

The **Soundhack Echophon** is a digital Echo, Delay, and Pitch-shifting device programmed by Tom Erbe & produced by Make Noise.

**SIGNAL IN & ATTENUATOR:** Audio input for the Echophon. AC coupled. Accommodates modular synth signals of 10Vpp for the first 70% of its rotation. Beyond 70%, there will be clipping followed by digital overloading.

**Feedback IN:** AC coupled return for the external Feedback loop. Expects standard signal level of 10Vpp.

**PITCH ROTARY & LEDS:** Bipolar panel control. Turn CCW for pitch shifting down. Turn CW for pitch shifting up. At 12 noon, there is no pitch shifting. The range is always dependent on the Depth setting. The associated **Pitch LEDS** display the pitch shifting mechanics and whether the pitch is travelling downward or upward.

This rotary controls alter the perceived pitch of the sound. It has an associated bi-polar attenuator, allowing you to add or subtract the control signal patched from the setting of the Pitch rotary and Pitch 2 CV In. Pitch 1 CV In is perfect for patching an LFO for Vibrato effects. By adjusting the Pitch 1 Attenuator, the depth of the Vibrato is programmable. Pitch 2 is well suited for patching a sequencer CV or Keyboard CV. Since most analog sequencers generate unipolar CV in the range of 0V to 5V, you will need to set the Pitch rotary fully CCW in order to control the entire range of pitch.

**DEPTH ROTARY:** Unipolar rotary that sets the index of the pitch shift, ranging from sub-microtonal chorusing to 4 octaves harmonizing.

The Depth rotary acts to set the index or range of the pitch shifting. It could be thought of as a Digital VCA for the CV patched to Pitch 1 & Pitch 2, as well as the Pitch rotary. Fully CCW there is no pitch shifting. Up to around 12 noon, the pitch shifting is subtle, introducing chorusing effects. Increasing the Depth CW creates increasingly deeper pitch shifting, until fully CW the full 4-octave range of harmonizing is possible. Depth is best modulated with linear functions, such as an envelope generated by Maths into the Depth CV In.

**DEPTH CV IN & ATTENUATOR:** Unipolar control signal input. Range: 0V to +5V. The associated **Depth CV Attenuator** sets the level for the incoming CV.

**MIX CV IN & ATTENUATOR:** Unipolar CV input. Range 0V to +5V. The **Mix Attenuator** blends between the Dry (un-processed) & Wet (processed) Signal. With nothing patched to Mix CV In, works as standard panel control. With a signal patched to Mix CV In, it works as an attenuator for that signal. Set to 12 o'clock for a typical patch.

**MIX OUT:** Patch the Audio signal output here. 10Vpp (depending upon level setting and source material). AC coupled.

**FEEDBACK OUT:** AC coupled, 10Vpp send for external FB loop.

**CLOCK OUT & LED:** Outputs the echo time as 4ms wide clock pulse. Range: 0V to 5Vpp. The associated **Clock LED** pulses to the tempo of the echo clock.

**ECHO TIME ROTARY:** Sets the time/length of the echo. Range: 7ms (fully CCW) to 1,700ms (1.7sec) fully CW.

**Echo CV IN & ATTENUATOR:** Patch into Echo CV In, and adjust the associated unipolar attenuator to modulate the Echo Time. Just about any source will work wonderfully, as this parameter has a smooth exponential response tailored for great modulations. The associated **Echo Attenuator** sets the unipolar level for the incoming CV.

**TEMPO GATE IN:** Allows synchronization of echoes to a multiple or division of an external clock. While following external tempo, the Echo Time rotary Multiplies (CCW) or divides (CW) the incoming clock. Requires a clock/gate signal amplitude of at least 1.5V and width of at least 6ms.



**PITCH 1 CV IN & ATTENUATOR:** Bipolar CV input. Range: +/-4V. The associated **Pitch 1 CV Attenuator** sets the bipolar level for the incoming CV.

**PITCH 2 CV IN:** Bipolar CV input. Range: +/- 2V; total 4-octaves. Set the **Pitch rotary** fully CCW for unipolar control, such as an analog sequencer, or set to 12 noon for a bipolar signal, such as a CV Keyboard.

**FEEDBACK ROTARY:** Bipolar rotary determining the amount & direction of Feedback. Turning CCW sends more feedback to the Pitch Shifting loop. Turning CW sends more feedback to the Echo loop. At 12 noon, there is no feedback.

**FEEDBACK CV IN & ATTENUATOR:** Bipolar CV input. Range: +/-8V. The associated **Feedback Attenuator** sets the bipolar level for the incoming CV.

**FREEZE GATE IN, FREEZE BUTTON & LED:** Pushing the **Freeze Button** or sending a gate high signal (1.5V) to the **Freeze Gate In** causes Echophon to close the echo chamber and hold the sound inside. The **Freeze LED** lights to indicate this state. The Freeze Button is a latching toggle. Press once to enable. Press again to turn off. While frozen, the Pitch controls can be used, but Feedback controls do nothing. The Echo Time controls change the sound destructively. Note: the Freeze Button is top priority, meaning the Freeze Gate In has no effect when the Freeze Button enabled.

## Echophon Tips & Tricks

- **Feedback:** Loop 1 goes around the Pitch Shifter, and so each regeneration will be pitch shifting again, resulting in spiraling echoes that rise out of audibility or fall into sub sonic obscurity. Loop 2 will create traditional echo repeats. Patch a VCA or attenuator in front of the Feedback In. Or use Feedback In for a secret sound that will occur only as an echo repeat. Use Feedback Out to skip the Pitch Shifting machine. Conversely, to achieve pitch-shifting, Depth must be set to greater than 10%. Modulate Depth to create Harmonic sequences. Feedback will affect the harmonics being emphasized.
- **External Feedback Loop:** Patch the Feedback Out to an external module such as the modDemix. Set up the external module to process the Feedback Out signal. For the modDemix you could set up the typical Ring Modulation patch where you have a sine or triangle waveform from a VCO patched to the Carrier input on the modDemix. The Feedback Out signal would be patched to the Signal In on the modDemix. Take modDemix Signal Out and patch to the final stage in the external feedback loop, the VCA. The Optomix works nicely as the nal VCA stage in an external feedback loop patch. Patch the Signal OUT from the modDemix to the Signal IN on the Optomix. Take the Signal Out from the Optomix to the Feedback In on the Echophon. Set the Optomix Control level to determine the amount of regenerations. Other modules could be placed in the loop to create more complex sounds, but it is important to have a VCA (or manual attenuator) at the end of the loop for gain control. Without this nal gain control stage, the external feedback loop might be hard to tame and utilize in a musical way.
- **Echophon as Clock Multiplier / Divider:** If you patch an external clock signal to the Tempo In, the Echophon follow that clock's tempo, and the Echo Time controls act to set a Divisor or Multiplier of that master tempo. The slowest clock (input or output) is limited to the delay time, so to get 12/1 out, you need a fairly fast clock in (1.7s/12 or 15s).
- **Sequencing Pitch & Comb Filtering:** To sequence the full range of Pitch, set the Pitch rotary to full CCW, and patch a sequencer CV to Pitch 2. When the delay time is below 20 milliseconds, the delay is acting like a comb filter.
- **Dry Mix Bleed:** Because the Mix control uses a vactrol, it is prone to bleeding. As a result, the Mix signal may not go fully dry. You may be able to achieve something closer to a fully dry signal by opening the Mix Attenuator fully CW, and patching a negative DC offset to the Mix CV In.