Quick-Start Guide

fancyyyyy x grrrwaaa

1: Getting Started

Installation:

K-ACCUMULATOR requires two Eurorack power connections — both headers must be connected to your power supply. The module is 32HP wide and draws +12V 330mA / -12V 28mA.

Getting Started:

When you first power up the module, it will be in its factory default state — we call this position Centre. Connect the main sine and cosine outputs to the left and right channels of your monitoring system. Turn the Freq. knob to change the pitch of the sine/cosine pair.

Turn up Shift to introduce blended harmonic frequency shifting — this blends between the two nearest integer harmonics of the fundamental.

Turn up Depth to introduce self-feedback phase modulation, an all-harmonic distortion that tilts the sine toward a saw-wave spectrum. Turn up both together to hear how they interact. Turn them both down.

Turn up Shape to introduce harmonic wavefolding.

Turn the Detune knob on the Mod oscillator to hear the folder animate.

Turn Depth back up to hear how self-feedback interacts with the folder. Explore how the Shift, Depth and Shape parameters interact with each other.

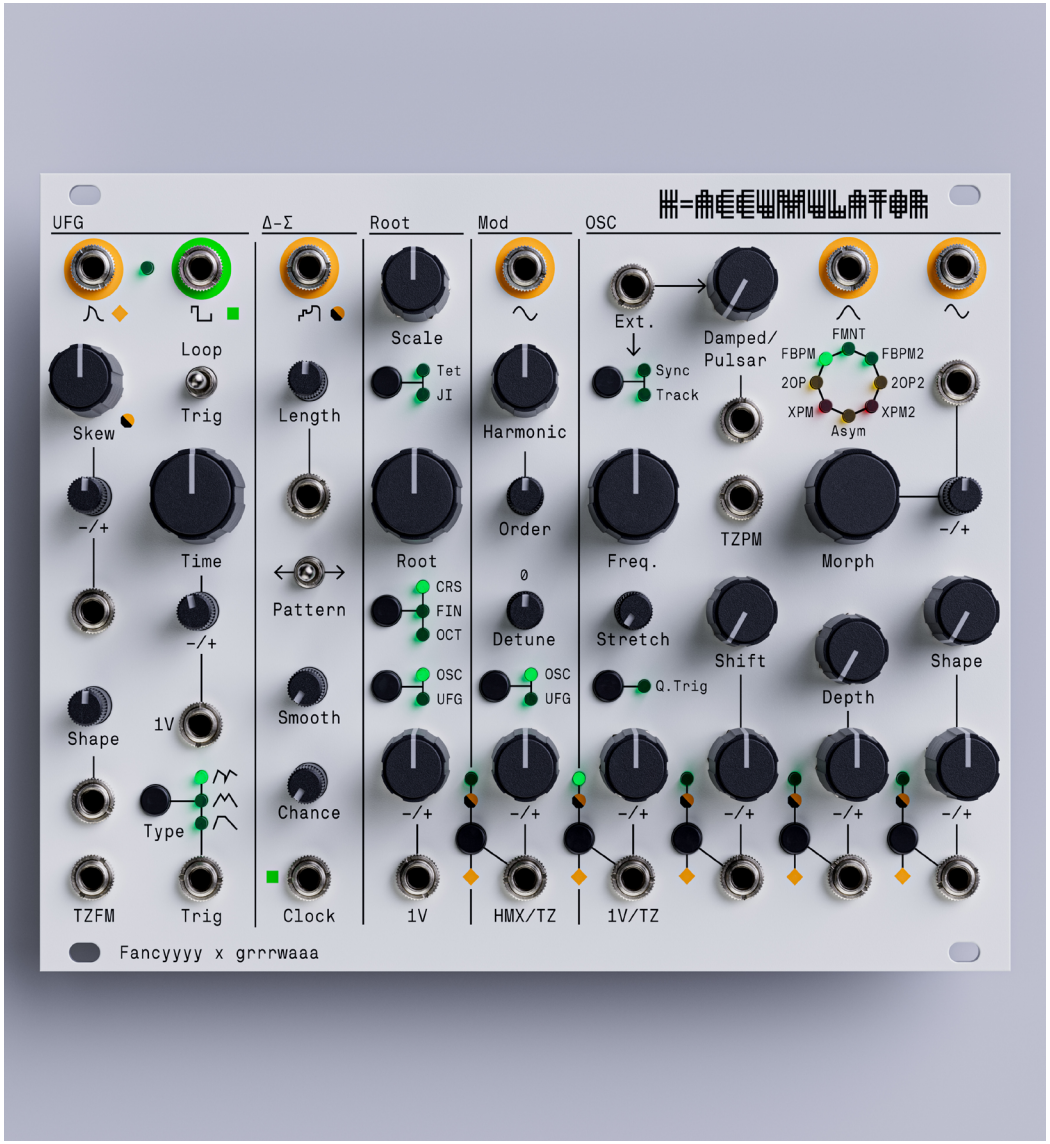
Turn up Stretch with Shift or Shape active to frequency-shift the generated harmonics while keeping the fundamental constant. Explore how Stretch interacts with the three waveshaping controls.

Turn up one of the Shift, Depth or Shape attenuverters to introduce modulation from the UFG. Change UFG Time, Shape and Skew to shape the modulation.

Turn down Stretch, Shift, Depth and Shape and zero the attenuverters to return to Centre.

Finally turn up Damped/Pulsar to sync and amplitude-modulate the OSC from the UFG. Set UFG Time to sub-audio range to hear enveloped, percussive sounds. Turn up the 1V/TZ attenuverter to receive modulation from the Δ-Σ — stepped and slewed sequences that animate the oscillator pitch. Press the Scale button to quantise to a TET scale and turn the Scale knob to explore different tunings.

The rest of this guide describes each section of the module in more detail.



Panel controls at Centre

2: Centre

K-ACCUMULATOR is a deep oscillator with a wide and continuous range — from pure sine waves through to dense, harmonically rich textures. Its architecture combines two oscillators, waveshapers, a function generator, a delta-sigma pattern generator, and extensive internal modulation routing, all built around a root frequency system.

The controls interact. Small movements in one place can change the response in another, and a single additional control can transform the sound entirely. The most rewarding approach is to start with a sine/cosine pair at the main outputs, move slowly, and listen to how each parameter reshapes the sound.

Explore outward from there, but keep that sine/cosine starting point as your reference — and keep in mind the route back to it. The architecture will make more sense once you've spent time with how the controls feel.

The panel image to the right shows this starting point: the module's Centre position, producing pure sine and cosine waves with no modulation or waveshaping applied. Learning to return to the Centre quickly is a useful skill — whenever you want to understand what a single control is doing, come back here and move just that one thing.

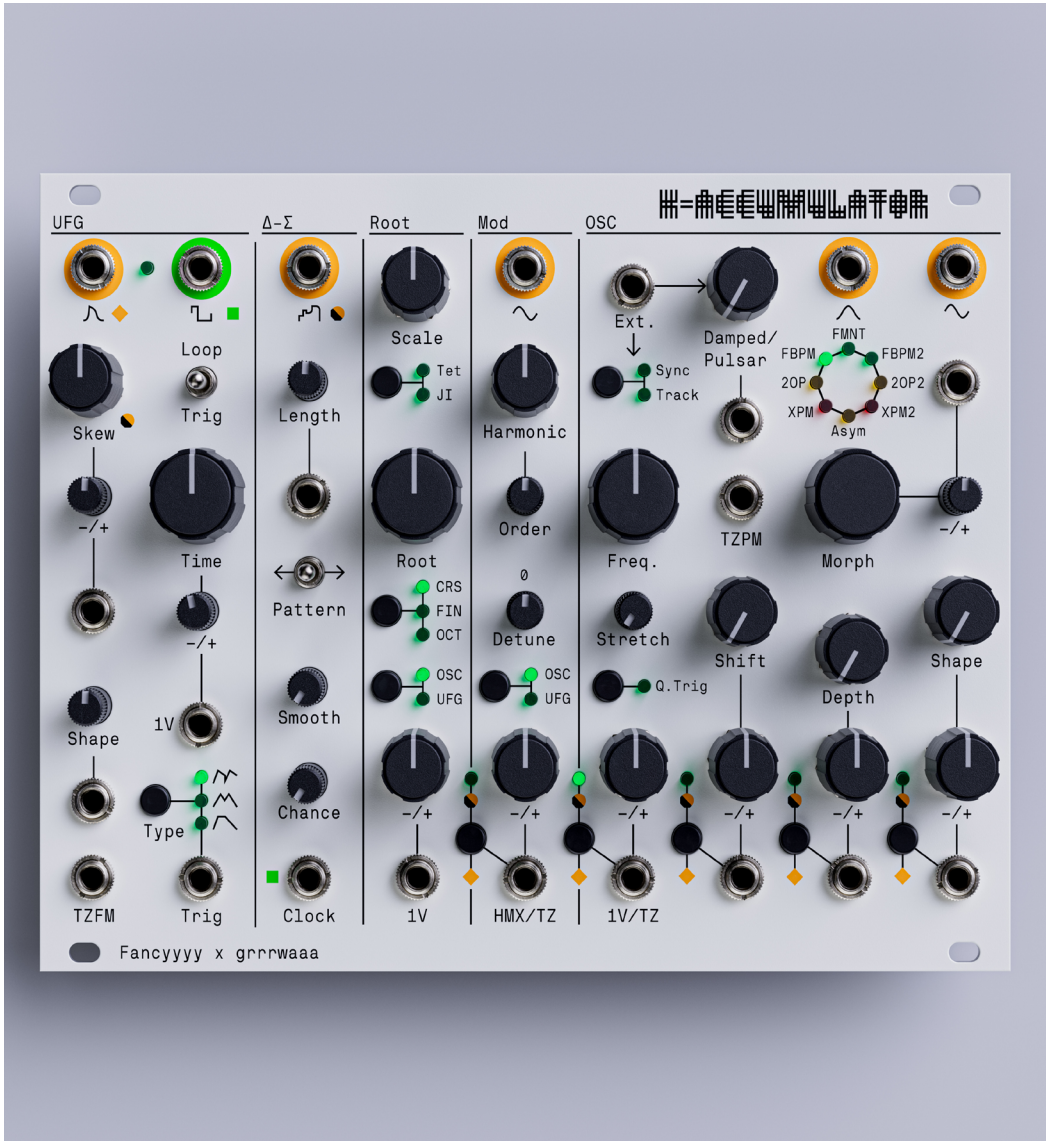
To reach Centre:

Set these controls to their minimum positions. Regardless of where the other controls are set, this will always produce a sine and cosine pair at the main outputs.

- Centre all attenuverters
- Set the Damped/Pulsar knob to minimum
- Set the Stretch mini-pot to minimum
- Set all three waveshaping knobs (Shift, Depth, Shape) to minimum

The remaining controls set the root frequency, tuning, and relative pitch of the oscillators — they determine the starting point and the direction you'll travel when you begin exploring, but don't move you away from Centre on their own.

The rest of this guide describes each control on the panel and introduces the mode morphing system. A full technical manual covering the module's architecture in depth is in progress. In the meantime, video accompaniment to this guide is available at fancysynthesis.net.



Panel controls at Centre

3: Root

K-ACCUMULATOR features a Root frequency system that sets the tuning reference for all three oscillators. The Root frequency can be quantised to a 12-TET or Just Intonation scale, then routed to the OSC, the UFG, or both. The Mod oscillator can independently track the OSC, UFG, or Root frequency, including any active scale quantisation. This architecture allows flexible frequency relationships between all three oscillators from a single tuning reference.

Root Knob — Sets the root frequency. The response is set by the CRS/FIN/OCT button, which cycles between coarse, fine, and octave modes. These controls use soft-pickup latching — the pitch does not jump when switching between modes; the knob captures the previous value before updating. When tracking a 12-TET scale, coarse mode is quantised to semitones; otherwise it is free pitch. At the centre position, the Root is tuned to MIDI note 0 for easy integration with MIDI-CV devices.

1V Input + Attenuverter — 1V/Oct calibrated CV input for the Root pitch.

Root Send Button — Routes the Root frequency to the oscillators. The button cycles through four states: OSC LED lit sends Root to the main oscillator only. Both LEDs lit sends Root to both OSC and UFG. UFG LED lit sends Root to UFG only. No LEDs lit disengages Root from both — the Mod will still receive Root if it is not set to track OSC or UFG.

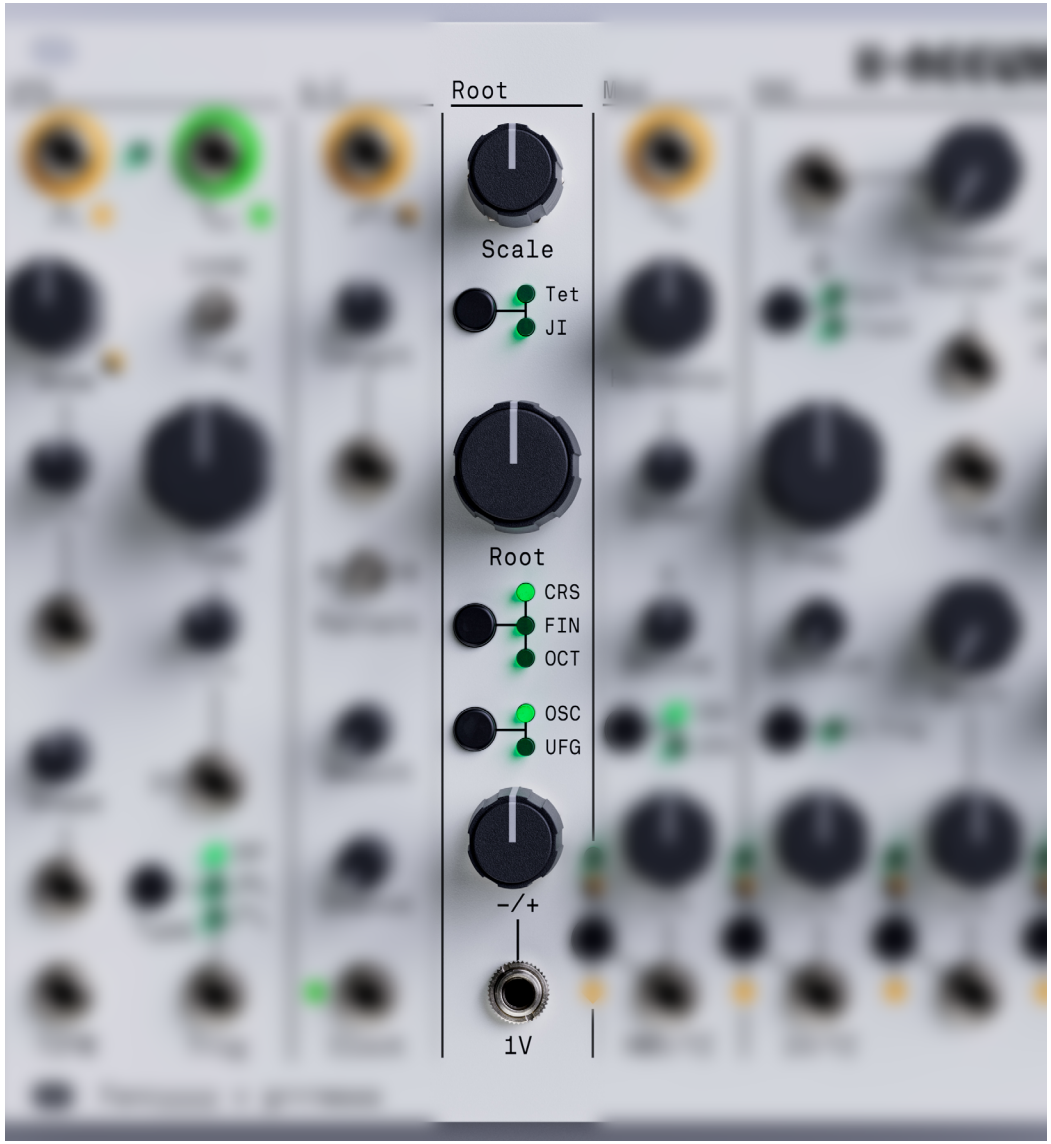
Scale + TET/JI Button — Selects the active scale. The button toggles between 12-TET and Just Intonation tuning systems. There are 21 scales in each system. The Scale knob sweeps through them:

Minimum and maximum: octaves only

Centre: most dense scale (semitones for TET, 32-step microtonal for JI)

Left of centre: standard TET scales / JI ratios tuned for PM and FM

Right of centre: exotic TET scales / microtonal JI tuning systems



Root panel controls

4: OSC

The OSC section contains the oscillator's pitch, phase modulation, amplitude modulation and waveshaping controls. Everything here shapes the signal at the two main outputs — the sine and cosine jacks at the top right of the panel.

All CV inputs and attenuverters on the bottom row of the OSC have internal normalisation from either the UFG or Delta-Sigma. The button next to each CV input jack selects the normalled signal: LED lit selects Delta-Sigma, LED unlit selects UFG. Plugging a cable into any CV input overrides the normalisation. The attenuverters feature a deadzone at the midpoint and an exponential response to help null modulation precisely.

The waveshaping controls mostly retain similar functions throughout modes, with some mode-specific exceptions. See 4: Morph on p.6 for more information.

Main Outputs — Waveshaped sine and cosine pair from the main oscillator. Designed to be used as a stereo pair.

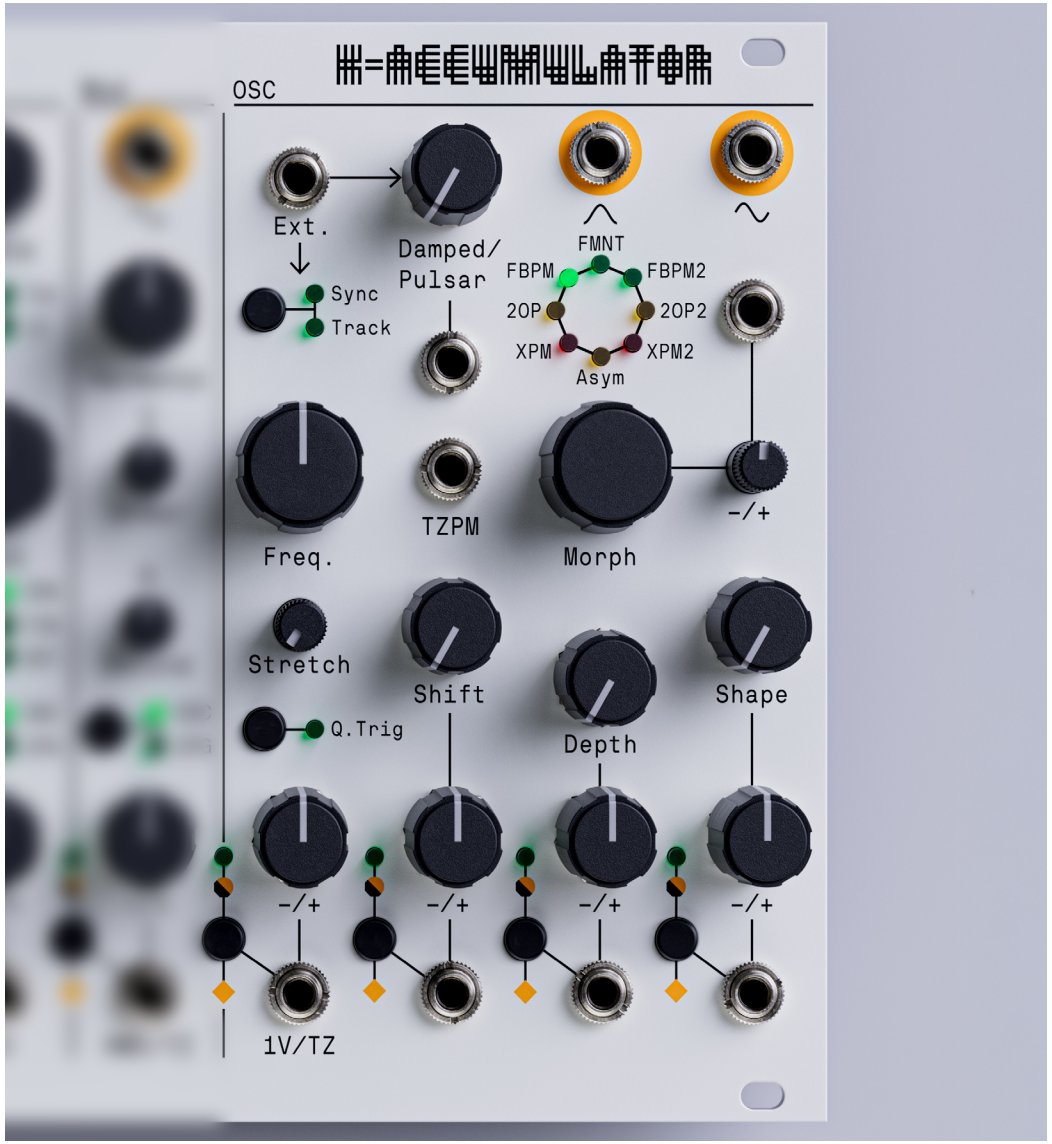
Freq. — Sets the pitch of the main oscillator, either free-running or relative to Root when Root is routed to OSC.

1V/TZ Input + Attenuverter — External pitch and FM input. The input automatically detects whether the incoming signal is a stepped sequence or an audio-rate signal, and routes accordingly: stepped signals (including sequences with glide and LFOs) are treated as DC-coupled 1V/Oct pitch control, while audio-rate signals are treated as AC-coupled through-zero FM. The input tracks 1V/Oct accurately with the attenuverter at maximum.

TZPM Input — External AC-coupled through-zero phase modulation input.

Q.Trig Button — When active, a trigger is sent to the UFG each time the oscillator frequency crosses a quantiser threshold (requires Root tracking with a scale enabled). When the UFG is not looping, this enables auto-arpeggiation — patch an LFO to 1V/TZ with Damped/Pulsar at maximum.

Stretch — Controls harmonic stretching: a novel type of frequency shifting that stretches waveshaped harmonics while keeping the fundamental constant. Stretch only has an effect when waveshaping is active. Sidebands from phase modulation and amplitude modulation are not affected.



OSC panel controls

4: OSC – cont.

Damped/Pulsar + CV – Controls the amount of damped sync and amplitude modulation from the UFG, enabling enveloped sounds and pulsar synthesis. Damped sync is a sync algorithm that progressively synchronises the follower to the leader whilst increasing amplitude modulation. At minimum, no sync or AM is applied. At maximum, the UFG fully gates and synchronises the oscillator. The range moves from subtle animation at low settings, through PLL-like behaviour, to hard-sync at maximum. OSC will lock to subharmonics when at a lower frequency than the sync source.

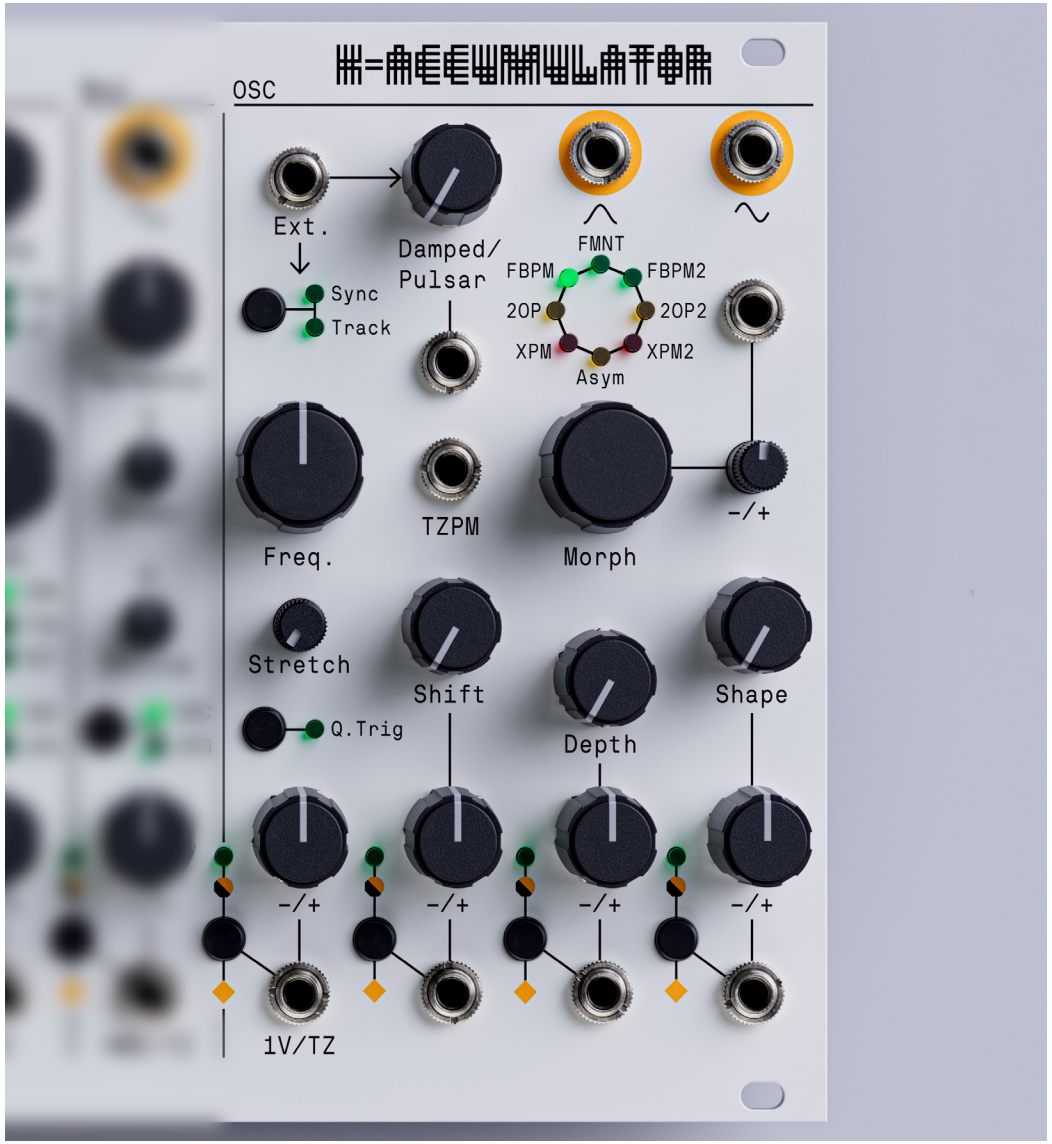
Ext. Sync/Track + Button – External input for sync or tracking. Press the button to toggle between three states: Sync LED lit routes the external input as the damped sync source, overriding the UFG. Track LED lit uses zero-crossing pitch detection to follow the frequency of the incoming signal – send in a square wave, get a sine/cosine out, with all waveshaping still applicable. The tracking is pitch-only; amplitude is not followed. This means complex signals like voice produce chaotic but recognisable results, as the pitch detection is fast and highly accurate even when the source is harmonically dense. No LED lit disables the external input.

Shift + CV + Attenuverter – Waveshaping control. In most morph positions, this performs blended harmonic frequency shifting.

Depth + CV + Attenuverter – Waveshaping control. In most morph positions, this introduces phase modulation with damping.

Shape + CV + Attenuverter – Waveshaping control. In most morph positions, this introduces harmonic wavefolding.

Morph Encoder + CV + Attenuverter – Sets the current position in the waveshaping morph matrix. Press to toggle between coarse and fine response. Double-press to snap to the nearest morph position. See 4: Morph on p.6 for more information.



OSC panel controls

5: Morph

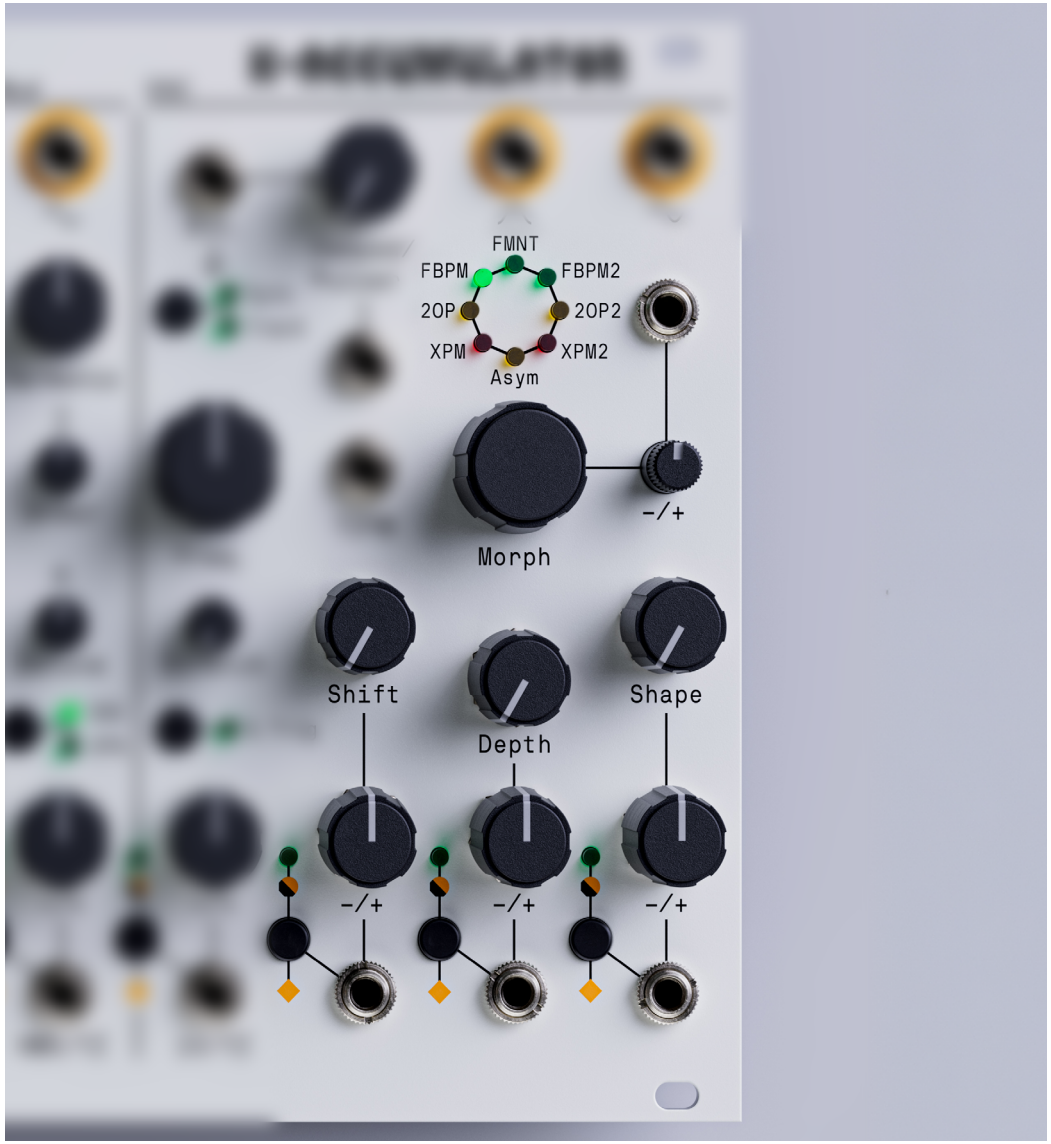
The Morph encoder moves through a waveshaping matrix that routes different combinations of phase modulation, damping, frequency shifting, and wavefolding to the three waveshaping controls. This is not a macro oscillator with separate algorithms — every mode is built from the same four core sine waves, and movement between modes is a continuous morph through a multidimensional modulation space.

The eight positions on the LED ring are arranged across two poles: FMNT and Asym. These two modes sit at opposite ends of the ring and share a common character — both incorporate amplitude modulation with raised cosine waveforms and phase modulation, producing clean, formant-like spectra. Every other position on the ring is a morph point between these poles, reached by two different paths.

The LED colours indicate the modulation topology at each position: green modes use self-feedback phase modulation with no Mod oscillator interaction, yellow modes introduce phase modulation from the Mod oscillator, and red modes add cross-phase modulation feedback between the two oscillators.

The left-hand path (counter-clockwise from FMNT toward Asym) moves through FBPM, 2OP, and XPM. This is the most predictable route through the matrix. Across all three modes, the waveshaping controls retain fixed roles: Shift always performs blended harmonic frequency shifting, Shape always introduces harmonic wavefolding, and Depth always controls some form of phase modulation — combining PM index and damping in a single control. The counter-clockwise morph is experienced as an increase in complexity rather than a redefinition of what the controls do. This is the simplest space to start exploring.

The right-hand path (clockwise from FMNT toward Asym) moves through FBPM2, 2OP2, and XPM2. These modes separate parameters that the left-hand path combines, split phase modulation depth from damping across different controls, and mix different types of modulation within a single mode. Where the left-hand path prioritises predictability and muscle memory, the right-hand path prioritises complexity, nonlinear dynamics, and extended technique.



Morph controls

6: Morph Reference

North Pole

FMNT (Green LED) — Formant-like AM and PM with similar effect to FOF synthesis. Depth controls bandwidth via self-raised-cosine AM. Shift blends harmonics. Shape controls self-feedback damping.

South Pole

Asym (Yellow LED) — Asymmetric PM with granular pulse-train style spectra. Depth controls PM and AM depth from Mod. Shift blends low-order harmonics. Shape introduces low-order harmonic wavefolding.

Left-hand path modes

FBPM (Green LED) — Self-feedback PM with all harmonic distortion sine-to-saw spectra.Depth controls feedback amount. Shift blends harmonics. Shape introduces wavefolding.

2OP (Yellow LED) — Two-operator PM. Depth controls PM index from Mod with damping. Shift blends harmonics. Shape introduces wavefolding.

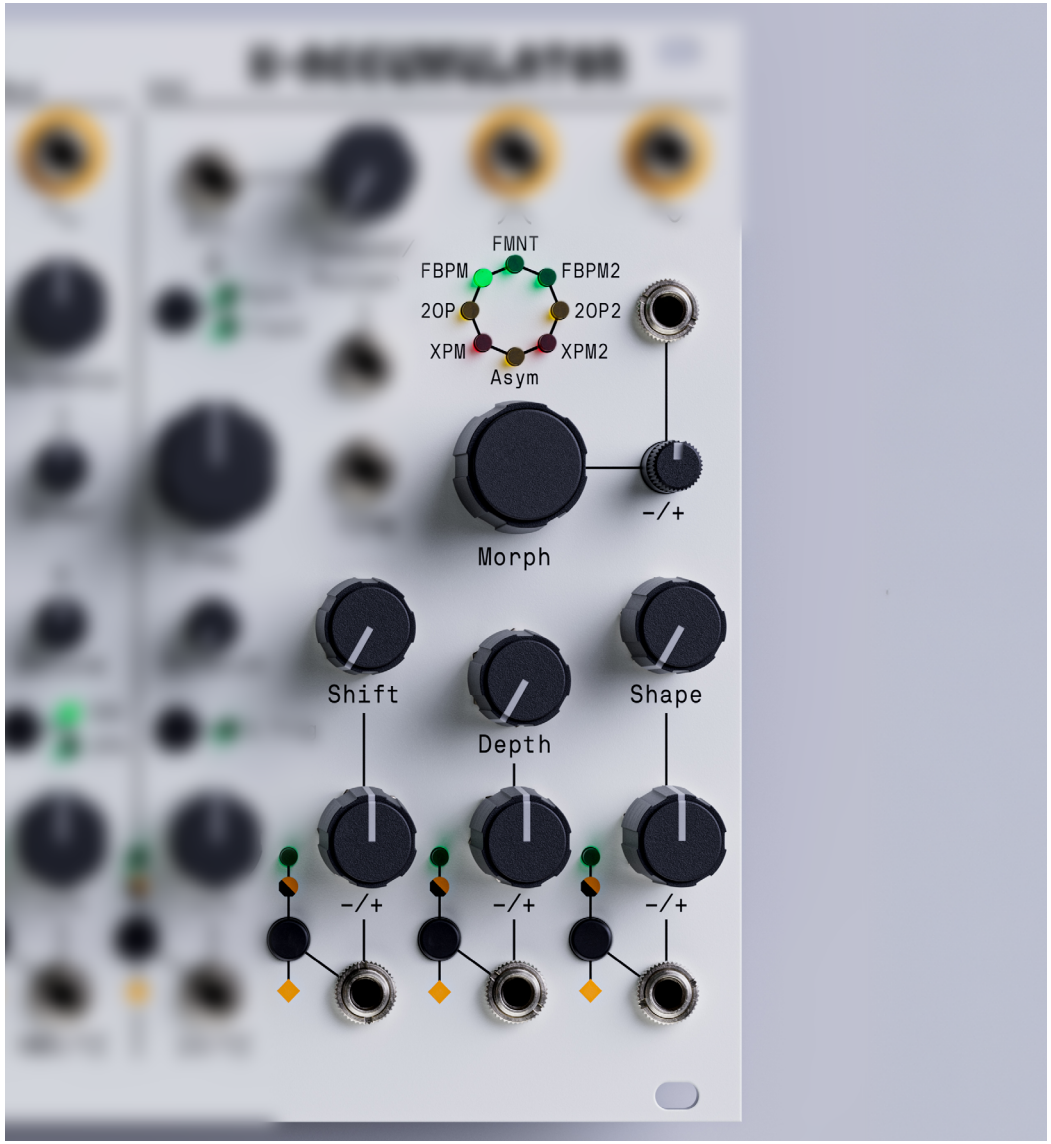
XPM (Red LED) — Cross-phase modulation. Depth controls PM from Mod with damping and cross-feedback to Mod. Shift blends harmonics. Shape introduces wavefolding.

Right-hand path modes

FBPM2 (Green LED) — Self-feedback PM with chaotic, subharmonic latching feedback. Depth controls feedback amount. Shift controls damping filter. Shape introduces wavefolding.

2OP2 (Yellow LED) — Two-operator PM with separated self-modulation. Depth controls PM from Mod. Shift controls self-PM with damping. Shape introduces wavefolding.

XPM2 (Red LED) — Cross-phase modulation with fully separated controls. Depth controls PM index from Mod. Shift controls PM damping filter cutoff. Shape controls XPM index and damping filter cutoff.



Morph controls

7: Mod

The Mod oscillator provides a second oscillator for phase modulation of the main OSC. Its frequency is set relative to a tracked source — Root, OSC, or UFG — and the Harmonic and Order controls work together to determine the relationship. Depending on the Order setting, the Harmonic knob can sweep a free pitch offset, blend through integer harmonics (with odd or even spreading), or quantise to the current scale. This gives the Mod a range from subtle detuning through to locked harmonic ratios, all relative to a single tracked pitch.

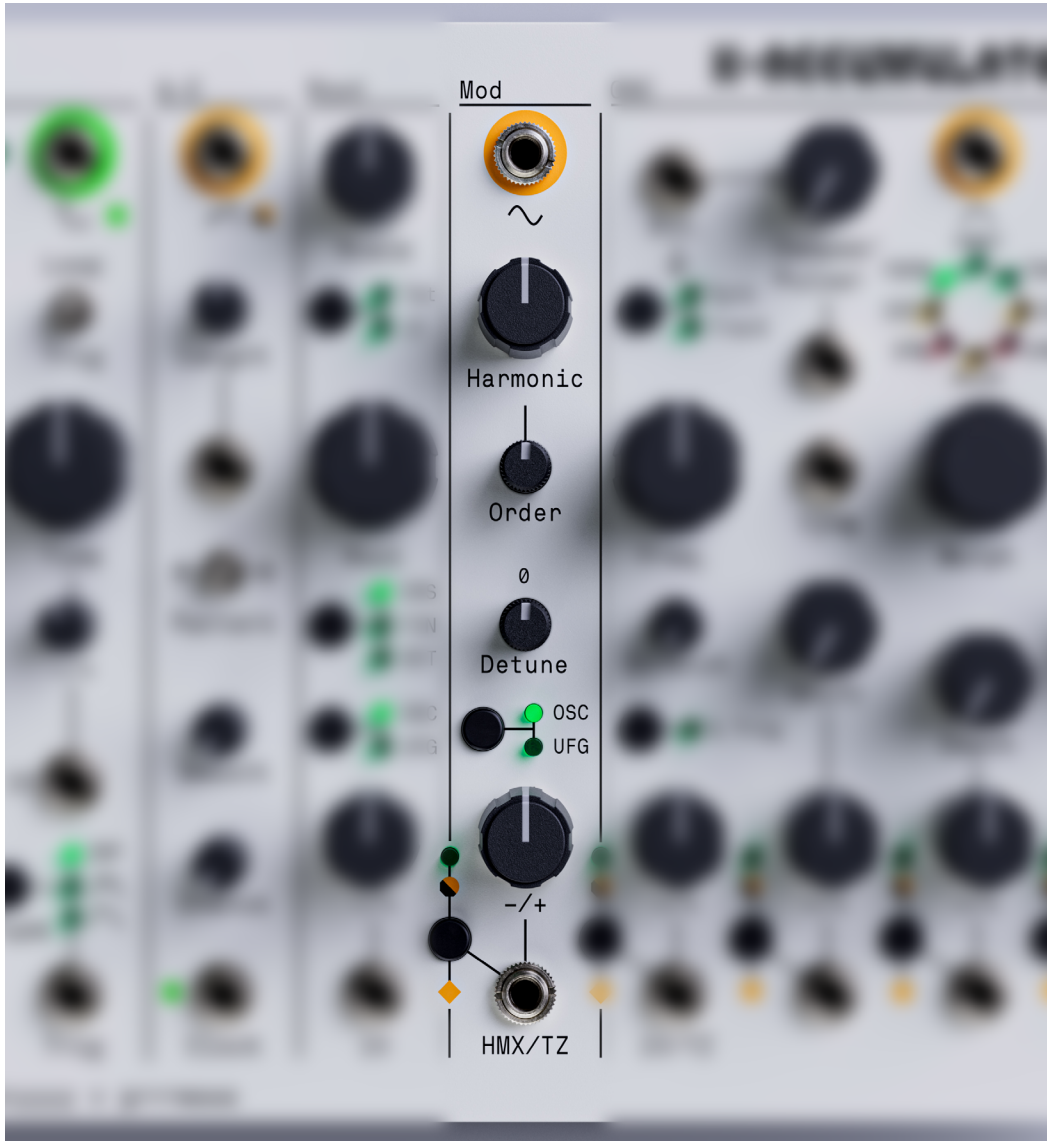
The OSC/UFG button selects the pitch tracking source: when the OSC LED is lit, Mod tracks the main oscillator's frequency; when the UFG LED is lit, Mod tracks the UFG frequency. In both cases, any active scale quantisation is included in the tracking. With no LED lit the Mod tracks the Root frequency.

Harmonic + HMX/TZ CV + Attenuverter — Sets the Mod oscillator's pitch relative to the tracked frequency. The behaviour is determined by the Order control. Above the centre position of the Harmonic knob, the Mod blends through harmonics above the fundamental. Below centre, the Mod sweeps freely below the fundamental. The CV input tracks 1V/Oct when Order is in free pitch mode and the attenuverter is at maximum or minimum.

Order — Sets the response of the Harmonic knob across a continuous range:

- Minimum: Harmonic knob sets a free pitch offset from the tracked frequency
- Centre: blended harmonics above harmonic 1 (all harmonics), free-running below
- Clockwise from centre: spreads blended harmonic response toward odd harmonics only
- Counter-clockwise from centre: spreads blended harmonic response toward even harmonics only
- Maximum: Harmonic knob is quantised to the current scale of the tracked frequency, or to integer ratios if no scale is selected

Detune — Detunes the Mod from the tracked frequency, with zero detune at centre. This is a global control — it also detunes the harmonic wavefolder on the main oscillator, as PM detuning and wavefolder animation produce a closely related effect.



Mod panel controls

8: UFG

The UFG is a full-spectrum digital function generator with advanced anti-aliasing. It serves three roles simultaneously: it is the primary modulation source for the OSC, the window generator for pulsar synthesis, and the clock source for the Δ-Σ. It tracks 1V/Oct across its full range, from sub-audio modulation through to audio-rate oscillation, and can track the Root frequency and scale or run freely.

The UFG produces anti-aliased function and gate outputs. The gate pulse width is set by the Skew control. With Shape set to linear, the UFG is a fully anti-aliased saw-tri-ramp oscillator.

Loop/Trig Switch — Three-position switch. Push up to toggle looping. Middle position is single-shot triggered externally. Press down for a momentary manual trigger.

Time + CV + Attenuverter — Sets the frequency of the function generator. The CV input tracks 1V/Oct. When no cable is patched, a random walk is applied via the attenuverter — centre the attenuverter to remove this.

Skew + CV + Attenuverter — Tilts the function between rising and falling ramp shapes, independently of Time. When no cable is patched, the Δ-Σ output is normalled to the CV input — centre the attenuverter to remove this.

Shape + CV — Morphs the UFG waveshape between linear, sine, exponential, and raised cosine.

TZFM Input — AC-coupled through-zero FM input. At sub-audio Time, the TZFM response is similar to a wavefolder, but the output can be skewed and shaped. For a wavefolder patch, patch through an external VCA before the TZFM input.

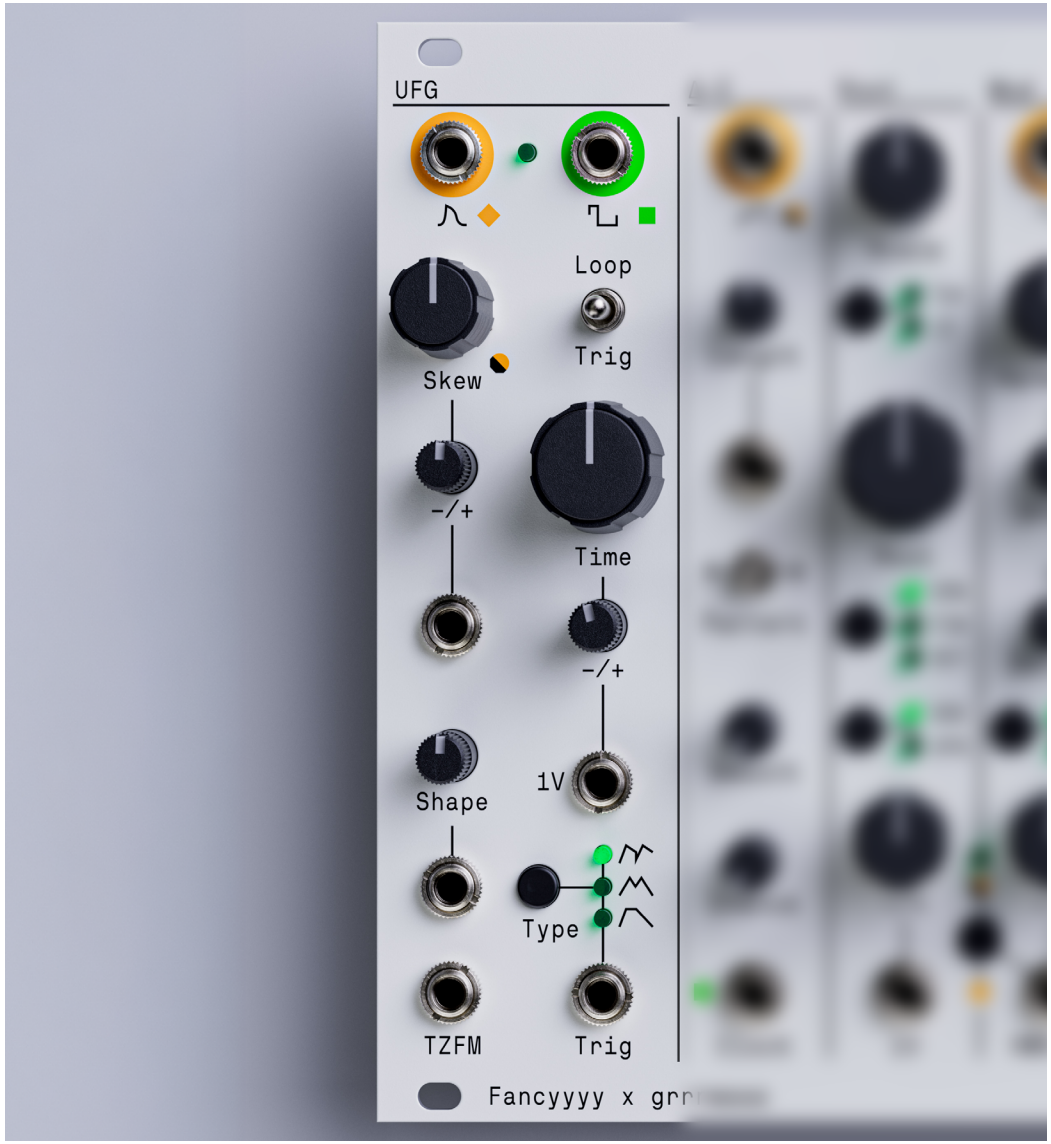
Trig Input + Type Button — External trigger input, functional across the full frequency spectrum in both looping and single-shot modes. The Type button cycles through four trigger response modes:

Hard sync with subharmonic locking — the UFG completes its current cycle before syncing.

Sync reversal — the UFG reverses direction on a rising edge.

Sustain + hard sync — held high while gate is high. Hard-sync on rising edge.

Sustain + sync reversal — held high while gate is high. Reversal on rising edge.



UFG panel controls

9: Δ-Σ

The Δ-Σ is a pattern generator that extends the random/looping sequencer concept. It is internally clocked by the UFG and uses delta-sigma encoding of the Mod oscillator to generate stepped and smooth patterns. Like many aspects of K-ACCUMULATOR, the Δ-Σ morphs between different behaviour at audio and sub-audio rates: at sub-audio range, smoothing acts like a sequencer glide control; at audio rate, it becomes a form of filtering and the output is optimised as a TZFM or PM source.

Pattern editing on the Δ-Σ is non-destructive. A user can alter a pattern and always return to the original loop. This makes it a powerful tool for wandering away from a locked sequence before returning to the original pattern.

Clock Input — External clock input. Patching a cable breaks the internal normalisation from the UFG.

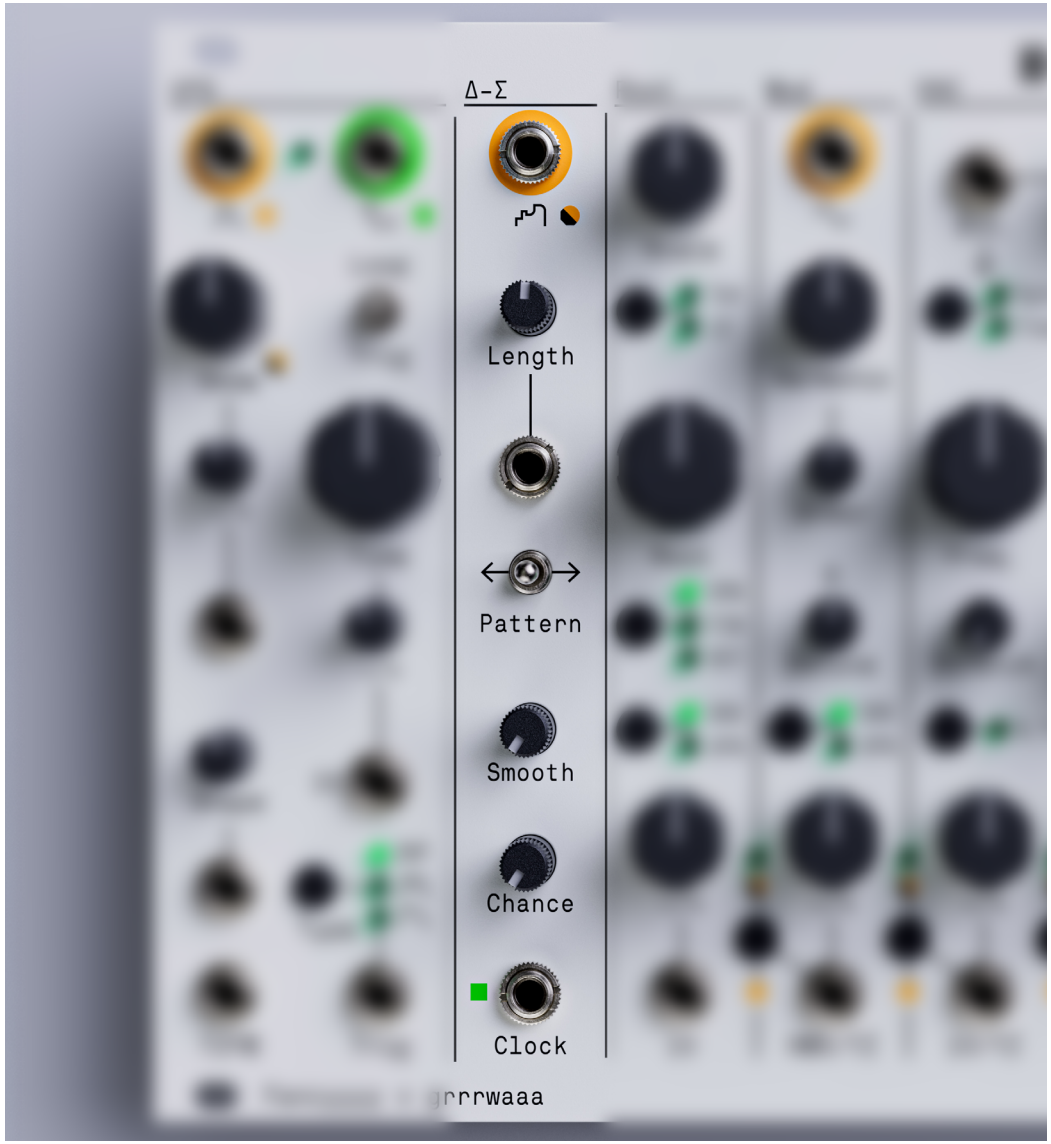
Δ-Σ Output — Stepped or smoothed pattern output.

Chance — Sets the probability of new values appearing in the sequence. At minimum, the sequence is a locked loop. Increasing Chance progressively introduces new values until the sequence is entirely new at maximum. This is non-destructive — returning to minimum always restores the original pattern.

Pattern Switch — Momentary switch for editing the pattern stored at the minimum Chance position. Push right to enter a new value at the current step. Push left to restore the previous value at the current step. Hold right to completely overwrite the pattern. Hold left for a double-length pattern.

Length — Non-destructively zooms into a section of the current pattern. The zoom position is determined by the current step. Length ranges from 2 to 16 steps, with a deadzone at centre for 8 steps. At short lengths, which section of the pattern loops depends on where in the sequence the length change occurs. Modulating Length in time with the Δ-Σ clock is an effective way to evolve a larger pattern.

Smooth — Introduces glides between pattern steps. The glide positions are fixed within a given pattern, so the same notes in a locked loop will always glide. At audio rate, Smooth controls how fast the Δ-Σ values can change, acting as a filter.



Δ-Σ panel controls