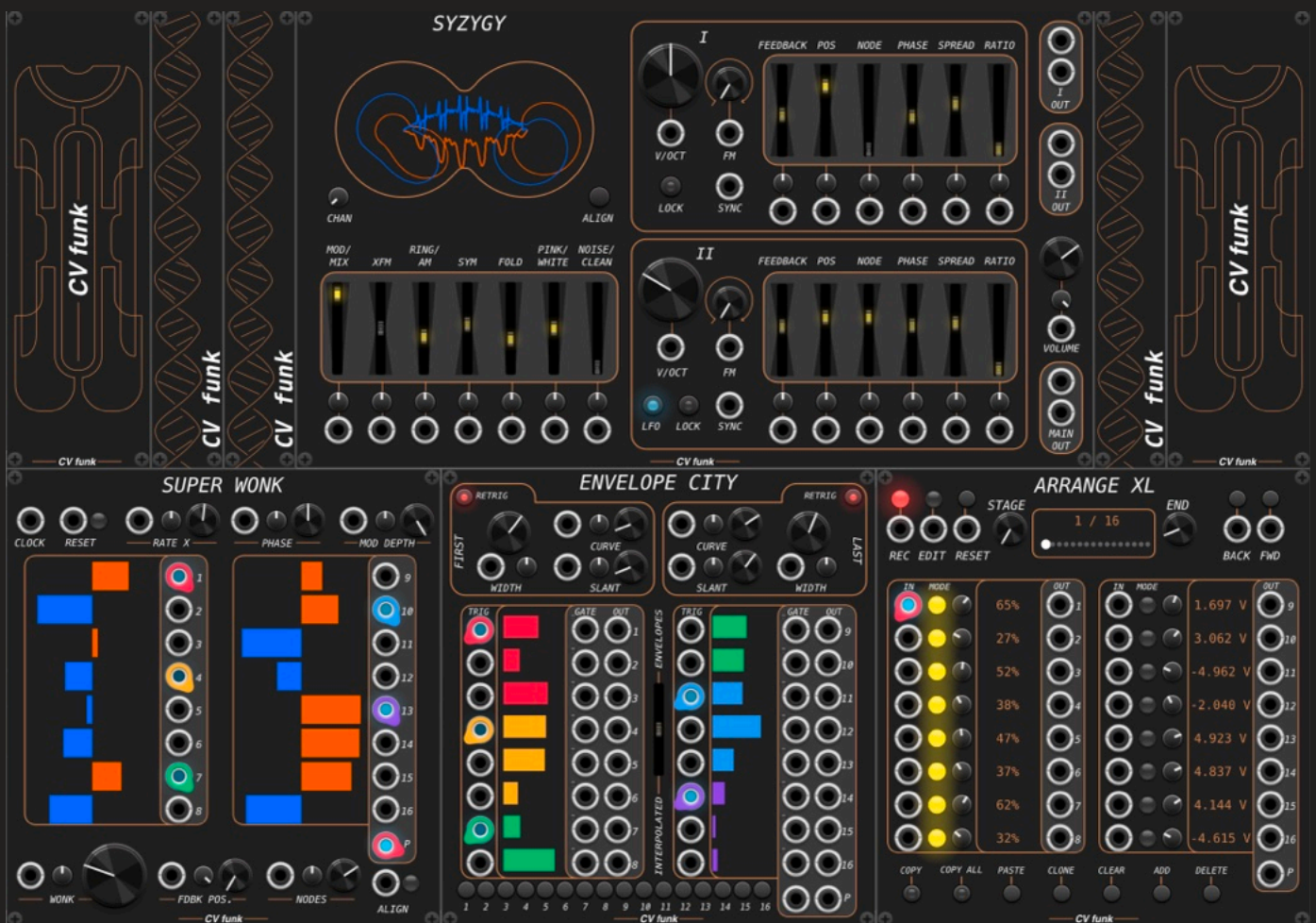# CV funk

CV funk Modulations Collection for VCV Rack

User Manual

Version 2.2.8

CV funk

LICENSES

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CV funk Modulation

*Explore the vast possibilities of modular synthesis with the **CV funk Modulations** collection. Syzygy, a complex oscillator based on Ouros, is a sonic pallet with many modulation possibilities. The Modulations collection includes a new fully polyphonic sequencer, envelope generator and low-frequency oscillator with a streamlined workflow.*

Syzygy   4

A polyphonic complex oscillator with many cross-modulation options. Mix and combine the sonic DNA of two different oscillators with Syzygy. Morph from a mix to deep ring modulation to AM, white to pink noise, and add harmonics by wave-folding.

Super Wonk   11

16 channels of wonky oscillations. Morph smoothly from a perfectly phase-aligned LFO to chaos. The Align gate input causes all 16 channels to smoothly morph into perfect phase alignment for a dramatic effect.

Envelope City   16

16 channels of AD envelopes with sample-precise accuracy. The envelopes interpolate between the first and last channel settings. Variable curve, slant and envelope time enable you to have a palette of 16 unique envelope shapes at your fingertips.

Arrange XL   23

A 16 channel sequencer, each channel has three possible modes: voltage, quantized note, and trigger probability. Two record modes let you edit or record over your sequence live. A fully-featured copy/paste makes building detailed sequences much simpler.

SYZYGY
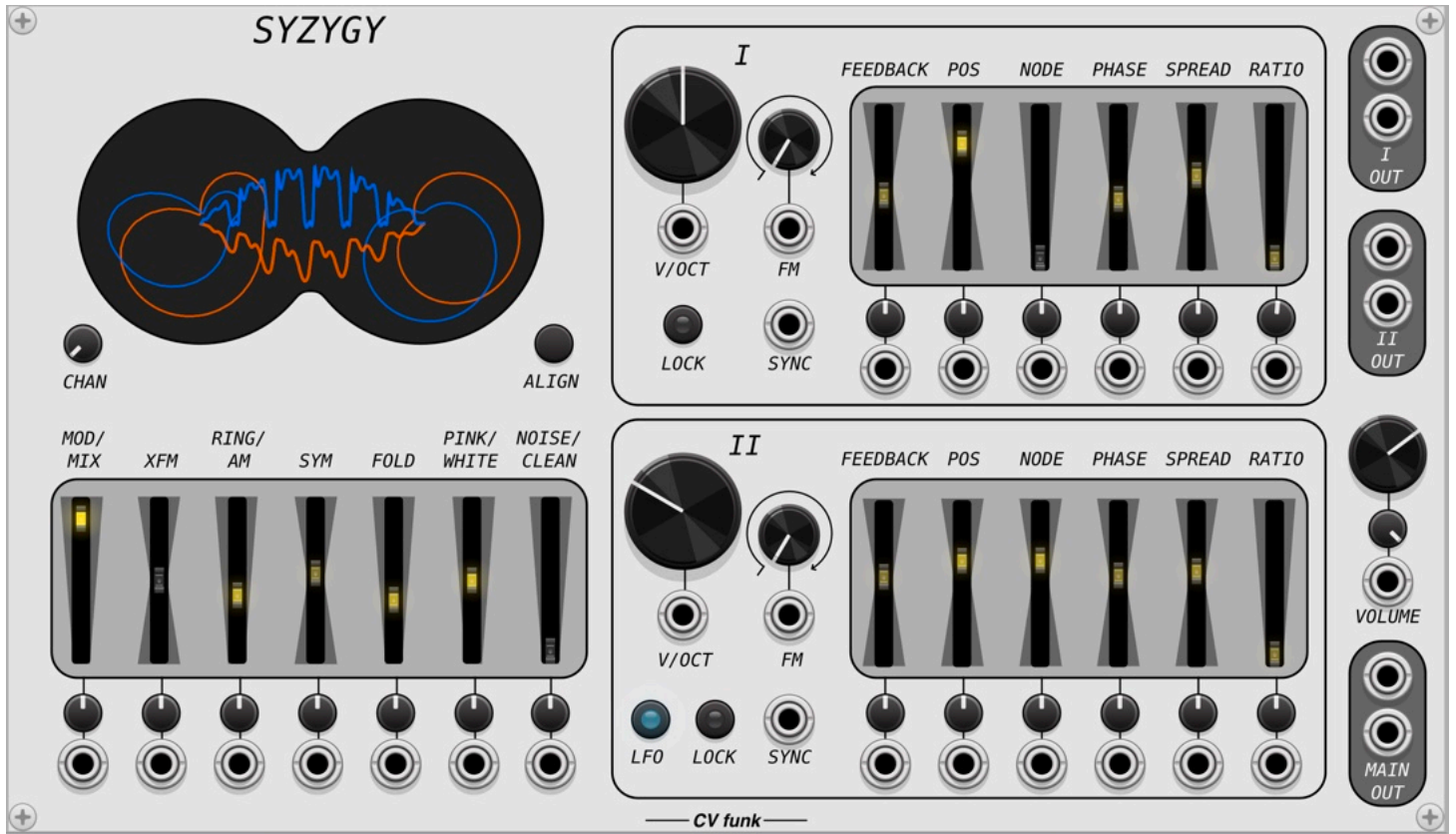
SYZYGY is a complex oscillator comprising two independent stereo phase feedback distortion oscillators that can be ring modulated and amplitude modulated to create rich harmonic interactions. The oscillator is inspired by the idea of chromosomal crossover, where the signals of the dual oscillators merge and the product of their recombination spans the centers of the two displays like homologous chromosomes. The oscillator architecture allows you to explore sounds from harmonious bell or glass-like ring modulated sounds to chaotic metallic clanging of linear TZFM cross-modulation.

SYZYGY

1: **Primary and Secondary Oscillators:**

POLYPHONY: A polyphonic input to **V/OCT** will activate polyphony on the module and all other CV inputs.

V/OCT: Set the frequency of the two oscillators separately.

FM: Linear FM input sums with V/oct.

By default the FM inputs are normalized for cross-modulation. Patching an input will break the normalization.

Exp FM, and different modulation depth options are in the context menu.

SYNC: Hard-syncs the oscillator to rising zero-crossing.

LOCK: Hard-syncs either Osc. I or Osc. II to the other.

LFO: Osc. II can be set to LFO mode, where 0V/oct is 1Hz.
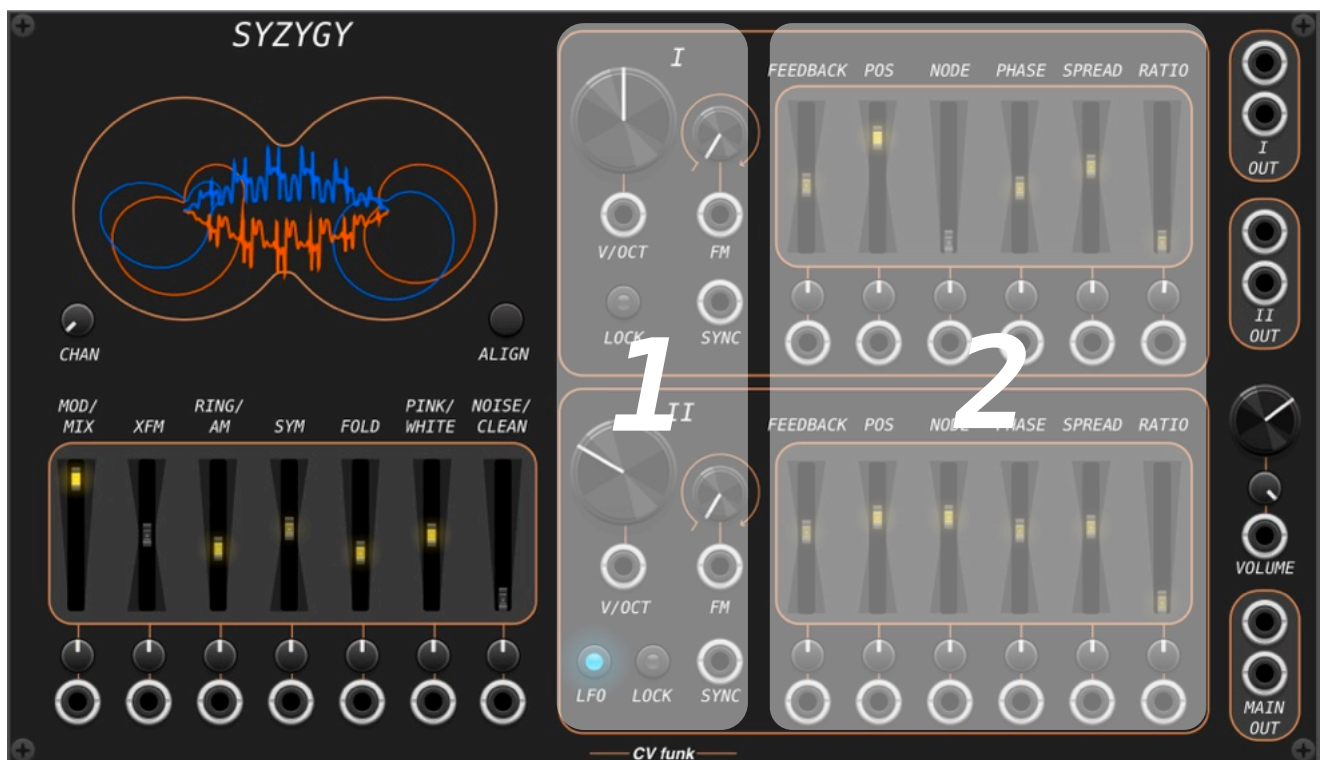
2: **Oscillator Harmonic Palette**

FEEDBACK: Sets the amount of phase-feedback. Set to zero, the oscillator will output a sine, and feedback related knobs POS, NODE and RATIO will have no effect.

POSITION: Sets the phase position of the feedback relative to the oscillator clock cycle.

NODE: Changes the number of cycles/nodes in the phase channel relative to the oscillator.

PHASE: Controls the phase of the oscillator.

SPREAD: Controls the spread of the L and R phases.

RATIO: Multiplies the feedback phase, generating higher harmonics. The knob is non-linearly mapped so that it always maps close to an integer value.

CV funk

3: Display and Align Function

DISPLAY: Shows the left and right (orange and blue) channels as polar coordinate displays of one wavelength. The XMOD product is shown bridging the two centers.

CHAN: Changes the channel of the display. When set higher than the polyphonic depth, it will display the deepest layer.

ALIGN: Sends a simultaneous pulse to SYNC of both oscillators, realigning their phase relative to each other.

4: Syzygy Mixer Stage:

MOD/MIX: Morph between a normal I+II mix and XMOD.

XFM: Set the amount of cross-modulated FM. The channels of the XFM can be set in context menu.

RING/AM: Morph between AM and Ring Modulation.

SYMMETRY: Add or subtract a DC offset from the signal before wave-folding.

FOLD: Set the amount of wave-folding. At max the wave-folder morphs again to a saturated distortion.

PINK/WHITE: Fade between white and pink noise generation.

NOISE/ CLEAN: Morph from the clean signal to the noise signal.

5: Syzygy Output Stage:

I/II OUT: Stereo outputs for Osc. I and II.

VOLUME: Acts as a VCA on the Outputs. In the context menu you can optionally have it only affect the Main Out.

MAIN OUT: Main stereo output. In the context menu there is an option to mix the polyphonic outputs down to one channel.
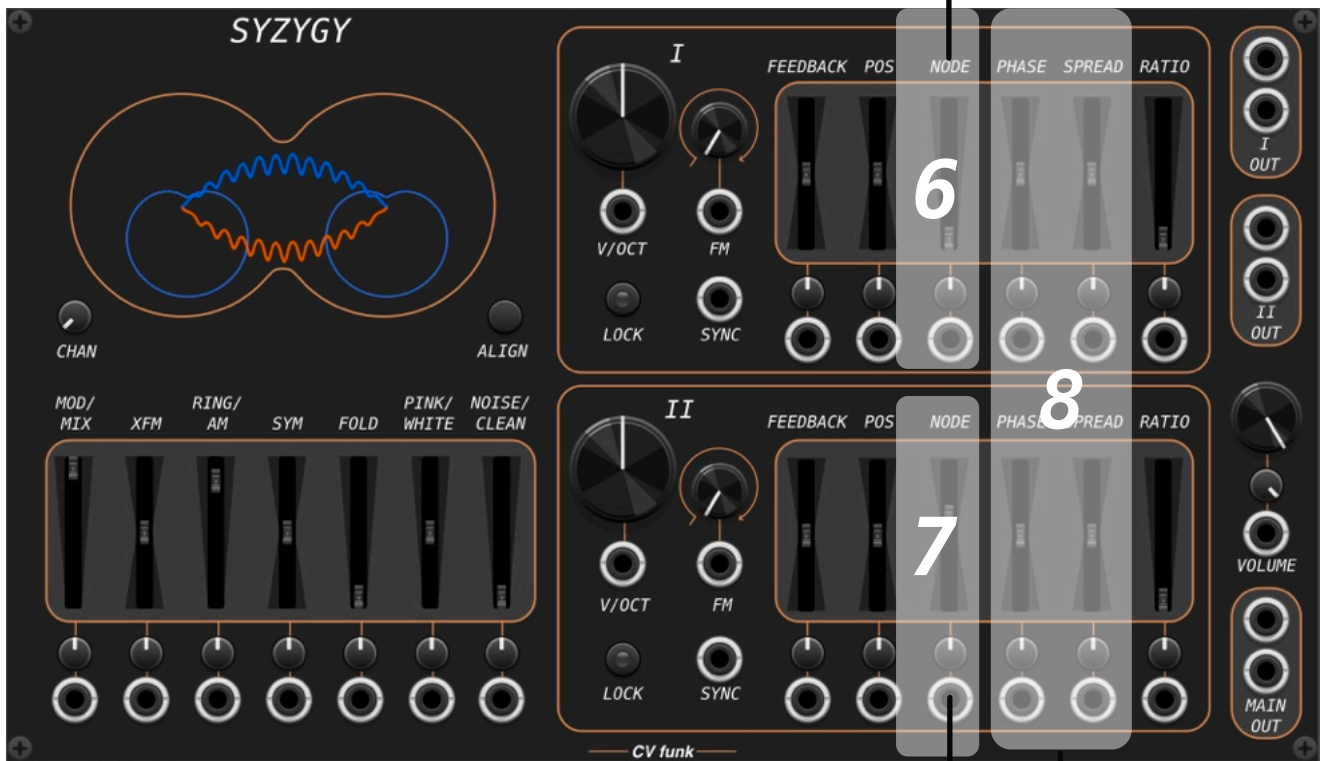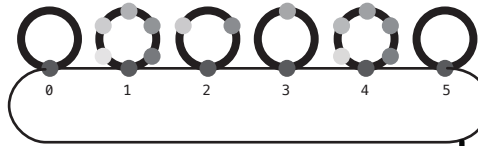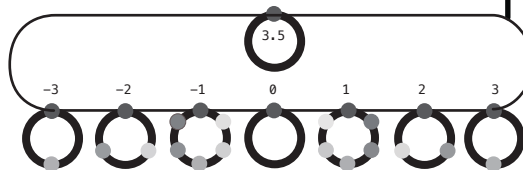
Oscillator Architecture:

6: Osc. I Node/Feedback

The Node mapping changes how phase feedback maps to the main oscillator.

7: Osc. II Node/Feedback

Osc II has a symmetric node distribution pattern, that gives its feedback a distinctively different, but related sound to Ouros.

8: Phase and Spread

PHASE sets the base phase of the oscillator, and can be used to adjust the phase of the two oscillators relative to one another (once Align is pressed). SPREAD offsets the phase of the L and R channels relative to the PHASE setting. A spatialized sound effect from the phasing can occur because your left and right ears hear the impulse of the sound at different times. The orange and blue trace will show the magnitude of this effect.
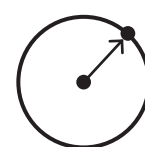
Phase   Spread
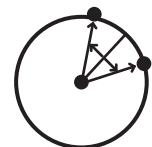
Technical Notes

1. How does phase feedback distortion work? Phase-feedback distortion happens because the oscillator's phase position isn't fixed — instead, it is continuously perturbed by feeding back a portion of another oscillator's output to control the phase placement. In essence it works like the ouroboros, the snake that eats its own tail. This feedback loop shifts the oscillator slightly off its "ideal" phase each cycle, causing the waveform to bend and skew over time. The result is a sine-like signal whose harmonic content and shape depend on the feedback depth, giving a controllable distortion that grows as feedback increases.
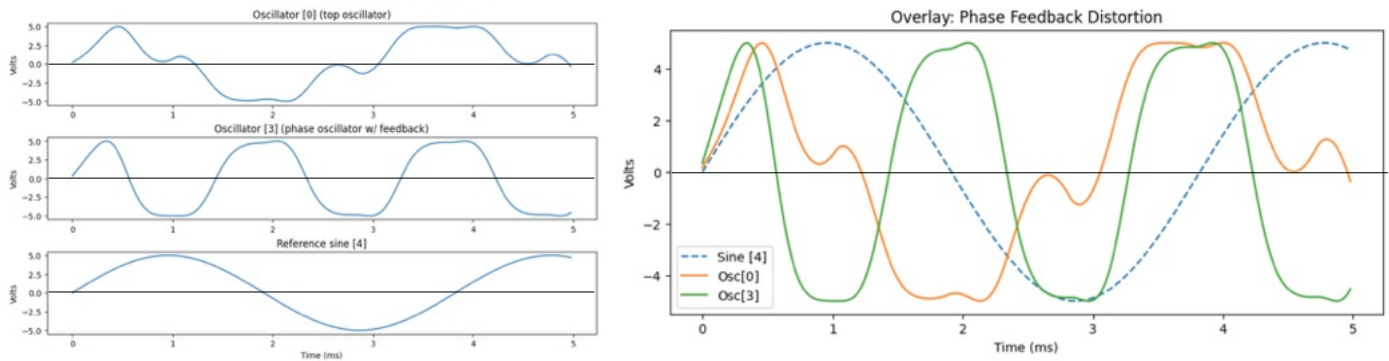
Ratio = 2 in this example

2. Non-linear mapping of RATIO knob. The RATIO knob determines how much the phase oscillator is scaled relative to the main oscillator. The scaling effect is similar to the effect of an FM operator ratio, and sounds best at integer ratios. The knob maps with a set of steep 5th order polynomials, so that you can span the whole range, but most of the span is on regions very close to integer values.
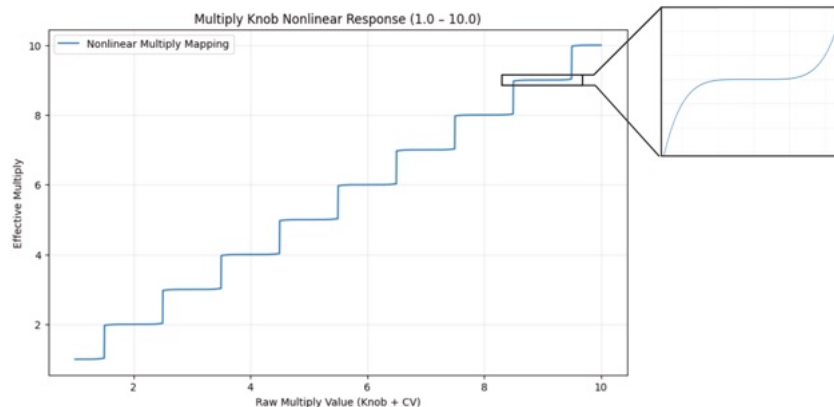
Usage

1. V/Oct: Set the base frequency of the two oscillators in C/oct. Patch any external v/oct controls, decide if you want to control the top, bottom or both oscillators by CV.

2. LOCK: Many configurations exist for producing interesting sounds. You can hard-sync either of the oscillators to the other, or let the two oscillators run free.

3. FM: By default the FM inputs are normalized to cross-modulate.

4. VOLUME: By default the Volume is set to max, allowing Syzygy to function as an oscillator. But it can be more, by setting Volume to 0 and patching an external envelope CV it becomes a fully polyphonic synth voice. The Volume VCA controls both the Main and Outs I/II, but can be decoupled from Outs I/II by context menu option.

5. FOLD: Set the amount of wave-folding. One way to use this input musically is to set the module to have a nice drone sound, and then use envelopes into FOLD to create brief wave-folded plucks of higher harmonics.

6. NOISE: The NOISE slider allows you to morph in some pink/white noise. It can be useful for generating more complex sound landscapes, or for adding to drum sounds.

7. XFM: The XFM can be set to linear or exp in the context menu, but also can be set to cross-modulate Osc. I, Osc. II or BOTH Osc. I and Osc. II at once. Double XFM can create wild unpredictable screaming or bubbling sounds, and the this mode is especially useful for sculpting drum sounds or effects. By default the XFM is set to Osc. I, as is the normal routing in many complex oscillators.

8. RING/AM: This slider morphs between amplitude modulation and ring modulation. The difference can be subtle in some cases, but in AM you can hear the carrier wave, and in ring modulation you can only hear the sidebands. Morphing between the two can create nice harmonic variations if the two oscillators are tuned relative to each other.

9. MOD/MIX: This slider morphs between the RING/AM cross-modulated sound and a flat mix of the two Osc. I and II.
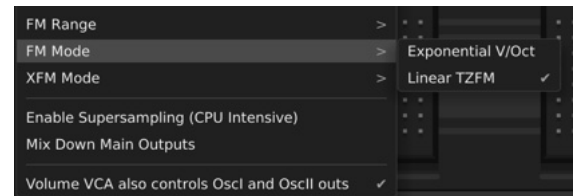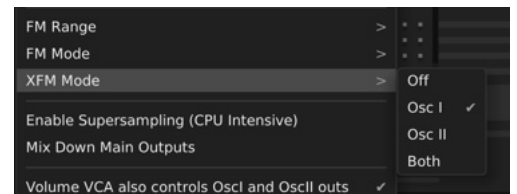
Context Menu

1.FM Range: Set the maximum FM depth.
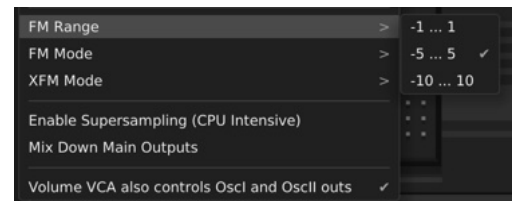
2. FM Mode: Switch between linear through-zero FM (TZFM) and exponential (V/oct FM).

3. XFM Mode: Choose the routing of the internal cross-modulation for the XFM slider and CV input. Can you choose if it cross-modulates Osc. I, Osc. II, or Both.


4: Enable Supersampling: *CPU-Intensive.* This option adds 4x supersampling antialiasing to the individual Osc. I and Osc. II outputs before the wave-folding.

5. Mix Down Main Outputs: By default the outputs match the polyphony of the oscillator, but this option allows you to normalize the outputs down to one channel.

6. Volume VCA also controls Osc. I and Osc. II outs: Enabled by default, youcan disable this normalizing to have full-volume oscillator outputs from Osc. I and II.

SUPER WONK
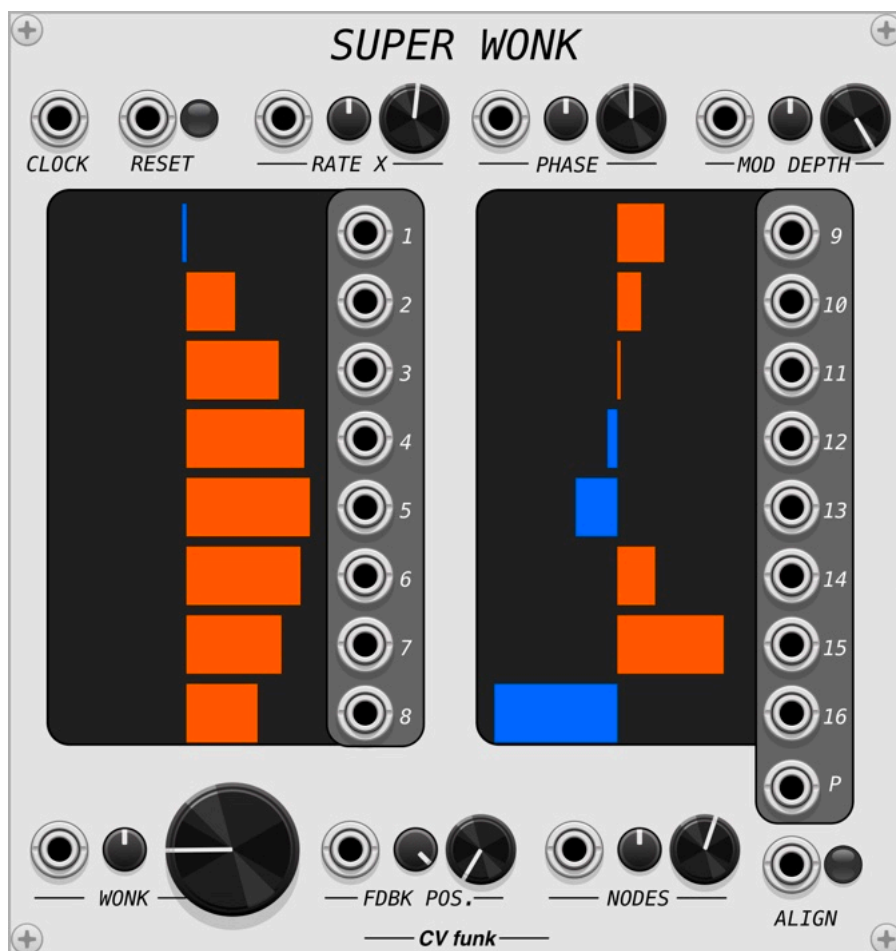
SUPER WONK *is a 16-channel low frequency oscillator with built in phase-feedback distortion designed to morph synchronous oscillator signals into more chaotic ones, but that still remain locked to the clock bpm.*

SUPER WONK

CLOCK

Sync the oscillators to external clock. Defaults to 30 BPM.
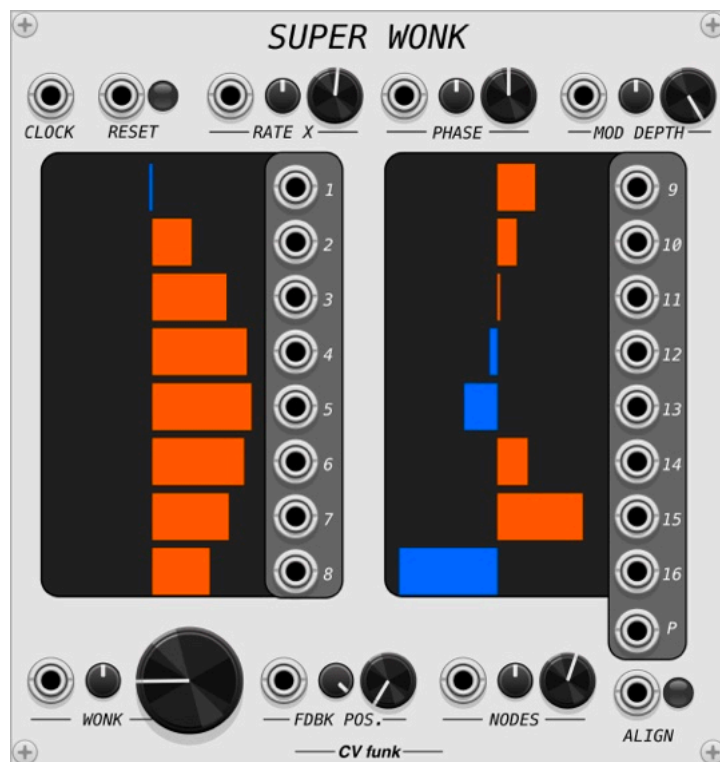
RESET

Resets the oscillators.

RATE X:

Sets the rate multiplier of the clock. Positive numbers multiply the clock. Negative numbers divide the clock. The range – 1…1 sets the clock to 1x.

PHASE:

Sets a phase offset for all oscillator channels.

MOD DEPTH

Set the modulation depth, up to a max of 5V.

OUTPUTS

Individual outputs for the 16 oscillators and a polyphonic output (P).

ALIGN

Unique ALIGN function responds to gate inputs and causes all channels to fade into alignment and back.

WONK

Set the amount of phase—feedback.As wonk increases, the range of nodes is narrowed, and the outputs morph between unison and chaos in a wonky way.

NODES

Set the phase spacing between oscillators.

## FEEDBACK POS.

Sets the channel for Wonk feedback

Usage

1. Clock: Clock input. Defaults to 30bpm.

2. Reset: Resets all the oscillator phases to their default positions based on NODE.

3. Rate X: Sets the oscillator rate as a multiple of the clock input rate. Positive numbers greater than 1 multiply the rate. Negative numbers less than -1 divide the rate. The region from -1 to 1 is a dead zone that defaults to 1.

4. Phase: Adjust the global phase of all oscillators. If you use the outputs for timing this can be used for fine adjustment. Or by CV control you can greatly increase the complexity of the outputs of the oscillator.

5. Modulation Depth: You can set the output range of the oscillators, up to a 5V oscillator signal.

6. Wonk: Adjust the amount of phase-distortion feedback. Any amount of Wonk will cause the oscillators to slowly drift out of phase while still staying mostly centered on the bpm.

7. Feedback Position: This sets the channel that is used for feedback modulation. Each setting gives the wonk as slightly different feel.

8: Nodes: Changes the per channel phase spacing between oscillators.

> *Nodes=0 :*Oscillators all oscillate in unison.

> *Nodes=1 :*Clockwise rotation in equal phase division.

> *Nodes=negative:* Inverts the direction.

> *Nodes=2 :*Outputs rotate 720° in phase, 2x of each output.

> *Nodes=8 :*Outputs rotate a full 4x rotations, there are 4x of each output in a binodal even/odd arrangement.

9: Outputs: Each oscillator has its own dedicated output, as well as a 16-channel polyphonic (P) output. Additionally, polyphony can be specified in the context menu for the individual outputs to output polyphonic groups.

10: Align: A unique function that causes the 16 oscillators to fade into alignment when a gate signal goes high, and to return to their nodal distributions when the gate goes low.
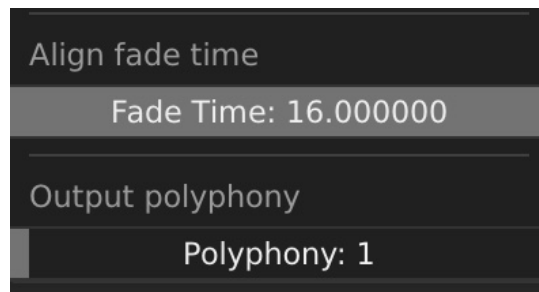*See next page for more detail:*

SUPER WONK

Align Function

Gates into ALIGN will cause all 16 channels of the oscillator to fade into alignment over 2.0 seconds, adjustable in the context menu. When the gate goes low the channels will again fade back to their NODE phase positions.

Align fade time

    Fade Time: 16.000000
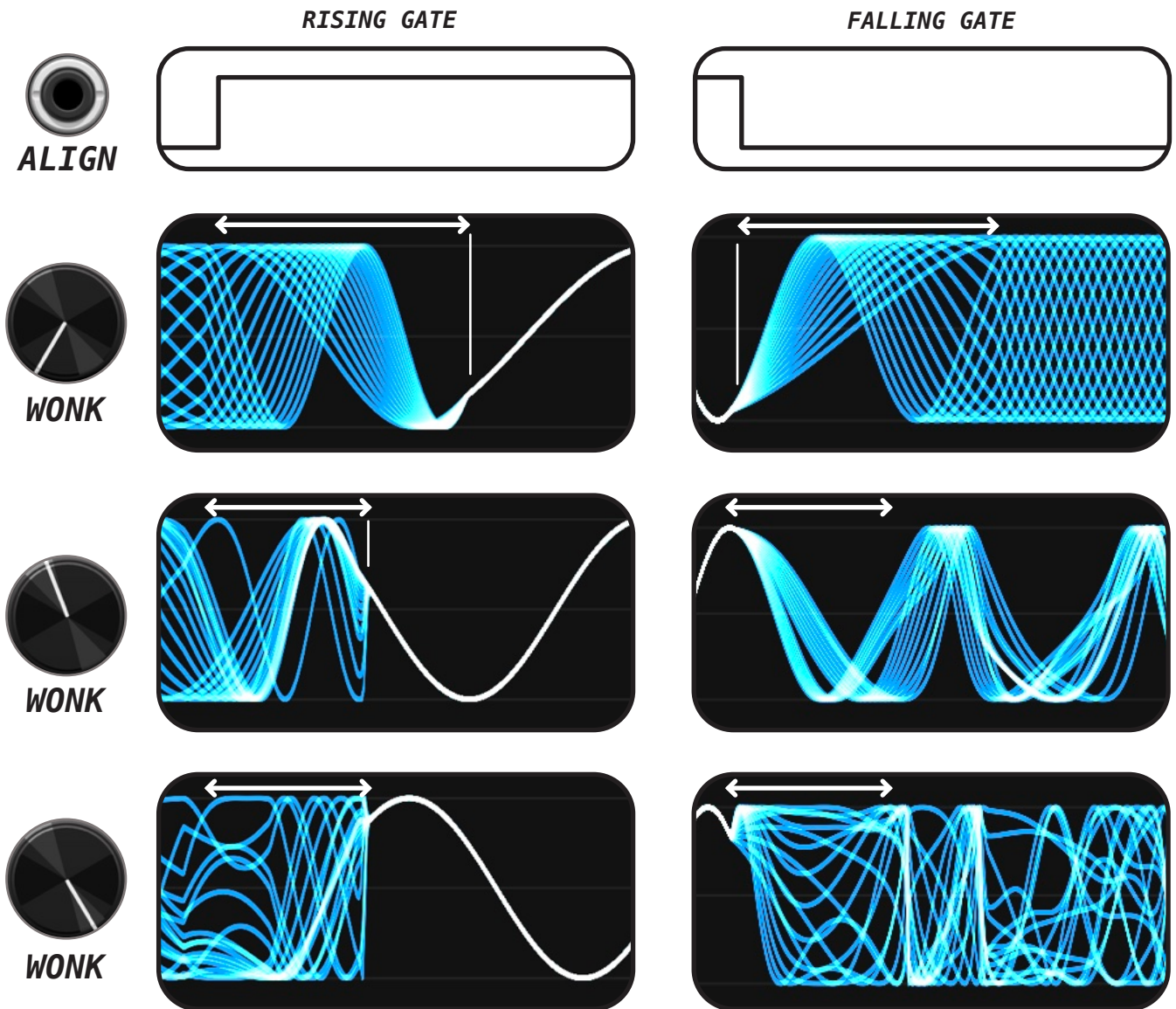
Output polyphony

    Polyphony: 1

Context Menu

1. Align fade time: Sets the transition time in seconds for alignment fades in and out. Range up to 16 seconds.

2. Output Polyphony: Sets the polyphony for each of the oscillator outputs. The outputs then send a range of outputs depending on the polyphonic depth, wrapping to 1 at channel 16.

ENVELOPE CITY

ENVELOPE CITY is an advanced envelope generator module for VCV Rack, designed to provide a wide array of dynamic control over amplitude shaping with 16 stages and complex modulation capabilities. The module can be self-patched to create a wide variety of modulations and is capable of self-oscillation when self-patched.

ENVELOPE CITY

WIDTH: Sets the cycle time of the first and last channel. Intermediate channels will have times that span FIRST and LAST.

SLANT: Sets the slant of the function, from rising ramp, to pyramid, to descending ramp.

CURVE: Adjust from Log to Linear to Exp.

RETRIG: Set envelope re-triggering for group 1–8 and 9–16. Retrig enables the envelope to be re-triggered during decay phase; when OFF re-triggering waits for the end-of-function.

INPUTS: Each channel has its own input trigger. Triggers are normalized to the right by default.
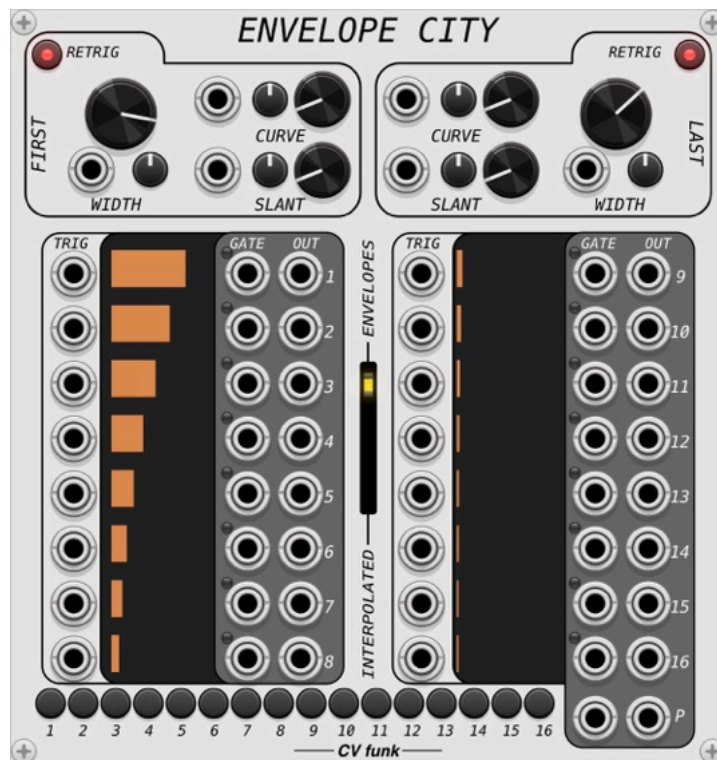
POLY: Each output channel can output polyphonic groups, set in the context menu.

BUTTONS: Manually trigger each envelope channel.

GATES: Each gate goes high when the envelope is at 0V. Allows for extensive self-patching and chaining of multiple modules.

ENVELOPES: 16 related envelope outputs.

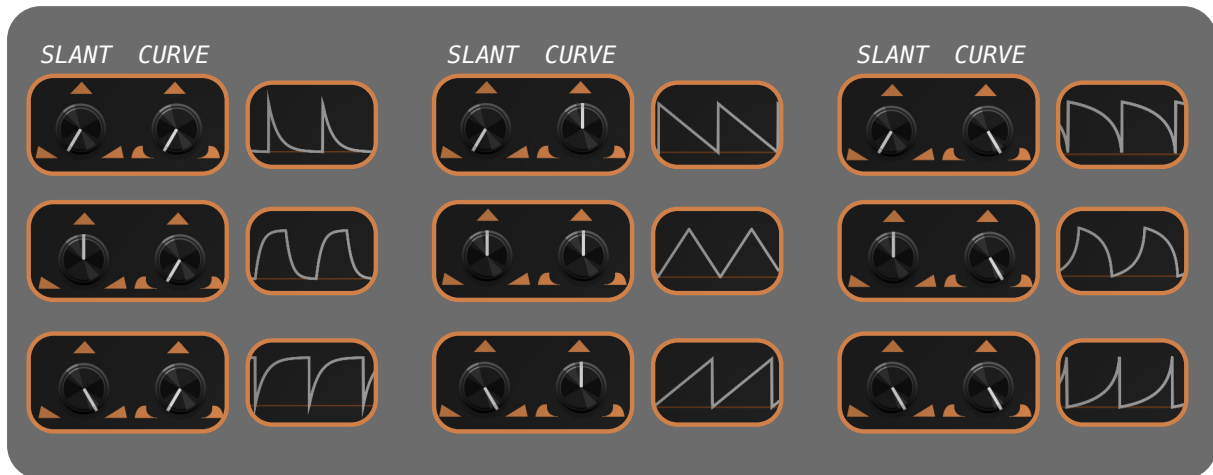**INTERPOLATED ENVELOPES:** Central slider controls the distribution of envelope shapes.

ENVELOPE CITY
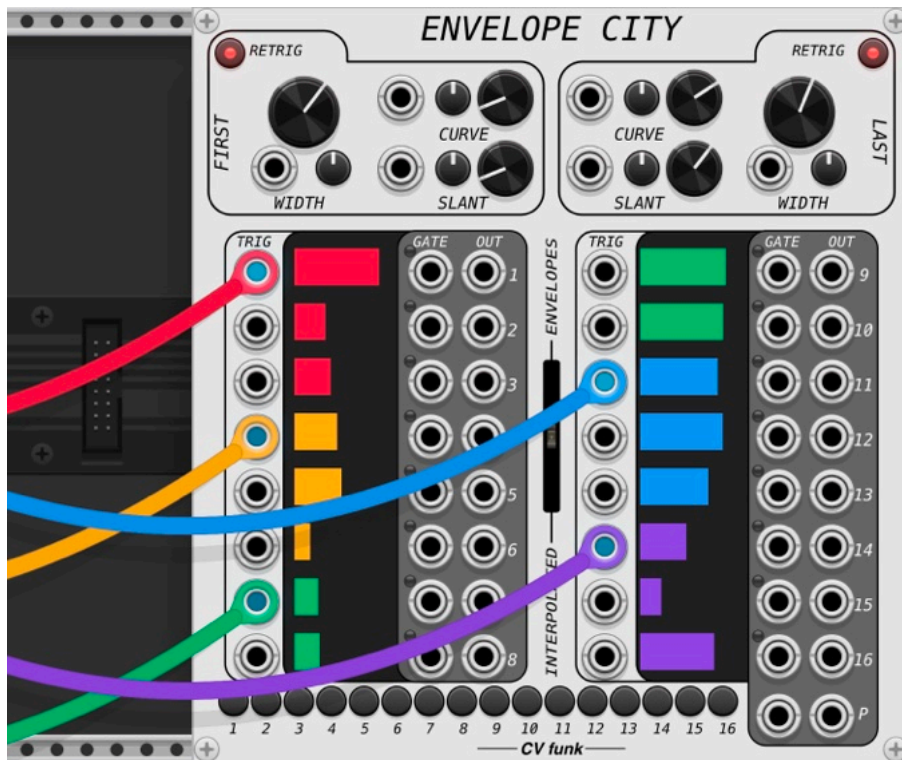
Display colors will match their corresponding input cables.

ENVELOPE CITY

SLANT *and* ***CURVE*** *combine to provide a wide range of possible envelope shapes.*

Usage

1. Set Envelope Stages: Adjust **WIDTH** knobs to define the width of initial and final stages of the envelopes in seconds, the other outputs will take intermediate values.

2. Shape Modulation: Use **SLANT** and **CURVE** knobs for the FIRST and LAST groups to shape the envelope's trajectory, creating everything from logarithmic to linear to exponential responses.

3. Dynamic Control: Patch CV signals into the respective attenuation inputs for real–time modulation of **SLANT, CURVE,** and **WIDTH** parameters in both FIRST and LAST knob groups.

4. Monitor Envelopes: Observe the module's graphical indicators for real–time visual feedback on the envelope stages and end–of–cycle signals.

5. Integrate with System: Utilize the end of function **GATE** outputs to trigger or synchronize with other modules, creating complex rhythmic patterns or sequences.

Envelope Shapes:

Adjusting **CURVE** and **SLANT** for the FIRST and LAST channels can produce a wide variety of envelope shapes. Useful for producing unique but related modulations that peak at different times.
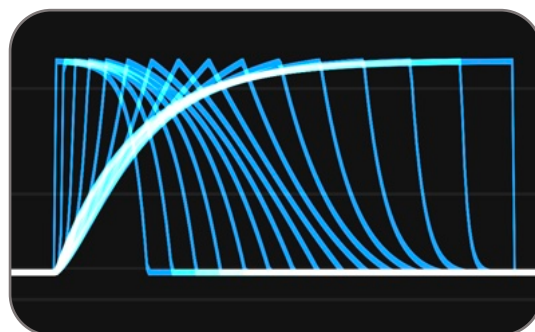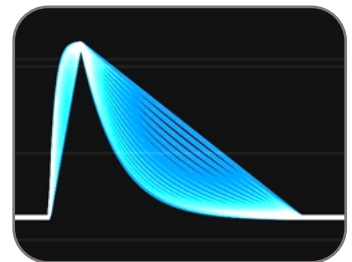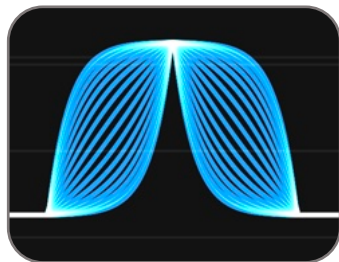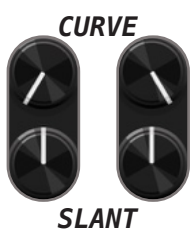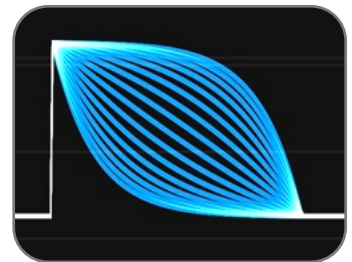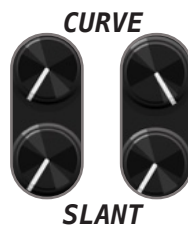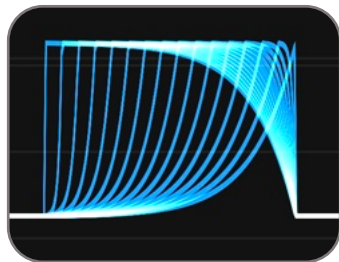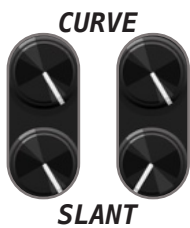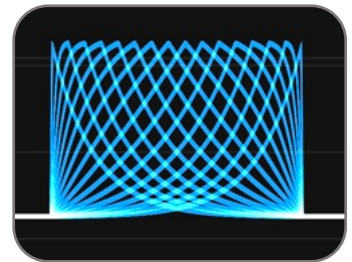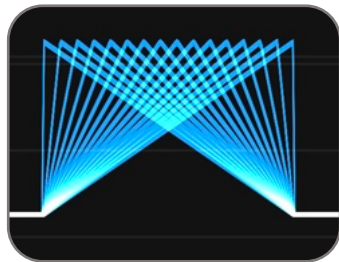
Volcano Mode Shapes:

In volcano-shaped envelopes mode, the curve is applied symmetrically to the shape rather than inverting at the crest.

Default Operation:

Shark-Fin Envelopes   *Volcano Envelopes*

CURVE

SLANT
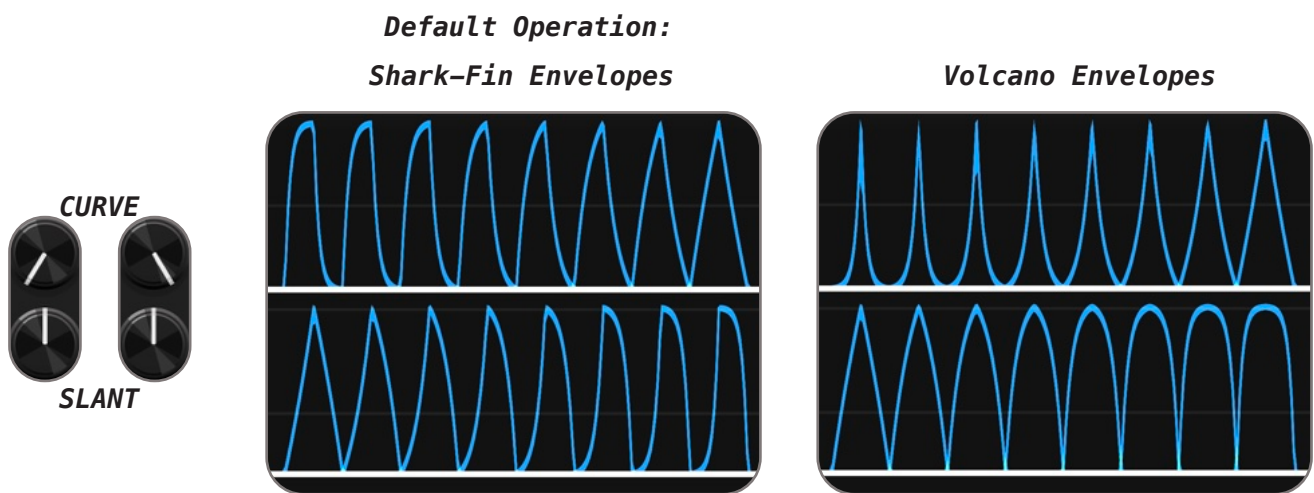
Context Menu

1. Envelope Polyphony: Sets the polyphony for each of the envelope outputs. The outputs then send a range of outputs depending on the polyphonic depth, wrapping to 1 at channel 16.

2. EOF Polyphony: Sets the polyphony for each of the envelope end of function gate outputs. The outputs then send a range of outputs depending on the polyphonic depth, wrapping to 1 at channel 16.

3. Trigger Probability: Enables variable trigger probability per channel. You can set each channel individually, or for convenience you can set all channels at once.

4. Volcano-shaped Envelopes: Make volcano-shapes instead of shark-fin shapes.
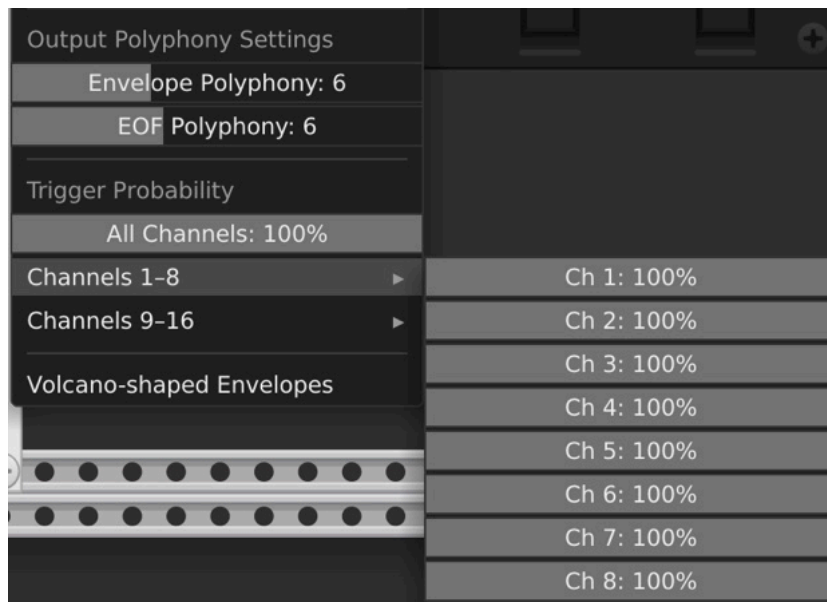
ARRANGE XL
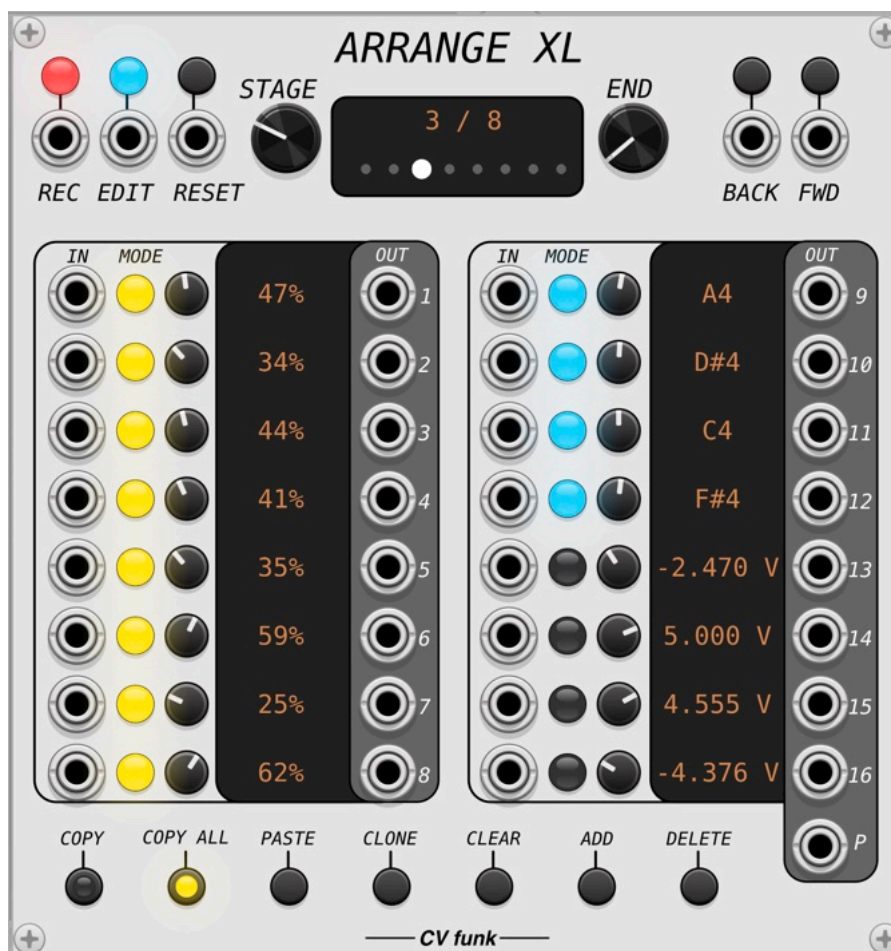
ARRANGE XL is a 16-stage sequencer with adjustable number of steps. It can sample input Cvs to play back. Each channels can be set into one of three modes: Voltage, Quantized, and Trigger with probability. Switches between record and playback for intuitive control over your sequences.

ARRANGE XL

REC:

Turn on/off recording mode. When active it saves the state of the active stage.

STAGE:

Selects the step of the sequencer.

END:

Selects the length of the sequence, up to 128 steps. Max lengths up to 2048 can be selected in the context menu.

EDIT:

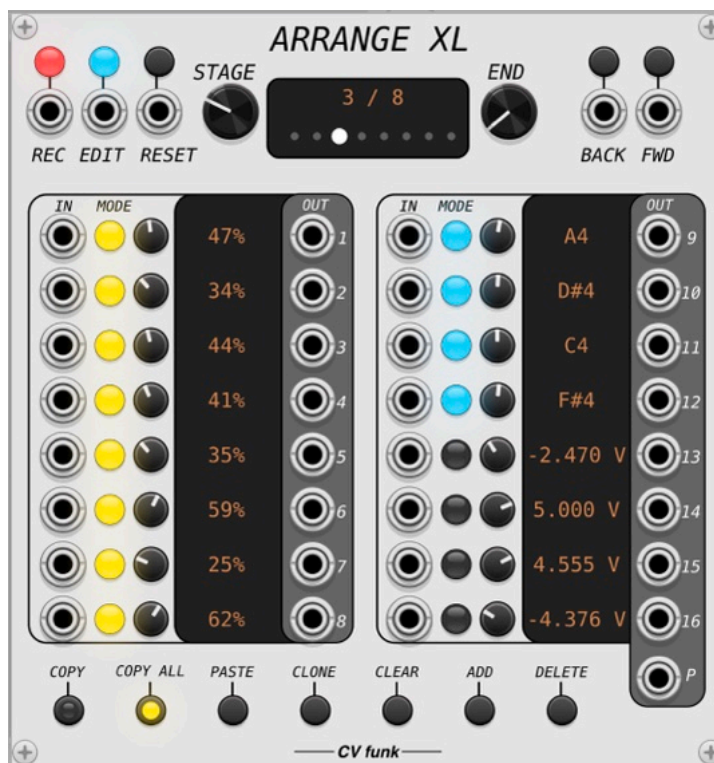Turn on/off recording mode. When active it saves the state of the active stage.

RESET:

Moves the sequencer stage back to the first stage.

IN:

Overrides the knob and program Cvs with external inputs. A polyphonic input to IN will distribute the inputs downwards.

MODE BUTTON:

Switch between Voltage (off), Semitone quantizer (blue) and Probability Triggers (yellow).

BACK:

Moves the sequencer stage back one step.

FWD:

Moves the sequencer stage forward one step.

DISPLAYS:

Top: Displays the current stage and number of steps. A white dot indicates the sequence progress.

Bottom: Displays the outputted voltage, note, or trigger probability.

COPY/PASTE:

Buttons provide copy/paste functionality:

- COPY ALL copies all stages up to the current stage.
- PASTE pastes the buffer after the current stage, adding new stages as required.
- CLONE pastes or 'clones' the top copied stage over ALL sequencer stages.
- CLEAR resets all params of the current stage.
- ADD adds a stage and increases sequence length by one.
- DELETE deletes a stage and decreases the sequence length.
- SHIFT-CLICKING a KNOB will apply its setting to all sequencer stages if REC is enabled.

Usage

1. END: Select the total number of sequencer stages. Changing this setting will reset the sequencer to the start and change the scaling of the **STAGE** knob.

2. STAGE: Select the current sequencer stage.

3. REC: Toggle button or CV arms the record, indicated by a red light. Record CV value samples to the active stage.

4. IN: Inputs for each stage override the knob setting for that stage. Polyphonic inputs spread downwards.

5. MODE: Each stage can be in one of three modes: Voltage, V/OCT CV, and Probability. In probability mode a –10V input sets 0% and a 10V input sets 100% – when the stage is triggered this sets the probability of outputting a trigger.

6. FWD/BACK: Advances the stage forwards or backwards.

7. RESET: Resets the sequencer to the first stage.

8. OUT: Outputs the current stage voltage. When **REC** is off, the parameter knob for that stage can be changed and its output value will change (without writing to the sequence). When **REC** is on the knob is ignored and the CV passes from the input.

9. Apply to all: Shift–click a knob in record mode will apply the selected voltage to all channels of the sequencer.

Individual Output Polyphony		
Output Polyphony: 6		
Set Max Sequence Length >	128 ✓	
	256	
Stop Record At End	512	
	1024	
	2048	
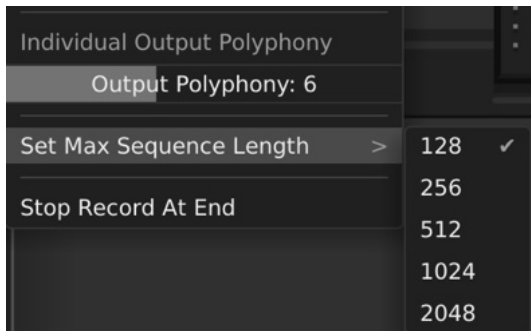
Context Menu

1. Output Polyphony: Sets the polyphony for each of the sequencer outputs. The outputs then send a range of outputs depending on the polyphonic depth, wrapping to 1 at channel 16.

2. Set Max Sequence Length: Option menu allows you to set the sequence length to much longer. This is useful if you want to quantize to 16th notes etc for a longer composition.

3. Stop Record At End: This option allows you to engage **REC**, and when the sequencer reaches the end it will automatically disengage **REC**, allowing you to record a complete loop more easily.