagonal-number gate (a first as a synth block): the output goes high when the step n is a pentagonal number - 1, 5, 12, 22, 35, 51, 70… (k(3k-1)/2), the dots that tile a growing pentagon. These are the very numbers in Euler's pentagonal-number theorem that drive the partition function, and n is one exactly when 24n+1 is a perfect square whose root is one less than a multiple of 6. The gate fires on a decelerating but sparser rhythm than the squares or triangulars. A rising edge on in1 resets.

■□■□ **Pentanacci** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pentanacci sequencer (a first as a synth block): the five-step Fibonacci - each term is the sum of the previous FIVE: 0, 0, 0, 0, 1, 1, 2, 4, 8, 16, 31, 61, 120… For the first several terms it doubles exactly (powers of two) before the deeper memory pulls it just below, its growth ratio approaching 2 as the number of summed terms rises. A deep-memory recurrence distinct from the two-term Fibonacci and three-term Tribonacci. Folded modulo Base. A rising edge on in1 resets.

▪▫▪▫ **Pentatope** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pentatope-number sequencer (a first as a synth block): steps through the pentatope (4-simplex) numbers 1, 5, 15, 35, 70, 126… = n(n+1)(n+2)(n+3)/24 - the four-dimensional analogue of the tetrahedral numbers, the running sums of the tetrahedral numbers and the fourth diagonal of Pascal's triangle (so every fifth binomial coefficient C(n,4)). Each clock advances one term, folded modulo Base. A 4-D figurate climb distinct from the 3-D tetrahedral sequencer. A rising edge on in1 resets.

▪▫▪▫ **Pernicious** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pernicious-number sequencer (a first as a synth block): steps through the pernicious numbers 3, 5, 6, 7, 9, 10, 11, 12, 13, 14… - integers whose binary representation contains a PRIME number of 1-bits (3 = 11 has two ones, 7 = 111 has three). A property living entirely in the binary digits, bridging primality and bit patterns. Each clock advances one term, folded modulo Base. A binary-popcount-prime class distinct from the decimal-digit sequencers. A rising edge on in1 resets.

▪▫▪▫ **Perrin** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Perrin-sequence sequencer (a first as a synth block): the recurrence P(n) = P(n-2) + P(n-3) seeded 3,0,2 - giving 3,0,2,3,2,5,5,7,10,12,17,22,29… - famous for the Perrin pseudoprime test (n divides P(n) almost exactly when n is prime). Each rising edge of the in0 clock advances one term, taken modulo Steps. It shares Padovan's plastic-number growth but a different opening, so its melody starts on a falling figure (3,0,2) before climbing - a distinct number-theoretic line from Padovan or the Fibonacci-based Pisano. A rising edge on in1 resets.

▪▫▪▫ **Persistence** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Multiplicative-persistence sequencer (a first as a synth block): each in0 clock advances the step n and outputs its multiplicative persistence - how many times you must replace the number by the product of its digits before reaching a single digit (39 -> 27 -> 14 -> 4 takes three steps, so its persistence is 3). Astonishingly, no number below 10^233 is known to need more than 11 steps, an unexplained ceiling. Most numbers collapse in one or two steps, so the output is a low, spiky pattern that occasionally jumps. The DEPTH of digit-product collapse, distinct from the MultRoot block that plays its endpoint. A rising edge on in1 resets.

▪▫▪▫ **Pisano** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Fibonacci-modulo sequencer (a first as a synth block): runs the Fibonacci recurrence modulo M, so the output is (..0,1,1,2,3,5,8,13..) wrapped into M levels - a melodic loop whose length is the Pisano period of M (often surprisingly long and lopsided). Advance on the in0 clock; Modulus sets the wrap and therefore the loop length and contour. Deterministic and exactly repeating yet rarely an obvious cycle - the additive cousin of the multiplicative sequencers. A rising edge on in1 resets to 0,1.

▪▫▪▫ **PlanePartition** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Plane-partition sequencer (a first as a synth block): steps through the number of plane partitions of n 1, 1, 3, 6, 13, 24, 48, 86, 160… - stacks of unit cubes pushed into a corner so the heights never increase going away from the walls, the three-dimensional generalisation of ordinary integer partitions. MacMahon's beautiful product formula counts them. The exact value is folded modulo Base. A 3-D partition count distinct from the flat partition and figurate sequencers. A rising edge on in1 resets.

▪▫▪▫ **Polydivisible** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Polydivisible-number sequencer (a first as a synth block): steps through the polydivisible numbers 1, 2, …, 9, 10, 12, 14, 16, 18, 20… - numbers where the first digit is divisible by 1, the first two digits form a number divisible

by 2, the first three by 3, and so on all the way down. A cascade of divisibility through the digits; there are only finitely many (the longest has 25 digits). Each clock advances one term, folded modulo Base. A prefix-divisibility class distinct from the whole-number divisibility sequencers. A rising edge on in1 resets.

▪▫▪▫ **Popcount** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Popcount sequencer (a first as a synth block): outputs the Hamming weight of the step n - the number of 1-bits in its binary representation - folded into Steps, one per in0 clock. As n counts up the bit-count rises and falls in a self-similar fractal pattern (0,1,1,2,1,2,2,3…), climbing on dense numbers and dropping to 1 at every power of two. Where Thue-Morse keeps only the PARITY of this count, Popcount plays the full value - a binary-weight melody distinct from the digit-sum and ruler contours. A rising edge on in1 resets.

▪▫▪▫ **Power2** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Power-of-two gate (a first as a synth block): the output goes high only when the step n is an exact power of two - 1, 2, 4, 8, 16, 32, 64… Each gap is double the last, so the gate fires on the sparsest possible self-similar rhythm: it hits, waits twice as long, hits, waits twice as long again, forever halving in density. The test is the classic bit trick (n AND n-1) == 0. The most extreme decelerando of the number gates, ideal for octave-spaced accents and bar-doubling structure. A rising edge on in1 resets.

▪▫▪▫ **Powerful** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Powerful-number sequencer (a first as a synth block): steps through the powerful numbers 1, 4, 8, 9, 16, 25, 27, 32, 36, 49, 64, 72, 81, 100… - integers in which every prime factor appears at least squared (so each is a product of a perfect square and a perfect cube). They are sparse and clump near the squares and cubes, giving a sequence that climbs in widening, uneven leaps. Each clock advances one term, folded modulo Base. A factor-exponent class distinct from the squarefree and smooth sequencers. A rising edge on in1 resets.

▪▫▪▫ **Practical** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Practical-number sequencer (a first as a synth block): steps through the practical numbers 1, 2, 4, 6, 8, 12, 16, 18, 20, 24… - integers n such that EVERY smaller number can be written as a sum of distinct divisors of n. They behave like little change-making systems (12 is why a dozen is handy), and they are about as dense as the primes yet defined multiplicatively. Each clock advances one term, folded modulo Base. A subset-sum-complete class distinct from the prime and abundant sequencers. A rising edge on in1 resets.

▪▫▪▫ **Prime** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Prime-step gate (a first as a synth block): a step counter advances on each rising edge of the in0 clock and the output goes high only when the count is a prime number (2,3,5,7,11,13…). Because primes thin out as they grow, the gate fires densely at first then ever more sparsely and irregularly - a deterministic yet non-repeating rhythm with no built-in period. Use it to trigger events, mask a sequence, or gate an effect on the primes. A rising edge on in1 resets the counter.

▪▫▪▫ **PrimeOmega** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Prime-factor-count sequencer (a first as a synth block): each in0 clock advances the step n and outputs big-Omega(n) - the number of prime factors of n counted WITH multiplicity (so 12 = 223 gives 3) - folded into Steps. It rises to a local peak at the powers and products of small primes and drops to 1 at every prime, climbing on average like log-log n. The total weight of a number's prime factorisation as a melody, distinct from the parity-only Liouville and the divisor-counting Divisors. A rising edge on in1 resets.

▪▫▪▫ **PrimePi** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Prime-counting sequencer (a first as a synth block): each in0 clock advances the step n and outputs pi(n), the number of primes less than or equal to n, folded into Steps. Unlike the prime GATE (which only fires on the primes themselves) this plays the running TALLY - a monotone staircase that steps up by one at every prime and holds flat across the composite runs, the function at the heart of the Prime Number Theorem (pi(n) ~ n / ln n). The widening flat steps trace how the primes thin out. A counting melody distinct from the prime gate. A rising edge on in1 resets.

▪▫▪▫ **Primorial** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Primorial sequencer (a first as a synth block): steps through the primorials 2, 6, 30, 210, 2310, 30030, 510510… - the running products of the prime numbers (2, then 23, then 23*5, and so on), the prime analogue of the factorial. They explode even faster than factorials and are central to proofs about prime gaps and to Euclid's proof that the primes never end. The exact product is folded modulo Base, giving a fast-cycling pattern as each new prime multiplies in. A prime-product climb distinct from the additive prime sequencers. A rising edge on in1 resets.

▪▫▪▫ **Pronic** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Pronic-number gate (a first as a synth block): the output goes high when the step n is a pronic (oblong) number - the product of two consecutive integers, 0, 2, 6, 12, 20, 30, 42… (k(k+1)), the count of dots in a rectangle one taller than it is wide, and exactly twice each triangular number. n is pronic when 4n+1 is a perfect square. The gate fires on a decelerating rhythm interleaved exactly halfway between the squares. A rising edge on in1 resets.

▪▫▪▫ **Queens** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

N-queens sequencer (a first as a synth block): steps through the number of ways to place n non-attacking queens on an n-by-n chessboard 1, 1, 0, 0, 2, 10, 4, 40, 92, 352, 724… - one of the most famous combinatorial search problems. The count is zero for the impossible 2 and 3 boards, then climbs irregularly; the eight-queens puzzle has its celebrated 92 solutions. Each clock recomputes the count by backtracking and folds it modulo Base. A board-packing count distinct from every closed-form sequencer. A rising edge on in1 resets.

▪▫▪▫ **Radical** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Radical sequencer (a first as a synth block): each in0 clock advances the step n and outputs the RADICAL of n - the product of its distinct prime factors, with all repeats stripped out (so 12 = 223 has radical 23 = 6, and 8 = 22*2 has radical just 2) - folded into Steps. The radical equals n itself for the squarefree numbers and drops far below it for the prime-power-heavy ones, so the melody dips sharply at every perfect power. The squarefree kernel of a number as a melody, central to the abc conjecture, distinct from the additive divisor functions. A rising edge on in1 resets.

▪▫▪▫ **Recaman** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Recaman's-sequence sequencer (a first as a synth block): walks the famous OEIS A005132 path a(n) = a(n-1) - n when that step lands on a positive integer not already visited, else a(n-1) + n - the jump-back-or-leap-forward self-avoiding walk that is renowned for sounding musical (the Numberphile melody). Each rising edge of the in0 clock advances one term, folded into Steps to keep it in range; the contour darts down and springs up with none of the symmetry of a periodic pattern. Distinct from the monotone hailstone of Collatz. A rising edge on in1 resets to the 256-term phrase start.

▪▫▪▫ **Refactorable** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Refactorable-number sequencer (a first as a synth block): steps through the refactorable (or tau) numbers 1, 2, 8, 9, 12, 18, 24, 36, 40, 56… - integers that are divisible by their OWN number of divisors (12 has six divisors and 12/6 = 2). A self-referential factor property: the count of divisors itself divides the number. Each clock advances one

term, folded modulo Base. A self-divisor class distinct from the perfect and abundant sequencers. A rising edge on in1 resets.

▪▫▪▫ **Repdigit** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Repdigit gate (a first as a synth block): the output goes high when every digit of the step n is the SAME (1, 2, …, 9, 11, 22, …, 99, 111, 222, …, 1111…). These monodigit numbers (the repunits 1, 11, 111… among them) are extremely sparse - only nine in each block of digit-length - so the gate fires in tight little clusters of nine right after each power of ten, then falls silent for a long stretch. The most regular of the rare digit gates, distinct from the palindrome and prime gates. A rising edge on in1 resets.

▪▫▪▫ **ReverseAdd** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Reverse-and-add orbit sequencer (a first as a synth block): walks the famous 196-algorithm - take a number, add it to its own digit-reversal, repeat - which almost always tumbles into a palindrome but for a few stubborn seeds (196, 879…) may climb forever. Each clock takes one reverse-add step and emits the running value folded into a pitch; when it grows large it reseeds to the next small number, so you hear orbit after orbit of this digit-mixing climb. A self-referential digit dynamic distinct from the power-sum orbits. A rising edge on in1 resets.

▪▫▪▫ **Riordan** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Riordan-number sequencer (a first as a synth block): steps through the Riordan numbers 1, 0, 1, 1, 3, 6, 15, 36, 91, 232… - the Motzkin paths with no flat steps at ground level, equivalently certain trees and the number of ways to colour cyclic arrangements. They obey (n+1)a(n) = (n-1)(2a(n-1) + 3a(n-2)) and are a close relative of the Motzkin and Catalan families. The exact value is folded modulo Base. A flat-step-free path count distinct from the Motzkin sequencer. A rising edge on in1 resets.

▪▫▪▫ **RogersRamanujan1** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Rogers-Ramanujan (first) sequencer (a first as a synth block): steps through the partitions of n into parts that leave remainder 1 or 4 when divided by 5: 1, 1, 1, 1, 2, 2, 3, 3, 4, 5… The celebrated first Rogers-Ramanujan identity proves this exactly equals the partitions whose parts differ by at least 2 - a deep and surprising equality between a congruence condition and a gap condition. Folded modulo Base. A gap-condition partition count distinct from the ordinary partition sequencer. A rising edge on in1 resets.

▪▫▪▫ **RogersRamanujan2** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Rogers-Ramanujan (second) sequencer (a first as a synth block): steps through the partitions of n into parts that leave remainder 2 or 3 when divided by 5: 1, 0, 1, 1, 1, 1, 2, 2, 3, 3… The second Rogers-Ramanujan identity proves this equals the partitions whose parts are at least 2 and differ by at least 2. The companion to the first identity, shifted by the smallest allowed part. Folded modulo Base. A shifted gap-condition count distinct from the first Rogers-Ramanujan sequencer. A rising edge on in1 resets.

▪▫▪▫ **RudinShapiro** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Rudin-Shapiro sequencer (a first as a synth block): outputs the Rudin-Shapiro sequence as a 0/1 gate - high when the number of overlapping '11' pairs in the step counter's binary is even (the +1 term), low when odd. Its defining property is remarkable: it is fully deterministic yet its power spectrum is FLAT, like white noise - the +/-1 sequence whose partial sums stay bounded by sqrt-of-n, the closest a structured pattern gets to acoustically random. A rhythm that sounds scattered and unpredictable but never actually repeats, distinct from the nested symmetry of Thue-Morse. A rising edge on in1 resets the counter.

▪▫▪▫ **Ruler** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Ruler-sequence sequencer (a first as a synth block): outputs the 2-adic valuation of the step n - the number of times 2 divides it, equivalently the count of trailing zeros in its binary - folded into Steps, one per in0 clock. The result is exactly the tick pattern on a ruler: 0,1,0,2,0,1,0,3,0,1,0,2… where every other mark is short, every fourth is taller, every eighth taller still, forever self-similar. A perfectly nested fractal staircase that drives rhythmic accents and melodic emphasis, distinct from the digit-sum and popcount contours. A rising edge on in1 resets.

▪▫▪▫ **Sandpile** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Abelian sandpile (a first as a synth block): drops a grain on the centre of a 4x4 pile each clock; when any cell reaches four grains it topples, sending one to each neighbour and possibly starting a chain reaction off the open edges. The output is the avalanche size - how many topplings that grain triggered - which is silent most of the time then spikes, following the power-law statistics of self-organised criticality. Most hits do nothing; occasionally one grain unleashes a cascade. A model of avalanches, forest fires and earthquakes as a rhythmic CV. A rising edge on in1 clears the pile.

▪▫▪▫ **Schroeder** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Schroeder-number sequencer (a first as a synth block): outputs the large Schroeder numbers - 1,2,6,22,90,394,1806… - which count the lattice paths from one corner of a grid to the opposite one using east, north and diagonal steps that never cross the diagonal (and a dozen other things in combinatorics). They are built here by the convolution S(n) = S(n-1) + sum S(k)S(n-1-k), so taking them modulo Base is exact. Growing faster than 5^n, mod Base they scramble into a busy pattern. A lattice-path melody distinct from the Catalan and Motzkin counts. A rising edge on in1 resets.

▪▫▪▫ **Secant** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Secant-number sequencer (a first as a synth block): steps through the even-indexed zigzag numbers 1, 1, 5, 61, 1385, 50521… that appear as the coefficients in the Taylor series of sec(x) (the unsigned Euler numbers). These count the alternating permutations of EVEN length and grow a touch slower than the tangent family, so the melody climbs steeply but a step behind Tangent once folded modulo Base. A trigonometric-combinatorial line distinct from the Euler and Tangent sequencers. A rising edge on in1 resets.

▪▫▪▫ **SecondOrder** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Second-order (reversible) cellular-automaton sequencer (a first as a synth block): runs an elementary CA with memory - the next row is the Rule applied to the current row XOR-ed with the PREVIOUS row. That backward coupling makes the automaton time-reversible (you can run it backwards to recover any past state), so it conserves information and never settles into a fixed pattern, churning endlessly. Each clock advances one generation on a 31-cell ring, reading a 12-cell window out as a stepped CV. A reversible CA distinct from the dissipative Wolfram and Totalistic ones. A rising edge on in1 resets.

▪▫▪▫ **SelfConjugate** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Self-conjugate-partition sequencer (a first as a synth block): steps through the number of self-conjugate partitions of n 1, 1, 0, 1, 1, 1, 1, 1, 2, 2… - the partitions whose Young diagram is symmetric across its main diagonal (unchanged when rows and columns are swapped). Euler showed these are exactly the partitions into DISTINCT ODD parts. Computed by the distinct-odd-parts recurrence, folded modulo Base. A symmetric-diagram count distinct from the full and distinct partition sequencers. A rising edge on in1 resets.

▪▫▪▫ **SelfNumber** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Self-number sequencer (a first as a synth block): steps through the self (or Colombian) numbers 1, 3, 5, 7, 9, 20, 31, 42, 53, 64, 75, 86, 97, 108… - integers that CANNOT be written as some smaller number plus its own digit sum,

so they have no ‘generator’ and stand alone. Discovered by the Indian mathematician Kaprekar, they thin out in a curious near-periodic pattern tied to base ten. Each clock advances one term, folded modulo Base. A digit-generator gap sequence distinct from the other digit sequencers. A rising edge on in1 resets.

■□■□ **Sigma** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Divisor-sum sequencer (a first as a synth block): each in0 clock advances the step n and outputs sigma(n), the sum of ALL of n’s divisors (sigma(6) = 1+2+3+6 = 12), folded into Steps as a 0..1 melody. Where the Totient counts what is coprime to n and Divisors counts how many divisors it has, Sigma adds them all up - so it climbs highest at the abundant, factor-rich numbers and sits low (sigma(p) = p+1) at the primes. The perfect numbers are exactly where sigma(n) = 2n. A melody from the total weight of divisibility, distinct from the other arithmetic functions. A rising edge on in1 resets.

■□■□ **SmallOmega** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Distinct-prime-factor sequencer (a first as a synth block): each in0 clock advances the step n and outputs little-omega(n) - the number of DISTINCT prime factors of n (so 12 = 223 gives just 2, since only 2 and 3 are distinct) - folded into Steps. It stays at 1 across all the prime powers and rises only when a number draws in a NEW prime, so it climbs very slowly and spotlights the squarefree, many-prime numbers. The count of distinct primes as a melody, distinct from the with-multiplicity PrimeOmega. A rising edge on in1 resets.

■□■□ **Smith** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Smith-number gate (a first as a synth block): the output goes high when the step n is a Smith number - a composite whose digits sum to the SAME total as the digits of all its prime factors added up (4 = 22 has digit sum 4 and factor-digit sum 2+2 = 4; 22 = 211 gives 4 and 2+1+1 = 4). Named after a phone number that turned out to have this property, they are scattered irregularly among the integers, so the gate fires on a sparse, unpredictable rhythm tied to the deep link between a number’s digits and its factorisation. A rising edge on in1 resets.

■□■□ **SophieGermain** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Sophie-Germain-prime sequencer (a first as a synth block): steps through the primes p for which 2p+1 is ALSO prime - 2, 3, 5, 11, 23, 29, 41, 53, 83, 89… Named after the mathematician who used them to attack Fermat’s Last Theorem, they are central to cryptography (the safe primes 2p+1 resist certain attacks). They form a sparse, irregular subset of the primes. Each clock advances one term, folded modulo Base. A cryptographic prime class distinct from the twin-prime and full prime sequencers. A rising edge on in1 resets.

■□■□ **Square** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Perfect-square gate (a first as a synth block): the output goes high when the step n is a perfect square - 0, 1, 4, 9, 16, 25, 36… The gaps between squares grow by the odd numbers (1, 3, 5, 7…), so the gate fires on a smoothly and quadratically decelerating rhythm: a quick flurry at the start that stretches into ever-longer silences faster than the triangular gate. A perfect-square pulse distinct from the triangular and prime gates. A rising edge on in1 resets.

■□■□ **Squarefree** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Squarefree-number sequencer (a first as a synth block): steps through the squarefree numbers 1, 2, 3, 5, 6, 7, 10, 11, 13, 14, 15, 17, 19, 21, 22, 23… - integers divisible by no perfect square (no repeated prime factor). They have density 6/pi-squared, about 61 percent of all integers, so the sequence skips only the few that carry a squared factor (4, 8, 9, 12, 16…), giving a near-chromatic run with occasional gaps. Each clock advances one term, folded modulo Base. The exact complement of the powerful numbers. A rising edge on in1 resets.

■□■□ **SquarePyramidal** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Square-pyramidal-number sequencer (a first as a synth block): steps through the square-pyramidal numbers 1, 5, 14, 30, 55, 91… = n(n+1)(2n+1)/6 - the count of spheres stacked in a pyramid with a square base, the running sums of the perfect squares. They appear in the classic cannonball problem (only 4900 is both square and square-pyramidal). Each clock advances one term, folded modulo Base. A square-based packing distinct from the triangular tetrahedral sequencer. A rising edge on in1 resets.

■□■□ **Stanley** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Stanley sequencer (a first as a synth block): steps through the Stanley sequence 0, 1, 3, 4, 9, 10, 12, 13, 27, 28… - built greedily by always adding the smallest integer that creates NO three-term arithmetic progression with any two earlier terms. Remarkably the result is exactly the numbers whose base-three representation contains no digit 2, giving it a clean self-similar Cantor-like structure. Folded modulo Base. A progression-free greedy set distinct from the Sidon (Mian-Chowla) set. A rising edge on in1 resets.

■□■□ **StarNumber** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Star-number sequencer (a first as a synth block): steps through the star (or centred-hexagram) numbers 1, 13, 37, 73, 121, 181… = 6n(n-1) + 1 - dots arranged in a six-pointed Star of David, a centred hexagonal number with six triangular points added. They climb in even, widely-spaced jumps. Each clock advances one term, folded modulo Base. A centred star figurate distinct from the solid polyhedral sequencers. A rising edge on in1 resets.

■□■□ **Stern** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Stern diatomic sequencer (a first as a synth block): outputs Stern's diatomic sequence (the fusc function) - 0,1,1,2,1,3,2,3,1,4,3,5… - in which consecutive pairs enumerate every positive rational number exactly once, the arithmetic behind the Stern-Brocot tree. Each rising edge of the in0 clock advances one term, folded into 16 steps; the contour rises and falls in a self-similar fractal staircase that never repeats. A deterministic, number-theoretic melody distinct from the Fibonacci-based Pisano. A rising edge on in1 resets.

■□■□ **Stirling1** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Stirling-first-kind sequencer (a first as a synth block): reads the UNSIGNED Stirling triangle of the FIRST kind row by row - the number of permutations of n items having exactly k disjoint cycles (1; 1,1; 2,3,1; 6,11,6,1…) - modulo Base. Built by S(n,k) = S(n-1,k-1) + (n-1)*S(n-1,k), so mod Base is exact. Where the second kind counts set partitions, the first kind counts permutation cycles, and each row sums to a factorial. A cycle-counting triangle melody distinct from the second-kind and Pascal triangles. A rising edge on in1 resets.

■□■□ **Stirling2** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Stirling-second-kind sequencer (a first as a synth block): reads Stirling's triangle of the SECOND kind row by row - S(n,k), the number of ways to split n objects into exactly k non-empty groups (1; 1,1; 1,3,1; 1,7,6,1…) - taken modulo Base. Built by the recurrence S(n,k) = S(n-1,k-1) + k*S(n-1,k), so mod Base is exact. Each row sums to a Bell number, so this is the partition-counting triangle behind the Bell sequence. A set-partition triangle melody distinct from the Pascal and Catalan triangles. A rising edge on in1 resets.

■□■□ **Tangent** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Tangent-number sequencer (a first as a synth block): steps through the odd-indexed zigzag numbers 1, 2, 16, 272, 7936, 353792… that appear as the coefficients in the Taylor series of tan(x). These are the alternating permutations of ODD length, and they explode far faster than the secant family, so the melody rockets upward in big leaps once folded modulo Base. A trigonometric-combinatorial climb distinct from the Euler and Catalan sequencers. A rising edge on in1 resets.

▪▫▪▫ **TentMap** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Tent-map chaos sequencer (a first as a synth block): iterates x' = R * min(x, 1-x), the simplest piecewise-linear chaotic map - a symmetric tent that stretches and folds the unit interval. At R near 2 it is fully chaotic, producing a stepped CV that never repeats yet stays evenly spread across the range (unlike the lopsided logistic Chaos). Each rising edge of the in0 clock takes one iteration; R below 2 tames it toward order. A rising edge on in1 reseeds. The angular, uniform cousin of the smooth attractors.

▪▫▪▫ **TernaryTree** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Ternary-tree sequencer (a first as a synth block): steps through the Fuss-Catalan numbers 1, 1, 3, 12, 55, 273, 1428, 7752… = C(3n, n)/(2n+1) - the count of rooted trees in which every node has exactly zero or three children (the ternary analogue of the Catalan binary trees), and of the ways to triangulate a polygon with non-crossing diagonals into quadrilaterals. The exact value is folded modulo Base. A three-way branching count distinct from the binary Catalan sequencer. A rising edge on in1 resets.

▪▫▪▫ **Tetrahedral** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Tetrahedral-number sequencer (a first as a synth block): steps through the tetrahedral numbers 1, 4, 10, 20, 35, 56, 84, 120… = n(n+1)(n+2)/6 - the count of spheres stacked in a triangular pyramid (cannonball-pile shape), the running sums of the triangular numbers. They are the third diagonal of Pascal's triangle. Each clock advances one term, folded modulo Base. A 3-D figurate climb distinct from the flat polygonal and the 4-D pentatope sequencers. A rising edge on in1 resets.

▪▫▪▫ **Tetranacci** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Tetranacci sequencer (a first as a synth block): the four-step Fibonacci, T(n) = T(n-1) + T(n-2) + T(n-3) + T(n-4) - 0,0,0,1,1,2,4,8,15,29,56… - each term the sum of the FOUR before it instead of two, so its ratio of successive terms climbs toward ~1.9276 rather than the golden 1.618. Each in0 clock advances one term, taken modulo Steps. Its faster four-term growth gives a melody that accelerates up the scale more steeply than Fibonacci or Tribonacci. A higher-order recurrence distinct from the Pisano and Padovan sequencers. A rising edge on in1 resets.

▪▫▪▫ **ThueMorse** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Thue-Morse sequencer (a first as a synth block): outputs the Thue-Morse sequence - the parity of the number of 1-bits in a step counter - as a 0/1 gate that advances on every rising edge of the in0 clock (0,1,1,0,1,0,0,1…). It is the canonical fair-share, cube-free, self-similar binary sequence: never periodic yet never random, full of nested symmetry. Use it as an aperiodic rhythm, a generative on/off mask, or a melodic gate that feels structured but never repeats. A rising edge on in1 resets the counter.

▪▫▪▫ **Totalistic** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Totalistic cellular-automaton sequencer (a first as a synth block): runs a one-dimensional CA whose next cell depends only on the SUM of its three-cell neighbourhood (0 to 3), not the exact pattern - so the whole rule is a 4-bit Code. This is the symmetric, count-only cousin of the Wolfram CA, the same rule space Wolfram used to study totalistic complexity. Each clock advances one generation on a 31-cell ring, reading a 12-cell window out as a stepped CV. A sum-driven automaton distinct from the pattern-driven Wolfram and second-order CAs. A rising edge on in1 resets to a single live cell.

▪▫▪▫ **Totient** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Euler-totient sequencer (a first as a synth block): each rising edge of the in0 clock advances the step n and outputs phi(n)/n - the fraction of integers up to n that share no factor with it. The contour is jagged and number-aware: it

sits high near primes (phi(p)/p = 1 - 1/p, almost 1) and plunges at the highly-composite, factor-rich numbers (6, 30, 210…), tracing the multiplicative texture of the integers as a melody. A deterministic line whose ups and downs encode coprimality itself, unlike the additive Stern or the word sequences. A rising edge on in1 resets.

▪▫▪▫ **Triangular** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Triangular-number gate (a first as a synth block): the output goes high when the step n is a triangular number - one that counts the dots in a filled triangle, 0,1,3,6,10,15,21,28,36,45… (n(n+1)/2). The test is the classic one: n is triangular exactly when 8n+1 is a perfect square. Because the gaps between successive triangular numbers grow by one each time, the gate fires on a steadily-rarefying rhythm - dense at first, then ever-longer silences - a smoothly-decelerating pulse distinct from the irregular prime and happy-number gates. A rising edge on in1 resets.

▪▫▪▫ **Tribonacci** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Tribonacci-word sequencer (a first as a synth block): the three-symbol cousin of the Fibonacci word, grown by the substitution a -> a b, b -> a c, c -> a (its own fixed point) and emitted as a three-level CV (0, 0.5, 1), one symbol per in0 clock. Where the Fibonacci word is built on the golden ratio, this is built on the tribonacci constant ~1.839 - a balanced, aperiodic THREE-state pattern that never repeats and tiles the line like a 1-D quasicrystal. A richer alphabet than the binary words, distinct from the Fibonacci word and Kolakoski. A rising edge on in1 resets; the first 256 symbols then loop.

▪▫▪▫ **TribonacciWord** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Tribonacci-word sequencer (a first as a synth block): the infinite three-symbol word grown by the substitution 0 -> 01, 1 -> 02, 2 -> 0, giving 0102010010201010201… - the ternary cousin of the Fibonacci word, the symbolic shadow of the Tribonacci constant. Its three symbols appear in the Tribonacci proportions and tile the line self-similarly, a three-note aperiodic pattern. Each clock advances one symbol, output as 0, 0.5 or 1. A Tribonacci-ratio word distinct from the two-symbol Fibonacci word. A rising edge on in1 resets.

▪▫▪▫ **TrigSeq** [SEQ][CV][FX][SYNTH] in: Clock out: CV

Trigger sequencer: steps through an on/off pattern on each rising edge of the in0 clock, emitting a trigger on the steps you switch on - a compact drum/gate sequencer. Steps sets the loop length, Pattern is the on/off bitmask (0-255 = 8 steps). in0 = Clock.

▪▫▪▫ **TwinPrime** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Twin-prime sequencer (a first as a synth block): steps through the lesser members of the twin-prime pairs 3, 5, 11, 17, 29, 41, 59, 71, 101, 107… - primes p for which p+2 is ALSO prime (3 and 5, 11 and 13, 17 and 19). Whether there are infinitely many is one of the oldest open problems in mathematics. They thin out faster than the primes, giving a sparse, irregular climb. Each clock advances one term, folded modulo Base. A prime-pair subset distinct from the full prime sequencer. A rising edge on in1 resets.

▪▫▪▫ **Ulam** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Ulam-sequence sequencer (a first as a synth block): the additive sequence 1, 2, 3, 4, 6, 8, 11, 13, 16, 18, 26, 28… where each new term is the smallest integer larger than the last that is the sum of two distinct earlier terms in EXACTLY one way. Despite that purely additive rule it develops a deep, still-unexplained near-periodicity (a hidden spacing near 21.6) that number theory cannot yet account for. Each rising edge of the in0 clock advances one term, folded into Steps; a quasi-periodic melody distinct from the Fibonacci-based Pisano and the rational-enumerating Stern. A rising edge on in1 resets.

▪▫▪▫ **Undulating** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Undulating-number gate (a first as a synth block): the output goes high when the step n has digits that strictly ALTERNATE between two different values in an a-b-a-b-a pattern (101, 121, 131…, 212, 232…, 12121…). These wavy numbers ripple back and forth between two digits, and they are sparse and clustered, so the gate fires in little flurries near each band of three-, then four-, then five-digit numbers. A zig-zag digit rhythm distinct from the palindrome and repdigit gates. A rising edge on in1 resets.

▪▫▪▫ **VanDerCorput** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Van der Corput low-discrepancy sequencer (a first as a synth block): outputs the radical-inverse sequence - reverse the bits of the step counter and read them as a fraction - so each new value lands in the largest remaining gap (0.5, 0.25, 0.75, 0.125, 0.625…). The result spreads evenly across the range yet never repeats a spacing, the quasi-random-but-balanced pattern used in quasi-Monte-Carlo sampling. Advance on the in0 clock; a rising edge on in1 resets. A more even, less clumpy alternative to a random source.

▪▫▪▫ **Wedderburn** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Wedderburn-Etherington sequencer (a first as a synth block): steps through the Wedderburn-Etherington numbers 1, 1, 1, 2, 3, 6, 11, 23, 46, 98, 207, 451… which count the number of distinct ways to bracket a product of n identical items when the operation is commutative but NOT associative - equivalently the unordered binary trees with n leaves. They arise in counting hydrocarbon isomers and phylogenetic trees, and grow by a deep nonlinear self-convolution. Folded modulo Base. A combinatorial tree count distinct from the linear recurrences. A rising edge on in1 resets.

▪▫▪▫ **Weyl** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Weyl-sequence sequencer (a first as a synth block): the additive recurrence x <- frac(x + alpha) with an IRRATIONAL step, whose iterates are equidistributed by Weyl's theorem - they spread out perfectly evenly and never repeat. With the golden ratio as the step it becomes the optimal one-dimensional low-discrepancy sequence, each new note falling in the largest remaining gap. Ratio selects the irrational (golden, root 2, root 3, plastic), each giving a different even scatter. A number-theoretic equidistribution distinct from the chaotic and pseudo-random sources. A rising edge on in1 resets.

▪▫▪▫ **Wireworld** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Wireworld cellular automaton (a first as a synth block): a 4x4 grid of cells in four states - empty, electron head, electron tail, conductor - evolves on each rising edge of the in0 clock. A head becomes a tail, a tail becomes a conductor, and a conductor becomes a head only if exactly one or two neighbours are heads, so electrons stream along the conductor wires like current in a circuit. The output is the electron-head density as a stepped CV - sparks chasing each other around closed loops. Seed sets the initial spark density; a rising edge on in1 reseeds.

▪▫▪▫ **Wolfram** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Elementary cellular-automaton sequencer (a first as a synth block): runs Stephen Wolfram's one-dimensional 2-state CA on a 31-cell ring - every cell updates from itself and its two neighbours by the 8-bit Rule code (Rule 30 is chaotic and was used as a random generator, Rule 90 draws the Sierpinski triangle, Rule 110 is Turing-complete, Rule 184 models traffic). Each clock advances one generation, reading a 12-cell window of the row out as a stepped CV. The whole zoo of CA behaviour - order, chaos and the complex edge between them - from one integer. A rising edge on in1 resets to a single live cell.

▪▫▪▫ **Xorshift** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Xorshift-PRNG sequencer (a first as a synth block): clocks George Marsaglia's xorshift generator - the running 32-bit word is repeatedly shifted and XOR-ed into itself (left 13, right 17, left 5) - one of the fastest pseudo-random

generators known. It visits all 2^32 - 1 non-zero states before repeating, so like the LFSR it plays a deterministic but seemingly random melody, with a denser, more thoroughly scrambled feel from mixing the whole word at once. Bits sets the read-out pitch range. A word-mixing noise distinct from the bit-shifting LFSR. A rising edge on in1 resets the seed.

▪▫▪▫ **Zeckendorf** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Zeckendorf-weight sequencer (a first as a synth block): every positive integer has a UNIQUE representation as a sum of non-consecutive Fibonacci numbers (Zeckendorf's theorem); each rising edge of the in0 clock advances the step n and outputs how many Fibonacci terms that representation needs, folded into Steps. The weight rises and falls as the greedy Fibonacci-base digits shuffle - the 'Fibonacci-base digit sum', a self-similar contour related to the golden ratio and the Fibonacci word. A melody from base-phi numeration, distinct from the decimal Champernowne. A rising edge on in1 resets.

▪▫▪▫ **Zuckerman** [SEQ][CV][FX][SYNTH] in: Clock, Reset out: CV

Zuckerman-number sequencer (a first as a synth block): steps through the Zuckerman numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 15… - integers divisible by the PRODUCT of their own digits (12 has digit product 2 and 12/2 = 6; numbers containing a zero are excluded). A self-referential multiplicative digit property. Each clock advances one term, folded modulo Base. A digit-product-divisible class distinct from the digit-sum Harshad sequencers. A rising edge on in1 resets.

Spectral (13)

▏▎▍ **FormantShift** [SPC][FX][SYNTH] in: Audio out: Audio

Formant shift: per STFT frame it captures the magnitude envelope, resamples it by a ratio of 2^(Shift/12), then re-weights each bin to impose the shifted envelope while leaving the underlying partials in place. Shift (+/-12 semitones) moves the formants up or down, so pitch stays fixed while timbre changes; Mix blends against the dry input. Produces vocal gender/size effects without affecting the played note.

▏▎▍ **LinearEQ** [SPC][FX][SYNTH] in: Audio out: Audio

Linear-phase 3-band EQ: per STFT frame it applies a single magnitude gain to each FFT bin grouped into low (below half/8), mid, and high (from half/2) bands, so the output has zero phase shift. Low, Mid, and High set each band's gain in dB (converted via 10^(dB/20)); Mix blends against the dry input. The linear-phase response avoids the phase smearing of analog EQ, useful on transient or stereo material.

▏▎▍ **MatchEQ** [SPC][FX][SYNTH] in: Audio out: Audio

Matching EQ: with Capture on it learns each bin's magnitude as a reference curve; with Capture off it scales every bin toward that stored reference per frame. Capture latches learn vs apply, Amount (0..1) blends between no change and a full match (bin gain clamped to 8x); Mix blends against the dry input. Reshapes the input's tonal balance to resemble a previously captured reference.

▏▎▍ **Soothe** [SPC][FX][SYNTH] in: Audio out: Audio

Dynamic resonance suppressor: per STFT frame it tracks a smoothed local average up the bins and pulls any bin above that average down toward it, scaled by Amount. Amount (0..1) sets how aggressively over-average peaks are tamed (0 leaves them, 1 flattens them to the average); Mix blends against the dry input. Reduces harsh resonant spikes for a smoother, more even spectrum.

SpecBlur [SPC][FX][SYNTH] in: Audio out: Audio

Spectral blur: per STFT frame each bin's magnitude is a Blur-weighted mix of its previous value and the current one, smearing magnitudes over time while keeping live phase. Blur (0..1) sets the smoothing amount – higher values hold past energy longer; Mix blends against the dry input. Softens transients and stretches the sound into a sustained pad.

SpecComp [SPC][FX][SYNTH] in: Audio out: Audio

Spectral compressor: per STFT frame it finds the loudest bin, then attenuates every bin above Threshold (relative to that peak) back toward the threshold. Threshold sets the relative knee and Amount scales how hard over-threshold bins are pulled down; Mix blends against the dry input. Evens out spectral dynamics, taming dominant partials for a flatter, denser spectrum.

SpecDelay [SPC][FX][SYNTH] in: Audio out: Audio

Spectral echo: per STFT frame each bin's magnitude is summed with its previous-frame value scaled by Feedback, and that running magnitude is fed back (live phase retained). Feedback (0..0.95) sets how much each bin's energy persists and decays across frames; Mix blends against the dry input. Produces a smeared, frequency-domain tail closer to a freeze/reverb than a discrete time echo.

SpecFilter [SPC][FX][SYNTH] in: Audio out: Audio

Per-bin spectral filter: runs a streaming STFT and zeroes whole FFT bins on one side of a cutoff bin for a brick-wall response in the frequency domain. Cutoff is the bin index of the edge and Mode selects low-pass (zero bins above) or high-pass (zero bins below); Mix blends against the dry input. The hard bin cut gives a far steeper, ringing-free roll-off than an analog filter.

SpecFreeze [SPC][FX][SYNTH] in: Audio out: Audio

Spectral freeze: while Freeze is off it tracks each FFT bin's magnitude per frame; when Freeze is on it holds those captured magnitudes (keeping the live phase) to sustain the last spectrum indefinitely. Freeze is the on/off latch and Mix blends the held spectrum against the dry input. Turns a transient moment into a steady drone or pad.

SpecGate [SPC][FX][SYNTH] in: Audio out: Audio

Spectral gate: runs a streaming STFT and, per frame, zeroes any FFT bin whose magnitude falls below Threshold relative to the loudest bin. Threshold sets that cutoff fraction (0 passes everything, 1 keeps only the peak); Mix blends the gated spectrum against the dry input. Keeps only the strongest partials, thinning noise and weak harmonics into a sparser, cleaner tone.

SpecMorph [SPC][FX][SYNTH] in: Audio out: Audio

Spectral smoothing: per STFT frame it runs a one-pole average up the bins, replacing each magnitude with a Smooth-weighted blend of the running value and the current bin (live phase retained). Smooth (0..1) sets how strongly the envelope is smeared across frequency – higher values flatten spectral detail; Mix blends against the dry input. Blurs sharp formants into a softer, more uniform tone.

Spectral [SPC][FX][SYNTH] in: Audio out: Audio

FFT spectral-resynthesis oscillator: a streaming 1024-pt STFT phase vocoder (75% overlap) that FFTs each frame, reshapes the spectrum, then iFFTs. Stretch scales the spectral envelope by resampling bins, Shift moves bins up/down for a frequency shift, and Blur smears each bin's magnitude over time. Mix crossfades the resynthesis against the dry signal – pushes toward metallic, harmonically reshaped tones.

SpectralReso [SPC][FX][SYNTH] in: Audio out: Audio

Spectral resonator: per STFT frame each bin is compared with its two neighbors; local peaks are boosted by up to 1 + Amount x 2 while non-peak bins are cut by up to Amount x 0.5. Amount (0..1) sets both the peak boost and the valley attenuation; Mix blends against the dry input. Sharpens the spectrum into a more resonant, harmonically pronounced, vowel-like tone.

Stereo (18)

AutoPan [STR][FX][SYNTH] in: Audio out: Audio

LFO auto-panner for a mono source: a sine LFO driven from the shared transport time sweeps a constant-power pan automatically. Rate sets the sweep speed from 0.05 to 10 Hz and Depth scales how far the source travels. Out picks L or R, and because the LFO is phase-coherent across instances the two outputs track in opposition for stable motion.

AutoWidth [STR][FX][SYNTH] in: L, R out: Audio

Auto-widening LFO: a sine LFO swings the mid/side width of the L/R pair so the stereo image rhythmically breathes between narrow and wide. Rate sets the sweep speed, Depth how far the width travels around a centred 1.0, and the LFO is driven from the shared transport time so it is phase-coherent across instances. Where AutoPan moves a mono source side to side and StereoWidth sets a fixed spread, AutoWidth animates the width of an existing stereo signal. in0 is L, in1 is R; Out picks the channel.

Balance [STR][FX][SYNTH] in: L, R out: Audio

Stereo balance for an existing L/R pair: tilts the level between the two input channels without collapsing them to mono - Balance at -1 mutes the right and passes the left, +1 does the reverse, 0 leaves both untouched. Where Pan places a single mono source and StereoWidth changes the mid/side spread, Balance simply re-weights a stereo signal's sides (the classic balance knob). in0 is L, in1 is R; Out picks which channel this instance emits.

Binaural [STR][FX][SYNTH] in: L, R out: Audio

Binaural 3D panner: positions the (summed) input at an Azimuth around the head using an interaural time delay, an interaural level difference and a head-shadow low-pass on the far ear - a simplified HRTF that places a sound left/right with real depth on headphones, beyond a flat constant-power pan. Azimuth sweeps -90..90 degrees, Distance dims and dulls far sources, and Out picks L or R.

Crossfeed [STR][FX][SYNTH] in: L, R out: Audio

Headphone crossfeed: low-passes the opposite channel and bleeds it into this one by Amount, emulating how each ear hears both speakers in a room. Amount sets the bleed level from 0 to 1. Out picks L or R, choosing which channel is the destination and which is the filtered source; eases the hard-panned separation that fatigues on headphones.

Doubler [STR][FX][SYNTH] in: Audio out: Audio

Vocal doubler: writes the input to a delay line and reads back a single detuned, delayed copy whose time drifts via a slow c.time-phased LFO for a natural double-tracked feel. Detune scales the drift depth, Delay sets the base delay time, and Out shifts the copy slightly shorter or longer (0.9x or 1.1x of the base) to place it as the left or right voice. Layer two instances on opposite Out settings for a widened stereo double.

FreqPanner [STR][FX][SYNTH] in: L, R out: Audio

Frequency-split panner: sums the input to mono, low-passes it at Freq, and applies a constant-power pan to only the high band while the low band stays centred. Freq sets the split from 100 to 4000 Hz and Pan positions the highs from -1 to +1. Out picks L or R, applying the matching pan-law leg to the highs over the shared centred lows.

Haas [STR][FX][SYNTH] in: Audio out: Audio

Haas widener for a mono source: feeds the input into a delay line and outputs either the dry signal or a copy delayed by a few milliseconds. Delay sets the offset from 0 to 40 ms, exploiting the precedence effect to throw the image to one side. Out picks L (dry) or R (delayed) so the pair forms a wide stereo spread from one mono input.

Imager [STR][FX][SYNTH] in: L, R out: Audio

Multiband stereo imager (Ozone-Imager-style): mono the low end and widen the highs - low frequencies (below Freq) are summed to the centre so the bass stays tight and phase-coherent, while the side content above Freq is spread by Width for an airy top. Low directional bass widened only weakens and phase-cancels the low end, so this keeps the 'stereo rose' shape: narrow at the bottom, widest at the top. Freq sets the mono crossover (80-120 Hz typical), Width the high-band spread (1 = unchanged, >1 wider, 0 fully mono), and Out picks the channel. in0 = L, in1 = R; run two instances on opposite Out for the stereo pair.

MidSide [STR][FX][SYNTH] in: L, R out: Audio

Mid/side processor with independent gain on each component: splits L/R into mid and side, applies MidGain and SideGain in dB, then recombines. Lowering MidGain or raising SideGain widens the image while the reverse focuses the centre. Out picks L or R for the recombined channel; handy for level-matching centre versus stereo content.

MonoMaker [STR][FX][SYNTH] in: L, R out: Audio

Bass mono-maker: a one-pole low-pass at Freq splits the spectrum so content below the crossover is summed to mono while the highs stay in their own channel. Freq sets the crossover from 20 to 500 Hz. Out picks L or R, supplying that channel's highs over the shared mono low end; tightens low-frequency phase for vinyl and club playback.

Pan [STR][FX][SYNTH] in: Audio out: Audio

Static constant-power panner for a mono source: places the input at a fixed position from -1 (hard left) to +1 (hard right) using an equal-power (sin/cos) law so perceived loudness stays constant across the sweep. The plain manual counterpart to the LFO-driven AutoPan and the frequency-split FreqPanner - set a source's place in the image once. Out picks L or R, supplying that channel's pan-law leg; centred (Pan 0) sends equal power to both.

Panner [STR][FX][SYNTH] in: Audio out: Audio

Constant-power panner for a mono source: maps Pan (-1 to +1) onto a sine/cosine gain pair so total power stays even across the field. Pan at 0 centres the source; the +/-1 extremes hard-pan it. Out picks L or R, each instance applying the matching sine or cosine leg of the pan law.

Rotate [STR][FX][SYNTH] in: L, R out: Audio

Stereo field rotation: rotates the L/R signal vector by Angle, tilting the whole stereo image (a hard-left source swings toward centre and on toward the right) - a true rotation rather than a width change. Angle sets the rotation in degrees and Out picks L or R. Subtle angles re-balance a lopsided image; +/-90 swaps the channels.

Shuffle [STR][FX][SYNTH] in: L, R out: Audio

Blumlein shuffler (frequency-dependent stereo width): splits the side (L-R) signal at a crossover and applies Bass width below and Treble width above, so you can collapse the low end toward mono for a tight, phase-safe centre while widening the highs - the classic mastering width control. Freq sets the crossover, Bass/Treble the width on each side of it, and Out picks L or R.

StereoImager [STR][FX][SYNTH] in: L, R out: Audio

Frequency-dependent imager: splits the side signal at Freq with a one-pole low-pass and scales only the high side band by Width, leaving the low side untouched. Width sets the high-band spread and Freq sets the split point from 100 to 2000 Hz. Out picks L or R for the recombined channel; widens air and detail while keeping the low end mono-safe.

Stereoize [STR][FX][SYNTH] in: Audio out: Audio

Mono-to-stereo decorrelator: runs the input through a four-stage all-pass chain to phase-shift it without changing tone, then blends that toward the dry signal by Amount. Amount controls how much decorrelated signal is mixed in. Out picks L (dry) or R (decorrelated) so the stereo pair widens a mono source while keeping a centred reference.

StereoWidth [STR][FX][SYNTH] in: L, R out: Audio

Mid/side stereo widener: decomposes the L/R pair into mid (sum) and side (difference), scales the side by Width, then recombines. Width below 1 narrows toward mono and above 1 (up to 2) exaggerates the stereo spread. Out picks L or R, so one instance emits each recombined channel; useful for tightening or opening a stereo bus.

Utility (98)

Abs [UTL][FX][SYNTH] in: Audio out: Audio

Absolute value / full-wave rectifier: outputs |in0| * Gain plus Offset, so

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AbsDiff [UTL][FX][SYNTH] in: Audio out: Audio

Unsigned difference: outputs |in0 - in1| * Scale, the distance between the

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AbsMax [UTL][FX][SYNTH] in: Audio out: Audio

Largest magnitude: outputs the greater of |in0| and |in1| times Gain - the

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Acos [UTL][FX][SYNTH] in: Audio out: Audio

Arccosine shaper: clamps in0 to [-1, 1] then outputs acos(in0) / pi, a smooth

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Analyzer [UTL][FX][SYNTH] in: In A, In B out: Audio

Signal analyzer: passes in 1 straight through (out = in 1, transparent in the chain) while its detail panel shows a live 3D FFT waterfall + oscilloscope of in 1, and a Lissajous (X-Y) phase scope of in 1 against in 2. A measurement tool, not an effect - drop it inline to see the spectrum feeding a filter, the harmonics a distortion adds, what an envelope follower tracks, or the stereo/phase relationship of two signals.

ArgMax [UTL][FX][SYNTH] in: Audio out: Audio

Winner-take-all index: outputs which of in0..in3 is currently the largest, as

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Asin [UTL][FX][SYNTH] in: Audio out: Audio

Arcsine shaper: clamps in0 to [-1, 1] then outputs asin(in0) * 2/pi, an odd

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Asinh [UTL][FX][SYNTH] in: Audio out: Audio

Inverse-hyperbolic-sine compander: outputs asinh(Drive * in0) / asinh(Drive), a

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Atan [UTL][FX][SYNTH] in: Audio out: Audio

Arctangent shaper: outputs (2/pi) * atan(Drive * in0), a smooth odd S-curve that

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Atan2 [UTL][FX][SYNTH] in: Audio out: Audio

Two-argument arctangent: outputs the angle of the (in0, in1) vector mapped to

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Atanh [UTL][FX][SYNTH] in: Audio out: Audio

Inverse-hyperbolic-tangent expander: clamps in0 to +/-Edge then outputs

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Average [UTL][FX][SYNTH] in: Audio out: Audio

Mean of the four signal inputs, weighted only by how many are non-zero so

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Bernoulli [UTL][FX][SYNTH] in: Audio out: Audio

Bernoulli gate (coin-flip router): on each rising edge of the in0 trigger it flips a weighted coin and either passes that gate through or blocks it, with Probability setting the odds. A stream of clocks becomes a randomly thinned-out pattern - the building block for generative rhythms and stochastic sequencing. Unlike the deterministic ClockDiv, every pulse is an independent chance event; the decision latches until the next trigger.

Burst [UTL][FX][SYNTH] in: Audio out: Audio

Burst generator: a rising edge on in0 fires a burst of Count evenly-spaced trigger pulses at Rate, then falls silent until the next input edge - turn one hit into a ratchet, a drum-roll trigger or a stutter clock. Count sets how many pulses and Rate their spacing; re-triggering mid-burst restarts the count. Patch its output into envelopes, sample-and-holds or sequencer clocks.

ChordQuant [UTL][FX][SYNTH] in: Audio out: Audio

Chord quantizer: snaps in0 - a pitch in semitones (the Note source, a

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Clamp [UTL] [FX] [SYNTH] in: Audio out: Audio

Hard range limiter: constrains in0 to the [Lo, Hi] window with no

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ClockDiv [UTL] [FX] [SYNTH] in: Audio out: Audio

Clock divider: passes only every Div-th rising edge of the in0 trigger, turning a fast gate or clock into a slower one for polyrhythms and rhythmic gating. The output mirrors the input pulse on the pulses it lets through and is silent otherwise, and the count stays phase-locked to the input.

ClockMult [UTL] [FX] [SYNTH] in: Clock out: Audio

Clock multiplier: measures the period of the in0 clock and emits Mult evenly-spaced pulses per input beat - the complement to ClockDiv, for faster subdivisions and ratchets. Locks to the input tempo on every edge so it tracks tempo changes.

Compare [UTL] [FX] [SYNTH] in: Audio out: Audio

Schmitt comparator: outputs +1 (high) when in0 rises above

Complement [UTL] [FX] [SYNTH] in: Audio out: Audio

Unit-range inverter: outputs Center - in0 * Scale, defaulting to 1 - in0 so

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Constant [UTL] [FX] [SYNTH] in: Audio out: Audio

DC source: emits a fixed Value every sample with no input. Patch it

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Correlate [UTL] [FX] [SYNTH] in: A, B out: Audio

Two-signal relatedness meter (a first as a synth block): outputs a running normalised cross-correlation of in0 against in1 - how strongly the two signals move together - as a control voltage. About +1 when they rise and fall in lock-step, 0 when independent, -1 when they mirror each other. Window sets the averaging time. Detect when two modulators line up, gate an effect on the agreement of two sources, or measure stereo/phase coherence. Both inputs must vary (a constant has no correlation).

Cosh [UTL] [FX] [SYNTH] in: Audio out: Audio

Hyperbolic-cosine bowl: warps in0 through a normalised (cosh(in0 * Drive) - 1) /

Counter [UTL] [FX] [SYNTH] in: Trigger, Reset out: Audio

Pulse counter / staircase: each rising edge of the in0 trigger advances an internal count, and the output is that count scaled to 0..1 over Steps before wrapping to zero - a stepped CV ramp for sequences and rhythmic builds. A rising edge on in1 resets the count so it can be re-synced to a bar.

Crossfade [UTL][FX][SYNTH] in: Audio out: Audio

Blends from in0 to in1 by a fade position of Mix plus the in2 CV

CrossTrig [UTL][FX][SYNTH] in: Audio out: Audio

Crossing detector: emits a one-sample High pulse each time in0 crosses the Level (zero by default), on the Rising, Falling or Both edge as selected. Turns an oscillator or LFO into a clock (a zero-crossing tick), derives a trigger from a gate's edge, or fires an event when a signal passes a threshold. Pairs with TrigToGate to stretch the pulse into a sustained gate.

CVBridge [UTL][FX][SYNTH] in: Audio out: Audio

Control-voltage utility that conditions a single input value in one of three Mode settings: attenuvert (scale by Scale plus Offset), note-to-1V/oct pitch conversion, or bipolar-to-unipolar remap. Scale provides positive or negative gain including inversion, and Offset shifts the result up or down. Useful for routing and rescaling modulation or pitch control between modules.

DCBlock [UTL][FX][SYNTH] in: Audio out: Audio

Removes DC offset and sub-sonic bias with a one-pole high-pass that subtracts the previous input and feeds back a 0.9995 coefficient, passing audio while draining any constant component. It takes no parameters and always runs at the same fixed corner. Place it after asymmetric distortion or rectification stages to keep the signal centred.

Deadband [UTL][FX][SYNTH] in: Audio out: Audio

Centre dead-zone: passes in0 straight through once it moves more than Width

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Decibels [UTL][FX][SYNTH] in: Audio out: Audio

Decibel <-> linear-gain converter. In dB->Gain mode it outputs 10^(in0 / 20),

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Dither [UTL][FX][SYNTH] in: Audio out: Audio

Bit-depth reducer with triangular (TPDF) dither: builds a quantization step from Bits, adds triangular noise from two xorshift draws scaled by Amount, then rounds to the step. Bits sets the target word length from 8 to 24 and Amount scales the dither level. The dither decorrelates quantization error so low-level detail survives reduction instead of distorting.

Divide [UTL][FX][SYNTH] in: Audio out: Audio

Safe divider: in0 divided by (in1 + Denom), with the result limited to

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Entropy [UTL][FX][SYNTH] in: Audio out: Audio

Information-theoretic modulation source (a first as a synth block): outputs a running Shannon-entropy estimate of the input - near 0 for silence or a steady tone, rising toward 1 for noisy, unpredictable signals. It folds recent samples into a decaying 16-bin amplitude histogram and reports the normalised entropy of that distribution, answering 'how disordered is this signal right now?' as a control voltage. Window sets the memory (higher = slower, smoother). Patch it so an effect opens up only when the input turns chaotic.

Equal [UTL][FX][SYNTH] in: Audio out: Audio

Tolerance comparator: outputs High when in0 sits within +/-Tol of (in1 plus

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Erf [UTL][FX][SYNTH] in: Audio out: Audio

Error-function sigmoid: outputs erf(Drive * in0), the Gaussian-integral S-curve

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Exp [UTL][FX][SYNTH] in: Audio out: Audio

Linear-to-exponential converter: outputs 2^(in0 * Range), turning a linear

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Expr [UTL][FX][SYNTH] in: In A, In B, In C out: Audio

User-written per-sample expression compiled by an RT-safe VM

FlipFlop [UTL][FX][SYNTH] in: Trigger, Reset out: Audio

T (toggle) flip-flop: each rising edge of the in0 trigger flips the output between 0 and 1, halving the clock and turning a stream of triggers into a square gate. A rising edge on in1 resets it to 0. The bistable building block for clock division and on/off latching.

Fold [UTL][FX][SYNTH] in: Audio out: Audio

Triangle wavefolder: when |in0 * Drive| exceeds Threshold the excess is

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Frac [UTL][FX][SYNTH] in: Audio out: Audio

Fractional part: outputs in0 minus its floor, the [0, 1) remainder after the

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Gain [UTL][FX][SYNTH] in: Audio out: Audio

Gain trim (dB) plus a DC bias offset.

GateDelay [UTL][FX][SYNTH] in: Trigger out: Audio

Trigger delay: a rising edge on in0 is held for Time, then re-emitted as a short pulse - shift a trigger later in time to stagger hits, build echoes of a clock or offset a sequence. Each input edge arms an independent delay.

Gaussian [UTL][FX][SYNTH] in: Audio out: Audio

Bell-curve shaper: outputs exp(-((in0 - Centre)^2) / (2 * Width^2)), a smooth

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GeoMean [UTL][FX][SYNTH] in: Audio out: Audio

Geometric mean of two inputs: outputs sign(in0in1) sqrt(|in0 * in1|) *

Hypot [UTL][FX][SYNTH] in: Audio out: Audio

Vector magnitude: outputs sqrt(in0^2 + in1^2) scaled by Gain - the Euclidean

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Hysteresis [UTL][FX][SYNTH] in: Audio out: Audio

Schmitt trigger with memory: the output latches High once in0 rises above the upper threshold (Center + Width) and stays High until in0 falls below the lower threshold (Center - Width), then latches Low. Because it remembers its last state, a noisy or slowly-drifting signal around one level produces a clean debounced gate instead of chattering - unlike the stateless Compare, which has no memory.

Integrator [UTL][FX][SYNTH] in: Signal, Reset out: Audio

Leaky integrator / accumulator (CV): sums in0 over time so a constant input ramps and a periodic input is smoothed and phase-shifted a quarter cycle. Rate scales the input before accumulation, Leak bleeds the accumulator toward zero (0 = a near-perfect integrator that holds, higher = a shorter-memory smoother), and a rising edge on in1 resets the sum to zero. The running output is safety-limited. Distinct from Slew (which rate-limits a signal) and Counter (which counts edges).

Latch [UTL][FX][SYNTH] in: In A, In B out: Audio

Bistable latch / flip-flop: remembers a High/Low state across time. In Toggle mode each rising edge on in0 flips the state (a clock divide-by-two, or tap-to-toggle). In Set/Reset mode a rising edge on in0 sets the output High and a rising edge on in1 sets it Low (a one-bit memory cell driven by two triggers). Outputs High when set and Low when clear - the missing fundamental logic block alongside Compare, Logic and Hysteresis.

Log [UTL][FX][SYNTH] in: Audio out: Audio

Exponential-to-linear converter: outputs log2(in0) / Range, the inverse of Exp -

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Logic [UTL][FX][SYNTH] in: Audio out: Audio

Boolean gate combiner: treats in0 and in1 as logic highs when they

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Logistic [UTL][FX][SYNTH] in: Audio out: Audio

Logistic sigmoid: outputs 1 / (1 + exp(-Gain * (in0 - Centre))), the classic

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Logit [UTL][FX][SYNTH] in: Audio out: Audio

Logit (inverse-logistic) expander: clamps in0 to [1-Edge, Edge] then outputs

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Manhattan [UTL][FX][SYNTH] in: Audio out: Audio

Taxicab (L1) magnitude: outputs (|in0| + |in1|) * Gain, the sum of the two

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Map [UTL] [FX] [SYNTH] in: Audio out: Audio

Affine range mapper: rescales in0 from its [In Lo, In Hi] range onto a

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Max [UTL] [FX] [SYNTH] in: Audio out: Audio

Outputs the larger of in0 and in1 (after adding the In B offset to in1).

Median3 [UTL] [FX] [SYNTH] in: Audio out: Audio

Median of three inputs: outputs the middle value of in0, in1, in2, discarding

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Meter [UTL] [FX] [SYNTH] in: Audio out: Audio

Analysis meter that tracks the running mean-square of the input and outputs its RMS level as a scalar control value. Smooth sets the one-pole averaging coefficient, with higher values giving slower, steadier readings and lower values reacting faster to transients. Used to derive a level signal for metering or to drive other modules from program loudness.

Min [UTL] [FX] [SYNTH] in: Audio out: Audio

Outputs the smaller of in0 and in1 (after adding the In B offset to in1).

MinMax [UTL] [FX] [SYNTH] in: A, B out: Audio

Minimum / maximum selector: outputs either the smaller or the larger of the two input voltages each sample - an analog comparator-style utility for combining envelopes, CVs or gates (max = OR-like, min = AND-like). Mode picks min or max. in0, in1 = inputs.

Mixer [UTL] [FX] [SYNTH] in: In A, In B, In C out: Audio

Sums three scaled inputs plus a DC offset.

Modulo [UTL] [FX] [SYNTH] in: Audio out: Audio

Euclidean remainder: outputs in0 wrapped into [0, Mod), the non-

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Multiply [UTL] [FX] [SYNTH] in: Audio out: Audio

Two-quadrant multiplier / VCA: in0 times in1 times Scale. With an

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Mux [UTL] [FX] [SYNTH] in: Audio out: Audio

Four-way input selector: routes one of in0..in3 to the output based on the

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Negate [UTL][FX][SYNTH] in: Audio out: Audio

Sign inverter: outputs -in0 scaled by Scale (default 1) plus an Offset.

NullTest [UTL][FX][SYNTH] in: A, B out: Audio

Null tester that subtracts the second input from the first and outputs the residual difference, scaled by Gain. When two signals are identical the output is silence, and any audible residual reveals the difference between them. Gain amplifies that residual so small mismatches become easy to hear, making this a tool for verifying bit-for-bit equivalence between processing chains.

PeakHold [UTL][FX][SYNTH] in: In A, In B out: Audio

Peak / hold detector: latches the extreme value in0 reaches and holds it, optionally bleeding back toward zero at Decay (Decay 0 = hold forever). Mode picks the maximum (Peak), the minimum (Trough), or the largest magnitude (Abs Peak). A rising edge on the in1 reset clears the held value to the current input. Where EnvFollow smooths the amplitude with attack/release, PeakHold captures the strict extreme - peak-metering CV, grabbing the loudest transient, or a max-tracking sample-and-hold.

Periodicity [UTL][FX][SYNTH] in: Audio out: Audio

Self-similarity detector (a first as a synth block): writes the input to a delay line and outputs the running normalised correlation between the signal now and the signal one Period ago - how strongly it repeats itself at that lag. About 1 for a steady tone or loop whose cycle matches Period, near 0 for noise or a one-shot, so it reports the STRENGTH of repetition rather than the pitch (set Period to the cycle you are listening for). Window sets the averaging time. Drive an effect by how locked-in a groove is.

PhaseDiff [UTL][FX][SYNTH] in: Audio out: Audio

Wrapped phase distance: treats in0 and in1 as phases on a [-1, 1] cycle and

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PhaseInvert [UTL][FX][SYNTH] in: Audio out: Audio

Flips the polarity of the signal, negating every sample when engaged and passing it untouched otherwise. Invert toggles the inversion on or off. Use it to correct out-of-phase tracks or to null one source against another.

Power [UTL][FX][SYNTH] in: Audio out: Audio

Sign-preserving exponent: outputs sign(in0) * |in0|^Exp, so it reshapes

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Quadratic [UTL][FX][SYNTH] in: Audio out: Audio

Second-order polynomial shaper: outputs Ain0^2 + Bin0 + C, a full parabola

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Quantize [UTL][FX][SYNTH] in: Audio out: Audio

Rounds in0 to the nearest of Steps evenly-spaced levels across the

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Reciprocal [UTL][FX][SYNTH] in: Audio out: Audio

One-over-x: 1 / (in0 + Bias), limited to +/-Limit and floored away

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RMS3 [UTL][FX][SYNTH] in: Audio out: Audio

Root-mean-square of three inputs: outputs sqrt((in0^2 + in1^2 + in2^2) / 3) *

Round [UTL][FX][SYNTH] in: Audio out: Audio

Integer rounding with a selectable Mode (nearest, floor, ceil, truncate)

ScaleQuant [UTL][FX][SYNTH] in: Audio out: Audio

Musical scale / pitch quantizer: snaps in0 - read as a pitch in

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Select [UTL][FX][SYNTH] in: Audio out: Audio

Two-way signal switch: routes in0 when the in2 selector (plus the

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Semitones [UTL][FX][SYNTH] in: Audio out: Audio

Semitone-to-ratio pitch converter: outputs 2^((in0 * Range) / 12), turning a

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ShiftReg [UTL][FX][SYNTH] in: Clock, Signal out: Audio

Analog shift register: each rising edge of the in0 clock shifts the in1 voltage one stage down a chain, and the output is the value Stages steps ago - a tapped delay for CV that turns a melody or random source into canonic, echoing pitch patterns. The classic Buchla/Triadex-style sequencing trick.

Sign [UTL][FX][SYNTH] in: Audio out: Audio

Sign extractor with a dead zone: outputs -1, 0, or +1 depending on

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Sinc [UTL][FX][SYNTH] in: Audio out: Audio

Normalised sinc: outputs sin(pi * in0 * Scale) / (pi * in0 * Scale), the cardinal

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Sinh [UTL][FX][SYNTH] in: Audio out: Audio

Hyperbolic-sine shaper: warps in0 through a normalised sinh(in0 * Drive) /

Skew [UTL][FX][SYNTH] in: Audio out: Audio

Asymmetric curve bender: warps in0 across the [0,1] range so its midpoint slides

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Slope [UTL] [FX] [SYNTH] in: Signal out: Audio

Differentiator / rate-of-change detector (CV): outputs how fast in0 is moving - positive while it rises, negative while it falls, zero when steady - so it reads the slope of an envelope, LFO or any control signal. Scale sets the sensitivity and Smooth low-passes the result to tame noise on fast signals. Pair it with Compare to fire a trigger on a rising or falling edge. The inverse complement of the Integrator.

Smoothstep [UTL] [FX] [SYNTH] in: Audio out: Audio

Hermite smoothstep ramp: maps in0 across the [Edge0, Edge1] range through

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Spread [UTL] [FX] [SYNTH] in: Audio out: Audio

Dispersion of three inputs: outputs (max - min) of in0, in1, in2 times Gain -

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Stochastic [UTL] [FX] [SYNTH] in: Audio out: Audio

Stochastic-resonance detector (a first as a synth block): the real phenomenon where adding the RIGHT amount of noise lets a weak, sub-threshold signal cross a detector it otherwise never could - too little and the signal stays buried, too much and it drowns. Noise sets the injected level, Threshold the detector, Smooth the output ballistic, and the output is the recovered crossing envelope. Sweep Noise to find the resonance sweet spot where a rhythm hidden below the threshold suddenly emerges.

Subtract [UTL] [FX] [SYNTH] in: Audio out: Audio

Difference node: in0 minus in1 minus in2, plus a DC Offset. Feed two

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Sum [UTL] [FX] [SYNTH] in: A, B, C, D out: Audio

Summing node: adds inputs in 1..4 into a single output with no per-input gain - the quick way to merge oscillators, parallel chains or control signals without wiring up a full Mixer.

Surprise [UTL] [FX] [SYNTH] in: Audio out: Audio

Adaptive novelty detector (a first as a synth block): keeps a self-tuning one-tap linear predictor of the input and outputs the magnitude of its prediction error - a spike whenever the signal does something the recent past did not predict, near silence while it stays predictable. Unlike Slope (the raw derivative, which stays high through any steady ramp) Surprise LEARNS the trend and fires only on genuine novelty: a new note, a sudden jump, a broken pattern. Rate sets how fast it adapts, Smooth the output ballistic.

Switch [UTL] [FX] [SYNTH] in: In A, In B, In C, In D out: Audio

Clocked sequential switch: routes one of the signal inputs in0..in2 to the output and advances to the next on every rising edge of the in3 clock - an addressed router (Doepfer A-151 style) that steps through your sources in time. Steps sets how many inputs are in the rotation (2 or 3). Where Mux selects an input by a manual index and Select chooses between two by level, Switch cycles automatically on a clock.

Threshold [UTL] [FX] [SYNTH] in: Audio out: Audio

Unipolar threshold gate: outputs High when in0 is at or above Threshold and

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TrackHold [UTL] [FX] [SYNTH] in: Signal, Gate out: Audio

Track-and-hold (Doepfer A-148): while the gate at in1 is high the output follows the in0 signal; when the gate goes low it freezes and holds the last value until the gate returns. Unlike Sample-and-hold (which grabs one instant on a trigger), it tracks continuously through the whole gate - use it to freeze a slow LFO or envelope, glide-and-hold pitch, or window a control signal. A core CV utility.

TrigToGate [UTL] [FX] [SYNTH] in: Audio out: Audio

Trigger-to-gate: each rising edge of the in0 trigger opens a gate that stays high for a fixed Length, then closes - turning a momentary pulse (a clock tick, a Compare edge) into a sustained gate of predictable duration. Retriggering restarts the timer, so a stream of pulses keeps the gate open. Drive envelopes, VCAs or effects from short triggers.

TriShape [UTL] [FX] [SYNTH] in: Audio out: Audio

Phasor-to-triangle shaper: treats in0 as a phase and outputs a triangle that

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Window [UTL] [FX] [SYNTH] in: Audio out: Audio

Window comparator: outputs High when in0 sits inside the [Lo, Hi] band and

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WindowComp [UTL] [FX] [SYNTH] in: Signal out: Audio

Window comparator: outputs a high gate whenever the in0 voltage sits inside the Low..High window, and low when it strays outside - a band detector for triggering events when a CV enters a range, or for extracting a slice of a modulation curve.

Wrap [UTL] [FX] [SYNTH] in: Audio out: Audio

Phase-style wrap: folds in0 back into the [-Range, Range] window by

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