



SONICSMITH

Semi-modular
audio controlled
analog synthesizer

ConVertor
A udio Controlled Synthesizer

Owner's manual

Hello and thank you for purchasing a ConVector synthesizer!

The ConVector is a semi-modular, audio controlled, analog synthesizer. This means, that it's fully equipped to play a palette of sounds using a mono audio signal alone, while still being able to communicate with modular synths via CV signals. It generates its sound using a proprietary 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. 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 Con-trol Voltages (CV) representing pitch and gate. The gate's threshold is fixed at -48 dBu (post preamp). That means that as long as the audio input is louder than -48dBu the gate will remain "open" (+9V) and let the synthesized sound through to the output. When the input audio drops below -48dBu the gate will be "closed" (0V) and the ACO's output will be silent. The pitch CV output of the ConVector synth varies between 0V and 8V at 1V per octave like other Eurorack compatible synths. The ACO is only one part of this ACS (Audio Controlled Synth) and the following manual will describe the rest of the parts and how they work with each other to create musical sounds.

The ConVector general input and output map



In the ConVector all the audio inputs are accommodated via mono instrument jacks (TS) at the back panel and all the CV inputs and outputs are accommodated via mono mini jacks on the front panel. The only stereo mini jack is the gate/trigger output which shares a stereo mini jack. Plug a mono mini jack to have the gate output, or use a stereo Y cable to split the Gate CV from the L channel and the trigger CV output from the R channel.

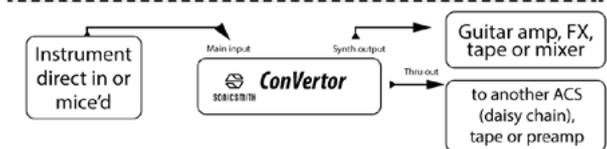
Pitch tracking / The ACS

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. Using the ACO, the ConVector completes the full blood stream of all modular synth essentials: Pitch, ENV, gate and trigger CVs. The ACO can detect frequencies between 25Hz and 6kHz and will lock to the fundamental frequency as long as it's the strongest frequency in the audio. Some recommendations for better pitch tracking include:

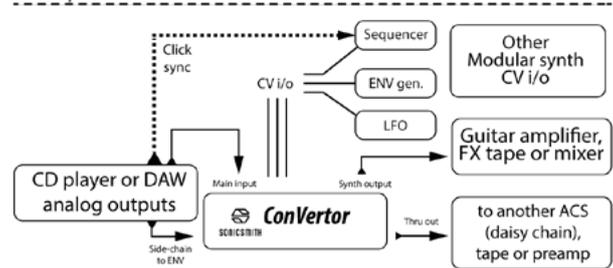
1. Switching to the neck pickup, as the bridge pickup generally contains much more treble (more energy in higher harmonics).
2. Turning down the treble tone knob, if you have one.
3. Picking with your fingers instead of a pick if you can.
4. Playing as "cleanly" as possible - muting adjacent strings etc. The ACO sometimes does some interesting things with polyphonic input but make sure that's what you are going for.

2 examples of Audio Controlled Synths usage

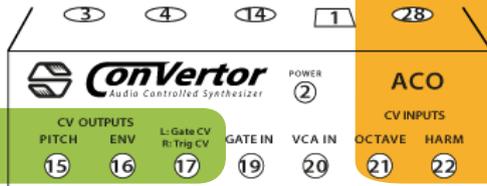
Example #1:



Example #2:



Patching & Routing



WARNING! Risk of permanent hearing damage!

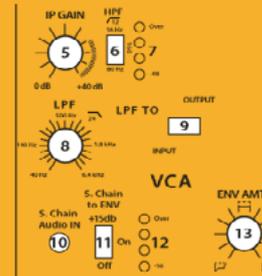
Before the synth is patched to any guitar level device (ie. preamps/amps/effects) turn down the OUTPUT level knob to around 9 o'clock! DO NOT keep your head close to any amp speaker while you or (especially) anyone else is changing the controls of the synth.

- 1) 9V PSU input** - Standard (minus inside) pedal power supply input. Note that the ConVertor will not turn on until a TS jack is inserted into the main input (3)
- 2) POWER LED** - When a power source (9V PSU / battery) is supplied and the main input is plugged in, this red LED indicates that the synth is powered on.
- 3) Main INPUT** - Mono (TS) instrument jack that can accept analog audio from line level (tapes, CD's...), instrument pickup levels (electric guitar and bass) or down to microphone level sources (from dynamic mics). The input impedance looking into this input is 100k ohms.
- 4) Main THRU out** - Unbuffered through connection to the main input.
- 5) PITCH CV out** - 1V/octave 0-8V CV corresponding to the pitch detected by the ACO from the main input.
- 6) ENV CV out** - CV representation of the input's level generated by an envelope follower. The decay time constant of this envelope follower is about 43ms.
- 17) GATE / TRIG CV out** - Stereo output with 9V gate CV out (from ACO) on the left channel and 9V trigger CV out (15ms pulse width) on the right channel.
- 17) Gate CV in** - Secondary gate input (post-VCA). Gate threshold voltage is 3.5v. Use a Y cable to split the gate (L) and the trigger (R).
- 20) VCA CV in** - Secondary VCA input. Plugging a cable into this input bypasses the internal VCA.
- 21) OCTAVE CV in** - Shifts the ACO output frequency by -2 to +2 octaves.
- 22) HARMONY CV in** - CV input to shift ACO output frequency by -7 to +5

semitones in a just intonation scale (see table 1).

The proper voltage range for all CV inputs is 0-9v but they are protected against signals with higher voltages than 9V so such signals won't damage the ConVertor synth.

The input section / ENV



5) InPut GAIN - Use this knob to amplify the main input level. This preamp is transparent and ranges from minimum 0dB (no change) to +40dB.

7) Main input meter - This 4 character LED meter will show you the audio input level. The bottom LED illuminates when the gate (-48dBu) is on, and the top LED will indicate approximately when the input is too loud and may be distorting. Clipping the input should be avoided if possible as it can result in worse frequency tracking and will be audible if you

mix the dry signal into the output via the SRC/Synth mix knob.

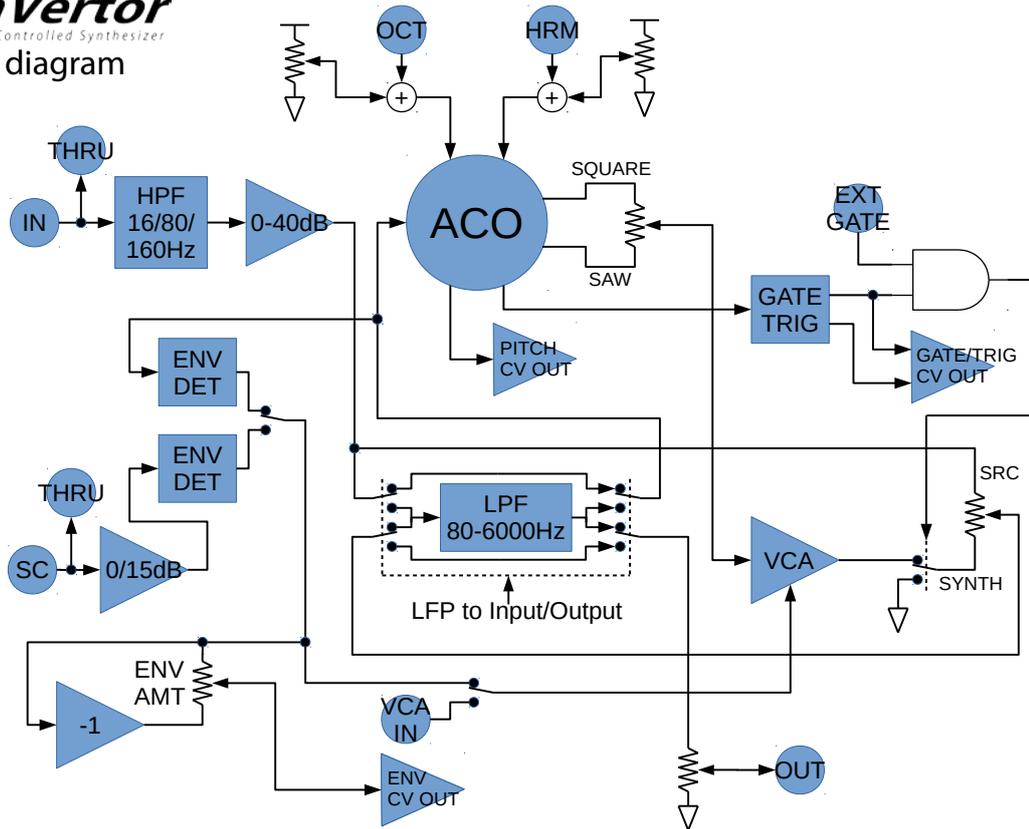
6) Input HPF switch (high pass filter) - A 12dB/oct filter used to cut unwanted low frequencies below the fundamental pitch. For example, if the user plays regular electric guitar, he can benefit from filtering the input at 80Hz (down). The minimum setting is 16Hz (up) and should be used if no filtering is desired.

8) LPF knob - Controls the input filter which can be used to emphasize the lower frequencies and thus help with pitch detection. In general, it should be set to fully counterclockwise unless you don't like its effect. In that case you can bypass it by turning this knob fully clockwise.

9) LPF TO switch - Sets the input filter to either the input where it can help with pitch tracking or to the output where it's audible.

13) ENV amount knob - The envelope (ENV) of an audio signal is the audio's amplitude behavior over time. The ENV CV in the ConVertor synth is generated by an envelope follower (pre filters) and flows to the internal VCA (affecting the synth's volume) by default. The ENV follower detects the level of the audio input and generates CV (control voltage) analogous to the audio's level between 0V and 8V. The ENV AMT knob can change the ENV shape from 1:1 in its full clockwise position, through infinity:1 in the middle position all the way to -1:1 (negative ENV) in the full counterclockwise position, which is the complete opposite of the audio's original envelope (ie. instead of the ENV of a picked string decay down gradually, it will rise up

ConVektor
Audio Controlled Synthesizer
Block diagram



gradually). Note that this control doesn't affect the ENV which VCA is fed internally. The VCA is always driven by the natural input signal envelope.

11) Side chain switch - While pitch detection will always be controlled by the main input, the ConVektor has an additional ENV follower on the side chain-audio input (#). The idea is to provide an optional alternative envelope source with its own ENV follower with the decay time constant of about 9ms for fast response. At its bottom position, the S. C. ENV won't have any effect. In the middle position, the S. C. ENV will be engaged at unity gain and its top position the input will be amplified +15 dBu to help adjust the audio level of weaker sources. Using the ENV AMT knob but you cannot increase the maximum ENV value detected by the ENV follower. So make sure you set the input level high enough.

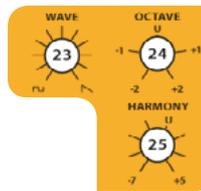
The oscillator section

The oscillator of the ConVektor synthesizer is the ACO 100 chip. Unlike other analog oscillators, it locks to an audio's frequency without needing to be tuned.

23) WAVE mix knob - This control is used to mix between the ACO's 2 audio outputs: the square wave and the sawtooth wave. You can smoothly mix between them to create any combination of the two sounds. A square wave has only odd harmonics and sounds "hollow" while the sawtooth wave has both even and odd harmonics and thus sounds "sharper".

24) OCTAVE knob - Use this control to shift the oscillator's octave from -2 to +2. The 12 o'clock position (indicated with U) will keep the oscillator playing in unison with the audio input. This OCTAVE control can be simultaneously controlled from the "octave" CV input (#).

25) HARMONY knob - Use this control to shift the oscillator's pitch from -7 to +5 semitones on a just intonation scale. This scale does not adhere to the familiar western equal-tempered scale and should be experimented with to find your favorite settings. The table below shows a comparison between the western scale and the ACO's just intonation scale. This HARMONY control can be simultaneously controlled from the "harmony" CV input (#).



The output section

SRM MIX knob - Mixes between the source coming from the main input (counter clockwise) and the synth sound.

OUTPUT knob - Attenuates the main output from its line level output all the way down to mute (counter clockwise). If you connect the main output to any guitar oriented gear like preamps, amps or effects pedals, make sure to set this knob to around 9 o'clock.

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, make sure you have a healthy signal into the S. Chain input.
- 4) Make sure the filter is not set too low

Noisy output

- 1) Disconnect the main input. If the noise stops, try using a new cable or troubleshoot the source instrument.
- 2) Make sure the LPF TO switch (#9) is set to the left (input) and set the input filter (#8) to fully counter clockwise.
- 3) Turn the OUTPUT knob all the way counterclockwise. If you still hear the noise, continue troubleshooting at the destination of the output/cable.

Outro

This audio controlled synth is a brand new technology and should be experimented with.

Feel free to send us content you may create to our email: info@sonicsmith.com, so we can show the world (through our social media channels) what one can do with it.

We hope you have fun with your ConVektor and let us know your feedback!