SONICSMITH

Audio Controlled
semi-modular
analog synthesizer

ConVertor +
Audio Controlled Synthesizer

Owner's manual

www.sonicsmith.com

Hello and thank you for purchasing a ConVertor+ synthesizer! The ConVertor+ is a semi-modular, audio controlled, analog synthesizer. This means that it's fully equipped to play a small range of sounds using a mono audio signal alone, but has the power to become much more complex with other CV gear. It generates its sound using a patented custom analog chip called the Audio Controlled Oscillator (ACO100). The ACO chip has an analog audio input at line level, and is able to identify the fundamental frequency (pitch) of a monophonic input audio signal. It then plays a square wave and a sawtooth wave simultaneously at the pitch of the input audio (or optionally at one of several discrete harmony intervals offset from the input audio) while generating Control Voltages (CV) representing pitch and gate. The gate's threshold is now variable via the new GATE knob. That means that as long as the audio input is louder than the gate's threshold, the gate will remain "open" (+9V) and let the synthesized sound through to the output. When the input audio drops below the threshold, the gate will be "closed" (0V) and the ACO's output will be silent. The pitch CV output of the ConVertor synth varies between 0V and 8V at 1V per octave like other Eurorack-compatible synths. Whether you choose to use the ConVertor+ as a sound generator and/or as a controller for other synths, you will find that you have everything you need to get started.

The ConVertor+ general input and output map

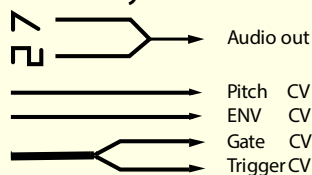**Analog audio in**

Side-Chain in   (optional)

Harmony CV in

Octave CV in

VCA and GATE CV in

Analog synth out

Audio out

Pitch   CV
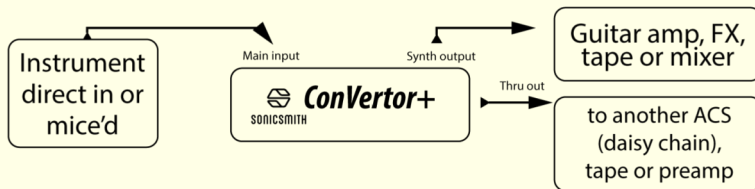ENV   CV
Gate   CV
Trigger CV

Pitch tracking / The ACS*

The ACO chip is powered from 4.5V and its inputs and outputs are scaled to 9V (to achieve 1V/oct pitch CV) inside the ACS (our term for any product containing an ACO). Using the ACO, the ConVertor+ provides the full blood stream of all modular synth essentials: Pitch, ENV, gate and trigger CV's. The ACO can detect frequencies between 25Hz and 6.4kHz and will lock to the fundamental frequency with the aid of the ConVertor+'s auto-tracking low-pass filter. Some recommendations for better pitch tracking include:
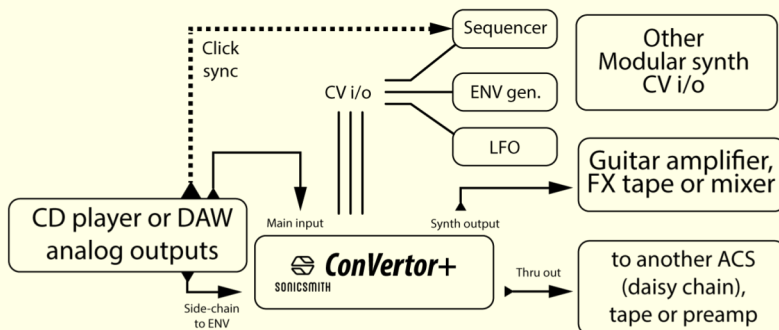
* Playing with the neck pickup, as the bridge pickup generally contains much less bass (more energy in higher harmonics).
* Turn down the treble tone knob, if you have one.
* Picking (or stroking the bow) further away from the bridge towards the middle of the string for more "bassy" sound.
* Try playing as "cleanly" as possible - muting adjacent strings etc. The ACO sometimes does some interesting things with polyphonic input but make sure that is what you are going for!

2 examples of Audio Controlled Synths usage

Example #1:


```
Instrument          Main input        Synth output       Guitar amp, FX,
direct in or                                             tape or mixer
mice'd                 ⊜ ConVertor+        Thru out
                       SONICSMITH                        to another ACS
                                                         (daisy chain),
                                                         tape or preamp
```

Example #2:


```
                              ┌ Sequencer ┐    Other
          Click               │           │    Modular synth
          sync      CV i/o     ┤ ENV gen. │    CV i/o
                              │           │
                              └   LFO    ┘     Guitar amplifier,
                                                FX tape or mixer
CD player or DAW   Main input      Synth output
analog outputs                                  to another ACS
                    ⊜ ConVertor+      Thru out  (daisy chain),
                    SONICSMITH                  tape or preamp
          Side-chain
          to ENV
```
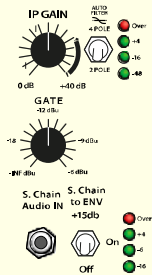
3

* = Audio Controlled Synths

A - The input section

9V DC input – Plug a standard 9V pedal PSU (plus outside) or insert a 9V battery.

(Main) INPUT – Plug a TS instrument jack cable carrying either line, instrument or dynamic mic signal. Be sure to use a proper XLR to mono TS adapter jack. Stereo TRS jacks will not work. If a mono TS plug is not inserted into the INPUT then the unit won't turn on.

THRU – An unbuffered copy of the input for direct recording, amp or daisy chaining multiple ACS.

IP GAIN – Can amplify the input from 0 to 40dB. The impedance looking into the input is 100kOhm. Set this knob while the source audio is playing. Turn up until the "over" LED lights up on the highest peaks.

2 POLE / 4 POLE sw. - The auto-filter which helps frequency detection can be configured as 2-pole in the down position (for faster transient response) or 4-pole in the up position (for more filtering of harmonics).

Input LED meter – A 4 character LED meter to show the input's level. The bottom LED lights up when the ACO's gate is open.

GATE – Controls the gate threshold level. Turn it low if the source doesn't have much noise and you wish to enjoy more dynamic range or sustain. Turn it higher to reject any noisy bursts present in a less clean source.

S. Chain Audio in – Auxiliary audio input for the 2nd ENV follower.

S. Chain to ENV sw. – Bottom = S. Chain off, middle = S. Chain on, top = S. Chain on with +15 dB gain for lower level sources.
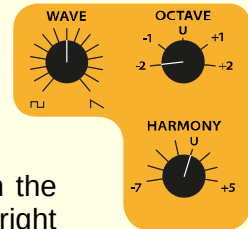
B - The ACO section

PITCH CV out – A 1V/oct pitch CV out. 25Hz=0V, 6.4kHz=8V

ENV CV out – An envelope CV output with a decay factor of 50ms. The ENV CV signal will always be affected by the ENV AMT knob.

L:gate R:trig CV out –
A stereo minijack output which plays gate CV on the left channel and trigger CV (3.5V 15ms) on the right channel.

WAVE – A Mix knob between square wave (fully counter-clockwise) and a saw wave (fully clockwise).

OCTAVE – Can shift the oscillator's sound output from -2 octaves in its minimum position to +2 octaves at its maximum position. The pitch CV out will not be affected by these shifts.

HARMONY – Can shift the semitones by -7 in its minimum position to +5 in its maximum position according to a just intonation scale. Just intonation scales are slightly different than western scales especially in certain notes. See table on page 9 to see an exact comparison between our just intonation scale and the familiar western equal-tempered scale.
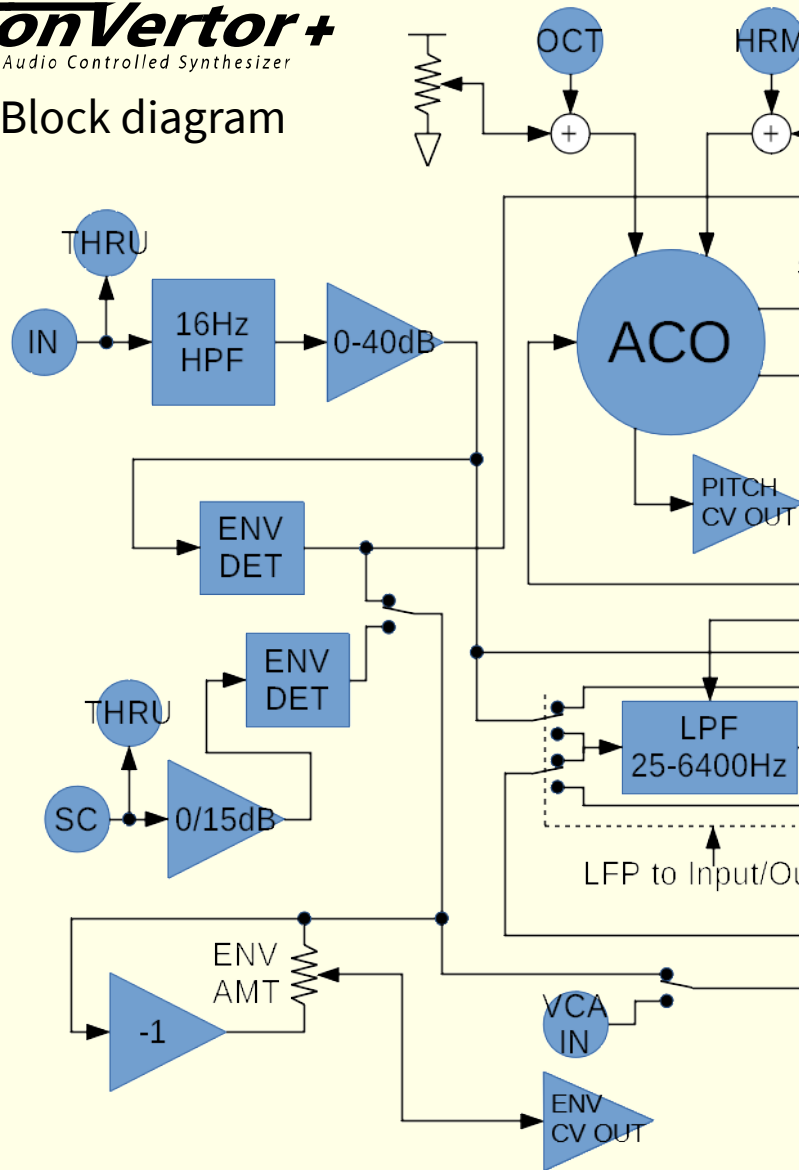
OCTAVE CV in – Patch any CV source here to shift the octave just like the knob does. The CV value will be mixed with the knob's position.
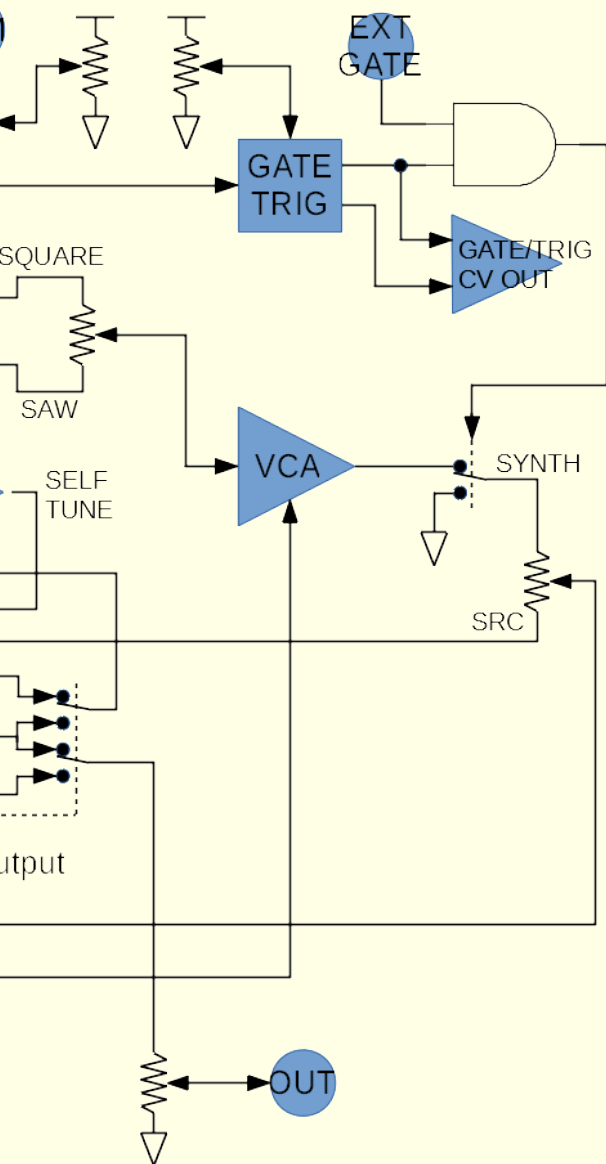
HARM CV in – Patch any CV source here to shift the harmony just like the HARMONY knob does. The CV will be mixed with the knob's position.

SONICSMITH

ConVertor+
Audio Controlled Synthesizer

Block diagram

OCT   HRM

THRU

IN → 16Hz HPF → 0-40dB → ACO

ENV DET

ENV DET

THRU

SC → 0/15dB

PITCH CV OUT

LPF 25-6400Hz

LFP to Input/Ou

ENV AMT

-1

VCA IN

ENV CV OUT

6

EXT
GATE

GATE
TRIG

GATE/TRIG
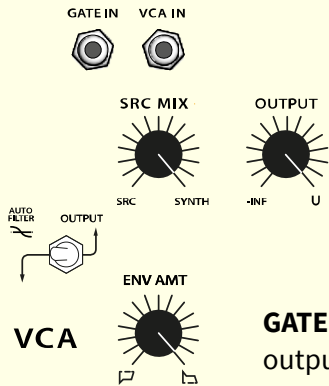CV OUT

SQUARE

SAW

SELF
TUNE

VCA

SYNTH

SRC

Output

OUT

C - The output section

SYNTH – Line level output of the oscillator sound modulated by the VCA. The ENV AMT knob will not affect the VCA unless the default ENV to VCA routing is overridden by patching the ENV OUT to VCA IN with a cable.

S.C THRU – An unbuffered copy of the S. Chain input.

GATE IN – Patch a CV source here to turn the sound output on or off. The V threshold is 3.5V.

VCA IN – Patch a CV source here to control the output audio's volume. Range is 0V – 9V.

SRC MIX – Mixes between the source (post preamp) and the ACO output.

OUTPUT – An output attenuation from fully clockwise being 0dB to counter-clockwise being mute. If you are connecting the synth output into any guitar preamp or effect then set it to around 9:00 – 10:00. If the AUTO-FILTER sw. is turned right (output) then the level will reduce around 8 dBu. In such case the OUTPUT can be around 11:00 – 12:00.

ENV AMT – Fully clockwise will make the ENV CV output a 1:1 copy of the ENV detected, and fully counter clockwise will make it a -1:1 copy. At 12:00 position the ENV will stay 4.5V and it's equivalent to disconnecting the ENV from the VCA completely (also known as a "square envelope"). This ENV AMT knob will not affect the output volume by default. If you want to change or reverse the ENV AMT which controls the internal VCA, connect the ENV CV out to the VCA IN via a minijack cable.

Auto-Filter to: input/output: Chooses to engage the auto-filter circuit to either the input (in order to help with frequency detection) or to the output where it's audible.

D – Troubleshooting

No Sound

1) Make sure you have input signal and the level meter shows it's loud enough.
2) Make sure the output knob is not set too low
3) Make sure the side-chain switch is not engaged, and if it is then make sure you have a healthy signal into the S. Chain input.
4) If you have any CV cables connected to the CV inputs, disconnect them one by one to see if any of them "silenced" the output.

Noisy output

1) Make sure you are not inputting excessive noise by dialing the SRC MIX knob fully counter-clockwise.
2) If you have any CV patch cables connected, disconnect them one by one to see if any of them makes the synth behave badly.
3) Make sure the filter switch in the center of the synth is pointed at the input (left position) so pitch detection is not the issue.
4) Send us a video showing the phenomenon so we can advise on a solution or repair the unit.

Just intonation scale vs. equal tempered

The HARMONY knob shifts the semitone of the ACO square and sawtooth audio outputs on a just intonation scale. Such tuning systems were used in history before the equal-tempered scale was adopted as a de facto standard. On the right column we can see the exact deviation between the two tuning methods in cents. While the octave shifts are exactly the same and the 4th and 5th harmonies (-7 and +5 semitones) are almost exactly the same, other harmonies may deviate farther from modern tuning so be advised. We believe you'll agree that shifting in just intonation results in very pleasing sounds when used as a ring modulation source or carrier.

Table 1: Selected Octave and Harmony Intervals

Octave	Harmony	Just Intonation Interval	JI interval (decimal)	Closest ET Interval (semitones)	Deviation (cents)
U	1 (-7)	2/3	0.6667	-7	-2
U	2	16/21	0.7619	-5	29
U	3	4/5	0.8000	-4	14
U	4	32/35	0.9143	-2	45
U	5 (U)	1/1	1.0000	0	0
U	6 (rising)	8/7	1.1429	2	31
U	6 (falling)	16/15	1.0667	1	12
U	7	32/25	1.2800	4	27
U	8 (+5)	4/3	1.3333	5	-2
+1	1 (-7)	4/3	1.3333	5	-2
+1	2	32/21	1.5238	7	29
+1	3	8/5	1.6000	8	14
+1	4	64/35	1.8286	10	45
+1	5 (U)	2/1	2.0000	12	0
+1	6 (rising)	16/7	2.2857	14	31
+1	6 (falling)	32/15	2.1333	13	12
+1	7	64/25	2.5600	16	27
+1	8 (+5)	8/3	2.6667	17	-2

Other Sonicsmith products

(as updated on our website sonicsmith.com/products

Modulor A1
Analog Modulation synth

- Analog VCO, LFO and dual VCA
- 1V/oct compatible
- LFO range from 0.2Hz up to 200Hz
- Sync inputs on both the VCO and the LFO
- 2nd VCA combines the LFO CV and AMT knob

Squaver P1+
Audio Controlled Synthesizer

- Audio Controlled Synthesizer
- Analog, semi-modular design
- 1V/oct pitch, ENV, gate, trig & expression pedal CV outs.
- 3-voice monophonic synth with PWM, -1 & -2 sub voices, ring-mod, VCA and VCF
- Many "performance enhancing features"
- LP, HP, BP, 2/4-pole VCF section

Experiment hard experiment often

Our products are meant to be experimented with to find their real potential. Please don't hesitate to send us videos of your experiments / performance so we can share them on our social media.

info@sonicsmith.com

www.sonicsmith.com

ConVertor+
Audio Controlled Synthesizer

The ConVertor+ Manual written by:
Noam Lavi & Brian Kaczynski

Sonicsmith B. Kaczynski, N. Lavi S.C.