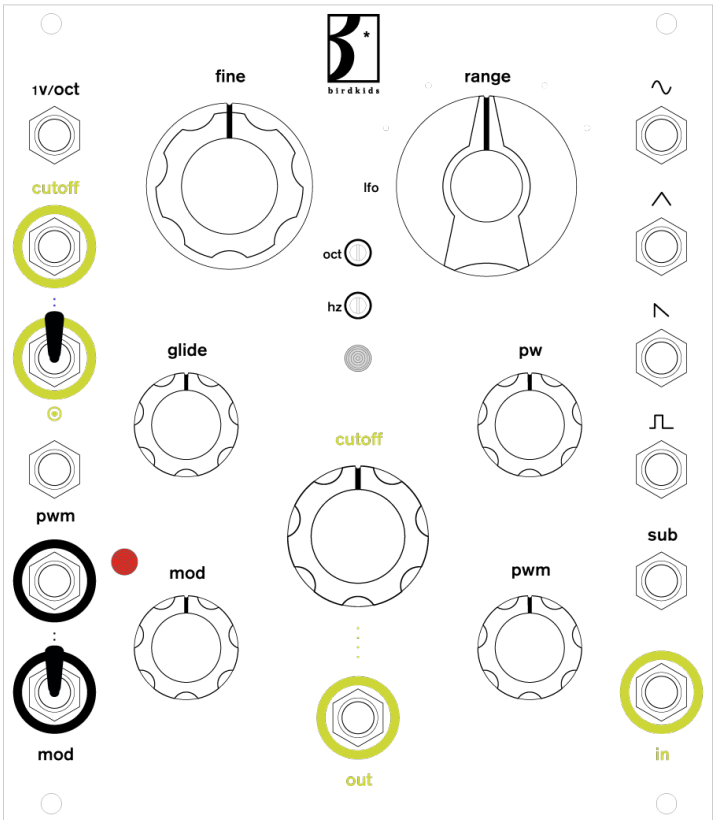
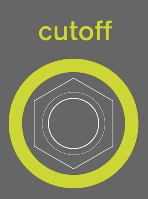
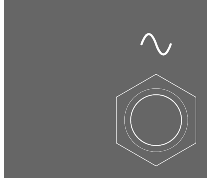
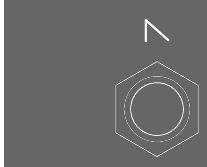
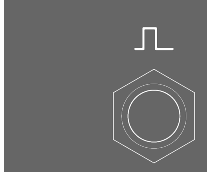
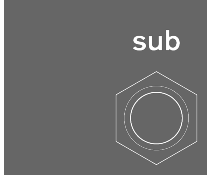
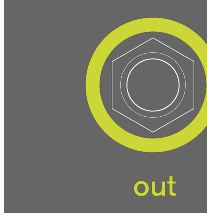
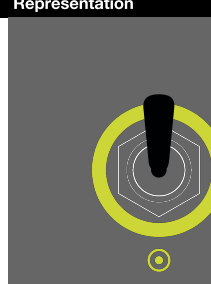
Voltage Controlled Oscillator mkII	
Revision:	4.7b (mkII)
Short Description:	**Voltage Controlled Oscillator** (Discrete Transistor Saw-tooth Core), **Voltage Controlled Filter** (Low Pass, 4-pole), **Voltage Controlled Amplifier** (built-in, accessible via Expander)
Width:	22HP (3U)
Maximum Depth:	40mm
Power Consumption:	120mA @ 12V 100mA @ -12V

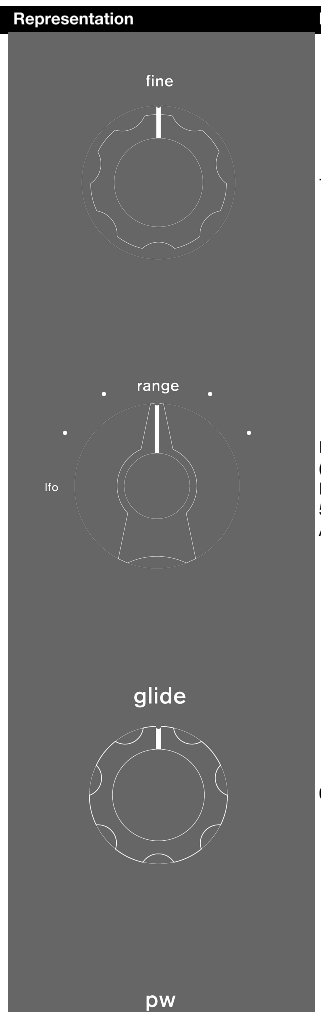
Representation

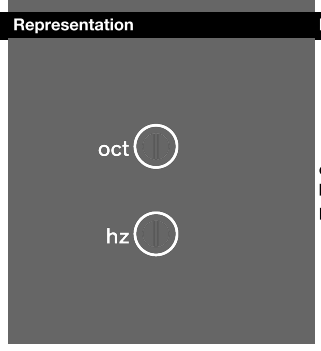


Input	Function	Representation	Range	Characteristic	Short explanation
1v/oct	Oscillator pitch control, CV input.		-2V to +6V	exponential	Quasi-standard for Eurorack Modular. Exponential relationship between voltage and frequency. Increase by 1V = increase by an octave.
cutoff	VCF cutoff modulation, CV input.		-5V to +5V	exponential	Modulate Filter Cutoff-Frequency using Control Voltage.
pwm	Pulse Width Modulation, CV input		-5V to +5V	linear	Modulate Pulse Width of Pulse Waveform using Control Voltage. Use pwm control to set modulation depth.
mod	Oscillator Modulation, CV input.		-5V to +5V	linear fm / Through-Zero fm	Modulate Oscillator using Control Voltage. Use mod control to set modulation depth.
in	VCF input, audio signal.		-5V to +5V	audio input	VCF audio input. Sub Waveform (50% Pulse, octave below base-frequency) normalized to input.

Output	Function	Representation	Range	Characteristic	Short explanation
sine	Sine Waveform output.		-5V to +5V	audio waveform	Sinusoidal Waveform Output.
tri	Triangle Waveform output.		-5V to +5V	audio waveform	Triangle Waveform Output.
saw	Sawtooth Waveform output.		-5V to +5V	audio waveform	Falling Ramp Waveform Output.
pulse	Pulse Waveform output.		-5V to +5V	audio waveform	Variable Pulse-Width Pulse Waveform Output. Use pw control to set initial Pulse-Width.
sub	Sub-Octave Square Waveform output.		-5V to +5V	audio waveform	Square Waveform Output. One octave below base-frequency of VCO.
out	VCF output, audio signal.		-5V to +5V	audio output	VCF audio output.

Toggle	Function	Representation	Range	Characteristic	Short explanation
VCF Mode switch	VCF Mode switch. Three positions.		**Top:** LPF Mode + 1V/oct tracking; **Mid:** Self-Oscillation + 1V/oct tracking; **Bottom:** Self-Oscillation without tracking.	three position switch	Switch between VCF modes. Self-Oscillation yields a Sinewave Waveform operating within the available Qmax-Range (approx. 19Hz-20KHz).
Modulation switch	VCO Modulation switch. Three positions.		**Top:** Sync; **Mid:** Linear FM; **Bottom:** Thru-Zero FM.	three position switch	Switch between VCO Modulation modes. **Sync** = peak detect mechanism, use mod control to control peak level; **Linear FM** uses mod control to attenuate incoming modulator CV; **Thru-Zero FM** has an initial threshhold, use mod control to increase depth from initial threshhold.

Control	Function	Representation	Range	Characteristic	Short explanation
fine	VCO pitch fine-tuning control. +/-7 Semitone range.		7 Semitones +/-	linear	Fine-Tunes the Oscillator's frequency by 7 Semitones up/down.
range	VCO Range Switch. 5 positions.		Base Frequencies @0V input (Factory Reset): | POS0-LFO | POS1-A0-27,5Hz | POS2-A1-55Hz | POS3-A2-110Hz | POS4-A3-220Hz | POS5-A4-440Hz |	five position, mil-spec miniature switch. Uses a potentiometer-shaft adapter for the custom "Chickenhead" Knob, slight freedom of movement due to size-adapter **intended.**	Octave/Mode Switch for the base operational frequency of the Oscillator. Incoming 1v/oct Voltages are summed to the current position. LFO Mode utilizes the fine-tune control to set LFO min-max frequencies.
glide	Glide amount control.		0-100%	linear	Delays transition from previous voltage level to current voltage using a set value (duration) 0 = no delay to 100 = maximum delay. In Musical terms = portamento.
pw	Pulse Width Setting control.		5% to 95% width	linear	Set Pulse Waveform's initial Width within an audible, 5% to 95% width-range.
mod	VCO Modulation depth control		**Sync & Linear FM** = 0-100%; **Through-Zero FM** = min. Threshold level to max. Modulation level.	logarithmic	Set modulation depth / level for the chosen modulation mode. See **Modulation Switch** for more info on modes.
pwm	Pulse Width Modulation depth control		0-100%	logarithmic	Set modulation depth for Pulse Width Modulation based on incoming CV at pwm input.
cutoff	VCF Cutoff frequency control.		0-100%	linear	Set Cutoff Frequency using available range. VCF range = ca. 14Hz to 22KHz

Trimmer	Function	Representation	Range	Characteristic	Short explanation
oct/hz	Set octave-spread and initial base frequency of Oscillator.		**oct** = suggested 12 semitones; **hz** = suggested A3 with @0V at pitch input.	various	Calibration: Set base frequency with range & fine-tune switch in middle position and no external voltage applied to ca. 220Hz = A3 using hz trimmer. Set octave-spread using oct trimmer to taste, suggested 12 semitone distance between octaves.

LED	Function	Representation	Range	Characteristic	Short explanation
VCO Status LED	Status LED for Vco Core. Oscillates in direct relation to Core Frequency.		Core min - Core max	luminosity	In LFO mode the LED's oscillation is visible, audible ranges will not produce any visible variation in luminosity due to high frequency of oscillation.
Modulation Mode LED	Color coded toggling between Modulation modes. Three states.		Sync = Red; Linear FM = LED off; Through-Zero FM = Green.	color	See Modulation Switch for more info on VCO Modulation possibilities.

IMPORTANT!	The module can be powered by any bus-board providing sufficient current on the EURORACK standardized 12V rails using a standard 16PIN Flat-Ribbon connector.
	14PIN Connector for TheBateleur EXPANDER(s) is bundled with the EXPANDER!
	Red stripe = -12v
	Misalignment or misorientation of Flat-Ribbon connector might damage the unit!