E950 Circuit Bent VCO

www.synthtech.com/euro/e950

What is the E950?

The E950 Circuit Bent VCO is the latest unique VCO module from Synthesis Technology. Using licensed technology from the original Texas Instruments LPC speech synthesizers, the E950 contains original voice ROMs and algorithms from 2 generations of speech DSPs. Additionally, 2 banks of 16 wavetables each from the E350 Morphing Terrarium are included for a low-cost morphing VCO.

The E950 can speak in both 'normal' and 'circuit bent' modes, all under voltage control. Unlike traditional 'circuit bent' toys and keyboards, the E950 is very repeatable and controllable.

Connecting to the power supply

The E950 uses a standard 16-pin Euro power cable. The -12V is the Red Stripe (Pin 1), and this is indicated on the pc board. Reverse-supply diodes will prevent the module from damage if the cable is reversed.

VCO Mode (VCO A and VCO B banks)

The E950 VCO mode is a Z-Morph (smoothly blends between 2 adjacent wavetables) oscillator for the audio range (no LFO mode). The **EFFECT** panel control sets the initial wavetable position, and any added control voltage into the **EFFECT CV** jack (attenuated by the **EFFECT MOD** control) is added to give the resultant **AUDIO** output. The **DIGITAL** output jack has pitched white noise, found on older video games.

PITCH will be the 'coarse' frequency, and **FINE/INDEX** controls the fine tuning. **1V/OCT** is the (trimmable) 1 volt/octave tracking control voltage input, which is added to the **FM/INDEX** CV jack if any is applied. The FM signal can be at audio rates, and is attenuated by the panel control **FM/INDEX MOD**.

The VCO can be forced into hard reset by applying a signal to the **SYNC** jack. When the voltage exceeds 0.25V, the VCO waveform is reset.

VCO A:Tri/Saw/Pulse/Square/Tri+Sine/Tri+Square/Saw+Square/FWR Sine/Sine/2^{nd} - 8^{th} harmonics
VCO B: Male and female vocal formants and vowels

Speech Mode (Speech banks 1-9)

Unlike a free-running VCO that has an output signal all the time, the Speech Mode of the E950 requires a signal to begin speaking. This is the function of the **SYNC** input. A voltage exceeding 0.25V will begin speaking the selected word/phrase. The E950 has 9 banks of words/phrases, with 60 per bank. To select which of the 60 is spoken, you first set the **FINE/INDEX** panel control. Then, this setting is modulated by applying a CV to the **FM/INDEX** jack, which is attenuated by the **FM/INDEX MOD** control. For example, if you have a MIDI/CV converter or a sequencer, use the CV out into the **FM/INDEX** jack, and the Gate output into the **SYNC** jack. Then, each time a 'note' is played, the Gate will cause the speech to begin, and the particular word spoken set by the combination of the **FINE/INDEX** panel control and the note being played. You can 'stutter' a word by triggering **SYNC** before the word has finished speaking.

The scaling of the Index controls is such there are 6 words/volt in each bank. See the website link for a complete word list by bank/index. Setting **INDEX** to maximum will speak the entire Bank in order.

The **PITCH** control and any CV applied to the **1V/OCT** jack will raise/lower the speaking pitch. The upper limit of speaking pitch is set to ~2400Hz (which is like a chipmunk anyway). The lower limit is about 40Hz, so the speech can be slowed down to be almost "VCO-like" in timbre.

The **DIGITAL** output in speech mode is a Gate (0 to +5V) which is high when the E950 is speaking. It is low when silent. This can then be use to trigger EGs or to clock other modules.

Circuit Bent vs Normal Speech

The **EFFECT** control (and applied CV) controls 2 parameters when in Speech mode. On the most CCW position, there are the letters 'SP' which stand for 'Speed of Playback'. Normal speech is approximately the 10:00 position. Less than this and the speech is slower, and above this the speech is faster. The control is scaled to have more range over the 'slowness', because this is more musically useful. Any CV applied to the **EFFECT** jack is added to the control.

At the 12:00 position, things begin to get interesting. The far CW position is labeled 'BD' which is short for 'Circuit Bending'. From the 12:00 position to the 5:00 position, this will purposefully make the LPC word be read out in the incorrect order, from fastest to slowest rate. This will produce different effects depending on the Bank number and the **INDEX** in that bank. In some cases, all that will be generated is a 'pop' or 'buzz', while in the very next word an entirely different sound is heard. In a few cases, the 'bent' word is very close to the 'normal' word.

In circuit bent toys, this behavior is unpredictable and in many cases will cause the speech chip to "lock up". This is why having a hardware reset button is needed on them. However, the E950 is 100% predictable: the controls and applied CV's will always generate the same "noise", based on the overall **EFFECT**. Not every word in a bank will have a "useable" output when in Bending mode. This is part of the fun, searching for that elusive bent tone that you can then alter the pitch, play it on a keyboard, and speed it up/slow it down all in real-time without the fear of crashing or lockup.

General Info

CV Inputs: -5V to +5V, DC to 8KHz.
Audio: 7.5V pk-pk, 12bits, 96KHz sample rate with 3-pole linear-phase LPF at 18KHz cutoff
Power supply range: +-9V to +-15V
Power supply current (typical): -12V @10ma +12V @ 48ma

1V/OCT trimmer:
There is a trimmer to adjust the VCO scaling (and the Speech scaling as best we could get it) to 1V/Oct. It is factory trimmed on our test setup. Adjust if needed.
3-pin Looping Expansion connector:
This will connect to the E951 Looping Expansion module via cable.