



SONICSMITH

Semi-modular
audio controlled
analog synthesizer

Squaver P 1
Audio Controlled Synthesizer

Owner's manual

21.7.2017 - SonicSmith

Hello and thank you for purchasing a Squaver P1 synthesizer!

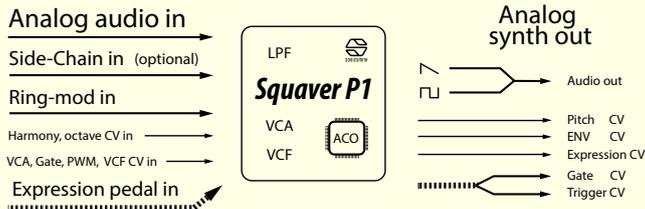
The Squaver P1 is a semi-modular, audio controlled, analog synthesizer. This means that it's fully equipped to play a palate of sounds using a mono audio signal alone, while still being able to communicate with modular synths via CV signals. It generates its sound using a proprietary, custom analog chip 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 Control 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 -48 dBu the gate will remain "open" (+9V) and let the synthesized sound through to the output. When the input audio drops below -48 dBu the gate will be "closed" (0V) and the ACO's output will be silent. The pitch CV output of the Squaver P1 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.

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 Squaver P1 completes the full blood stream of all modular synth essentials: Pitch, ENV, gate and trigger CV's. 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. Trying picking with your fingers instead of a pick for less transients.
4. Trying to play 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. :)

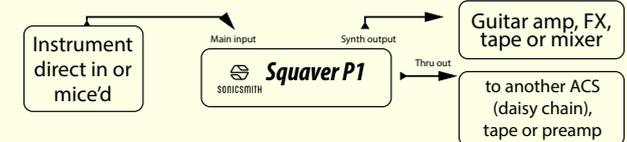
The Squaver P1 general input and output map



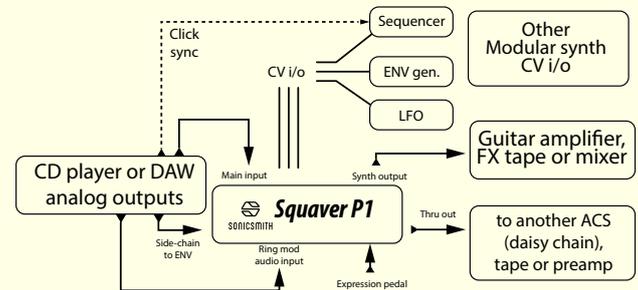
Most of the Squaver P1's audio inputs are accommodated via mono instrument jacks (TS) at the back panel, and all the CV inputs and output are accommodated via mono minijacks on the front panel. The only stereo CV is the gate / trigger output, which share a stereo minijack. Plug a mono minijack to have 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.

2 examples of Audio Controlled Synths usage

Example #1:



Example #2:



20) VCF IN - CV input to control the filter's cutoff frequency. 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 Squaver P1 synth.

The input section / ENV

- 21) Input Gain** - Use this knob to trim the amplification of the input preamp from minimum 0dB (no change) to +40dB.
- 22) Input HPF (high pass filter)** - This filter is used to cut unwanted low frequencies below the fundamental pitch. For example if you input a regular electric guitar or voice, you can benefit from filtering the input at 80Hz. The minimum setting is 16Hz and should be used if no filtering is desired.
- 23) 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.
- 24) THRU switch** - Bottom pos.=the main thru will copy the same exact input signal, and the top pos.=the main thru will be post preamp and filters.
- 25) LPF knob** - Controls the input filter range's minimum frequency. The input filter has changed from being an LPF to being an auto-adjusting filter but the text on the box remained "LPF" for this version. Set this knob to minimum to enjoy the full range of the tracking filter, or maximum to "bypass" it.
- 26) ENV amount knob** - The envelope (ENV) of an audio signal is the audio's amplitude behavior over time (for example the volume of a picked string decays down slowly). The ENV in the Squaver P1 synth is generated by an envelope follower at the input stage. 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. This knob can change the ENV shape from 1:1 in its full clockwise position, thru infinity:1 in the middle position all the way to -1:1 (negative ENV) in the full counter-clockwise 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 gradually). Note that this control doesn't effect the ENV which the VCA if fed internally, but will effect the CV ENV output (11).
- 27) Side Chain ON footswitch** - Press it to engage the 2nd ENV follower.
- 28) Side chain +15** - Use this switch to amplify the side-chain input by 15dB.

29) Side chain level meter - This 4 Character LED meter reflects the side chain's audio input level. Remember you can always scale the ENV down (or backwards) 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 to give you the best dynamic range.

30) Expression Destination switch - Determines where the expression 1 pedal input will control: Harmony, Octave, VCF cutoff or nothing (bottom pos.).

The oscillator section

31) 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".

32) PWM knob - Affects the amount of Pulse Width Modulation of the square wave. This knob position is mixed along with the PWM CV input so they affect each other.

33) SUBS knob - Mixes between the -1 octave sub voice and a -2 octave sub voice. Both are square waves and will only be audible if the SUB MIX (34) knob is not in the fully clockwise position.

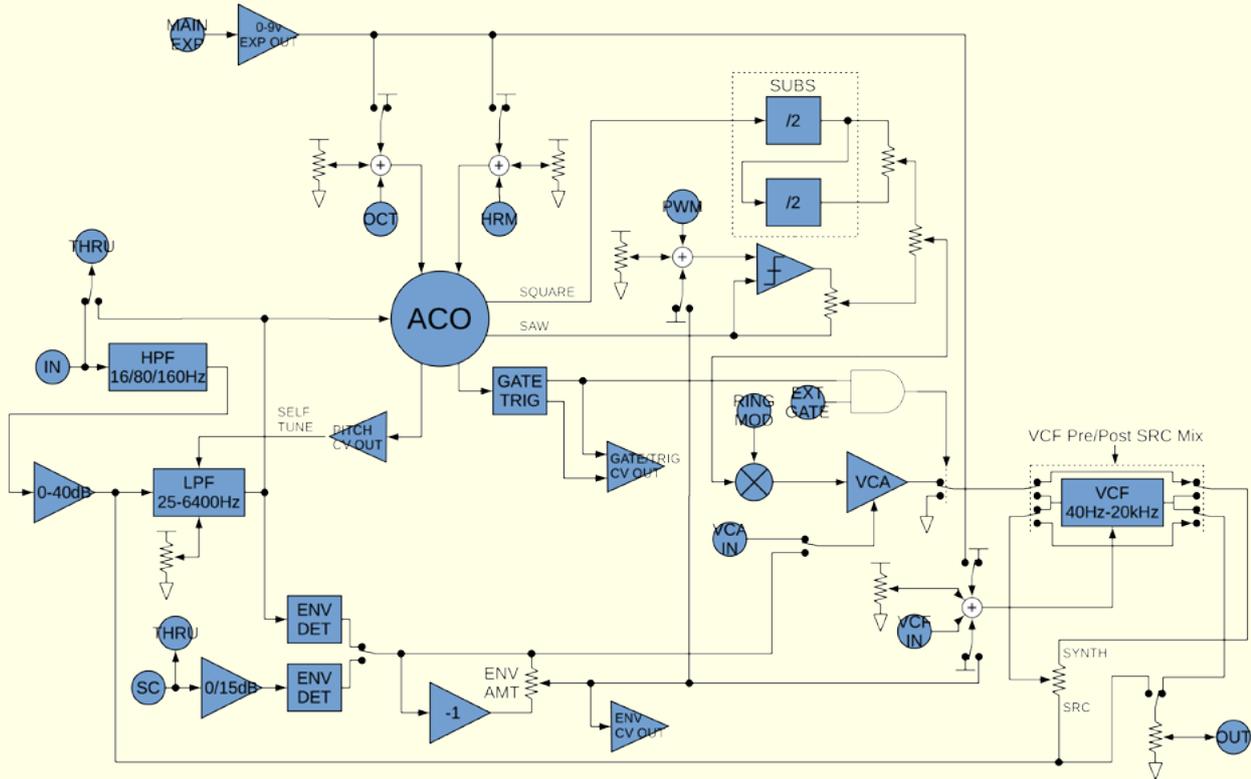
34) SUB MIX knob - Mixes between the ACO signals and the subs signals.

35) OCTAVE knob - Use this control to shift the oscillator's octave from -2 to +2 octave. 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 (14).

36) 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. Table 1 shows you 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 (15).

37) ACO CV in ON footswitch - When this footswitch is pressed and its LED is on, it means the Harmony and Octave CV inputs (35, 36) will start effecting and shifting the ACO's pitch. When the switch is pressed again and the LED is off, those CV inputs will have no effect.

Block diagram



The Filter section

- 38) **CUTOFF knob** - Simultaneously controls the cutoff frequency.
- 39) **RESONANCE knob** - Controls the filter's Q factor. Use with caution.
- 40) **Filter's shape switch** - Switches between 3 possible filter shapes. Bottom pos. is a low pass, middle pos. is a band pass and top pos. is a high pass shape.
- 41) **Filter BYP/12/24 switch** - Bottom pos.=hard bypass, middle pos.=12 dB/oct (2 pole) and top pos.=24dB/oct (4 pole).
- 42) **ENV to VCF switch** - Top position will apply the currently selected ENV to the filter cutoff frequency. It will blend with the knob position and the CV input.

The output section

- 43) **ENV to VCA switch** - Top pos.=ENV will effect the VCA
- 44) **ENV to PWM switch** - Top pos.=ENV will effect the PWM
- 45) **SRC MIX knob** - The source mix knob blends between the original audio input source and the synth output audio. Fully clockwise will let only the synth sound out, and fully counterclockwise would let only the audio source input to the output like a "bypass". Turning the mix knob fully to the left is a good debugging strategy if for some reason the synth output is unexpectedly quiet.
- 46) **OUTPUT knob** - This output attenuator can lower the output level from line level down to mute. Fully clockwise it will pass the unattenuated synth output at +4dBu. You should dial it around 9 o'clock setting when you want to patch the Squaver P1's synth output to any guitar input devices like preamps, amps or guitar effects.
- 47) **SRC MIXED switch** - Bottom pos. will have the source mix (27) post VCF and the top pos. will have the source as it is going in the input (unfiltered).
- 48) **GATE in LED** - This LED will light up when the GATE CV input is patched and is below the input (off) to indicate the output is silent.
- 49) **BYPASS footswitch** - Press it to let the input sound straight to the output. (post preamp and filters)

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) Make sure the filter is not set too low
- 5) Make sure the GATE LED is not on. If it is, disconnect this CV input.
- 6) Make sure the frequency is not set too low (below the audible frequency).
- 7) Make sure there are no other CV inputs patched that are setting the control to silence.

Noisy output

- 1) Disconnect the main input. Does the noise continue? If not, then continue troubleshooting the source you are using including the cable used.
- 2) Make sure the LPF knob is set to minimum for the best pitch tracking.
- 3) Make sure the ENV to VCA switch (43) is up unless you really want a "square" envelope response.
- 4) Turn the SRC MIX knob all the way left (counter-clockwise). Do you hear noise? perhaps you are inputting noise. Try a different sound source.
- 5) Turn the OUTPUT knob all the way down (counterclockwise). Do you still hear noise? continue trouble shooting at the destination of the output / cable.

Outro

This audio controlled synth is of 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 Squaver P1 and let us know your feedback!