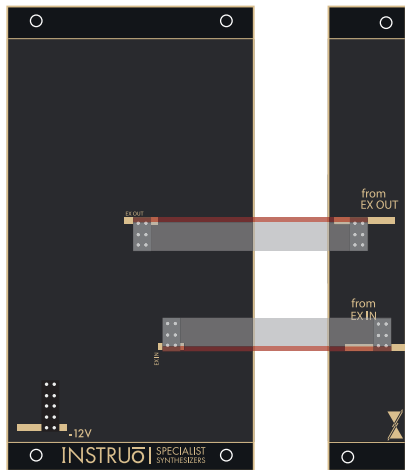# CV Expander ▬

Included with the **cruïnn** is a CV expander, which is connected to the module via two ribbon cables. The expander allows for discrete access to the core sawtooth waveform, as well as the five parallel phase-displaced sawtooth waveform variants.
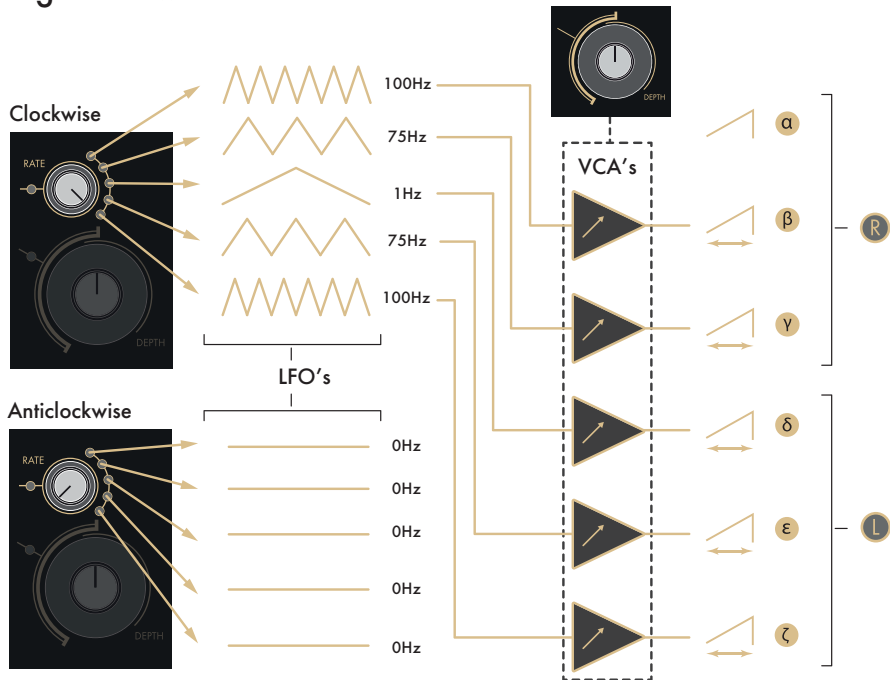

Module

Expander

Note: Negative voltage will displace the phase forward from the core waveform and positive voltage will displace the phase backward in time from core waveform.
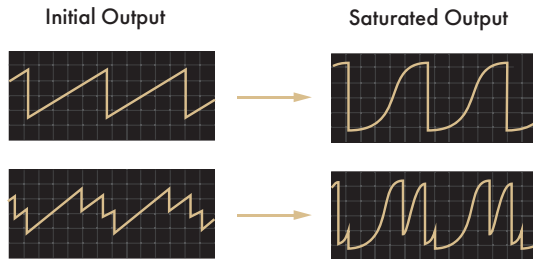

cruïnn
Analogue Stereo Oscillator

Signal Flow

Clockwise

100Hz
75Hz
1Hz
75Hz
100Hz

LFO's

Anticlockwise

0Hz
0Hz
0Hz
0Hz
0Hz

RATE

DEPTH

VCA's

α
β
γ
δ
ε
ζ

R

L

The **Rate** knob controls the rate of the five triangle waveform LFOs used for phase modulation of the five phase-displaced sawtooth variants. The **Depth** knob controls the depth of phase modulation applied to the five phase-displaced sawtooth variants by the five triangle waveform LFOs.

Initial Output

Saturated Output

To eliminate any chance of hard clipping that may occur when parallel sawtooth waves sum with perfect phase alignment, a soft clipping circuit is implemented and limits the amplitude range to ~10Vpp. This essentially turns the built-in VCA into a voltage-controlled saturator that can accentuate a nonlinearity of the sawtooth waveforms.