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# Halo Chorus

Stereo chorus / vibe guitar effect pedal

User Manual  
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## INTRODUCTION

Thanks for purchasing a Diamond Halo analog stereo chorus with parallel phase modulation. This unique combination of chorus pitch and phase modulation using a smooth sine wave low frequency oscillator, coupled with auto routing for mono to mono, mono to stereo and stereo to stereo operation, gives an incredibly versatile analog modulation tool for everything from subtle spatialization to deep pitch and amplitude modulated swirl effects.

*Remember to protect your hearing and wear appropriate hearing protection when playing loud...*

## DESIGN BACKGROUND

Originally, we envisaged the Halo Chorus as a dual delay path chorus device, one in which separately modulated bucket brigade devices would be assigned to left and right channels in stereo, and combined together for a multi-voice mono chorus configurations. The plan was that the slightly different delays in each channel along with some LFO tricks, would give a wide stereo image, and a thicker chorus effect in mono. After the first couple of prototype boards, it became clear that adding the second voice wasn't going to be enough of a benefit to stand out from existing phase-reversed single voice stereo choruses, and certainly not enough to warrant the additional infrastructure required for the second bucket brigade voice. Back to the drawing board we went...

We looked again at what could be done psychoacoustically to generate a wide stereo image without necessarily inverting the phase of the second output channel (although this is also included and switchable on the Halo). Although there was never any intention to build a rotating speaker simulator, we looked at their basic physics and decided that the inclusion of some mild phase modulation (and its resulting amplitude modulation) might integrate very well with the pitch modulation of the chorus effect. So, we decided to build a simple photocell based two stage phase modulation circuit, and assign this to its own parallel channel in place of the second chorus circuit. When we got the first proto Halo board with the phase modulator soldered and into a box, we hooked it up immediately in stereo to see what the effect would be...and after a couple of minutes of playing, we were certainly glad the two chorus path design didn't work out.

## QUICK SETUP

Although we strongly recommend reading the entire user manual before getting started, here's a few tips for quick setup:

1. Input and output channels aren't labeled 'left' and 'right', just single '<' and double '<<' directional arrows (indicating channels one and two).
2. For mono operation, plug into the '<' input and outputs (they're also marked 'mono').

3. For mono input, stereo output operation, plug into the '<' input and both '<' and '<<' outputs.
4. For full stereo operation, plug into both '<' and '<<' inputs and outputs.
5. Adjust controls to suit. '**SPEED**' affects the LFO speed for both chorus modulation and phase modulation effects. '**CH DEPTH**' controls the amount of pitch detuning of the delayed chorus signal, while '**CH MIX**' controls the amount of delayed chorus signal added in with the direct signal. '**PM MIX**' controls the amount of phase modulated signal added in with the direct signal.
6. The '<' and '<<' markings next to the control names indicate which channel is affected by that control when operating in the stereo modes – in stereo, the '<' channel carries the chorus signal, and the '<<' channel carries the phase modulated signal. In mono only operation, all controls (with the exception of 180 deg phase inversion) affect the '<' mono channel as both chorus and phase effects are mixed together into the '<' channel output. The 180 deg phase inversion feature is inoperative during mono operation.

If you've got two amps that you can hook it up in stereo, we highly recommend it. You'll be hooked on stereo!

## FEATURES

- parallel combination of delay / pitch modulation and phase modulation gives versatile control over modulation effects from light chorusing to deep 'vibey' swirl
- stereo operation gives wide stereo image spread while preserving the original guitar tone
- NOS MN3007 analog bucket brigade chip running at 15V rails for extended headroom
- dual opto 'vibe' phase modulation path also running at 15V rails
- all analog circuitry
- auto-configures for mono, mono in / stereo out, and stereo in / stereo out operation
- pure sinusoidal LFO using a dedicated function generator IC for smooth modulation with variable 'SPEED' and chorus pitch modulation depth 'CH DEPTH'
- 'CH MIX' and 'PM MIX' controls allows independent control of chorus and phase modulation mix levels in both mono and stereo configurations
- kill-dry switch for parallel FX loop operation or use of chorus path for pure vibrato
- mono input signal passed through to both outputs on bypass
- phase switch to invert phase of right channel output relative to left
- LED indication of LFO speed, visible while in bypass
- expression pedal control of LFO speed
- same Vishay JFET / audiophile Burr Brown opamp signal path as in Memory Lane delay
- telecom grade relay switched true bypass operation on all inputs and outputs
- internally regulated to 15V, can be run from provided 24V adapter or from 18V pedal board power supply outputs (including Y-cable powering from two 9V outputs on the Voodoo Labs Pedal Power 2 Plus)
- genuine Hammond cast aluminum 4.7 x 4.7 x 1.0 inch case

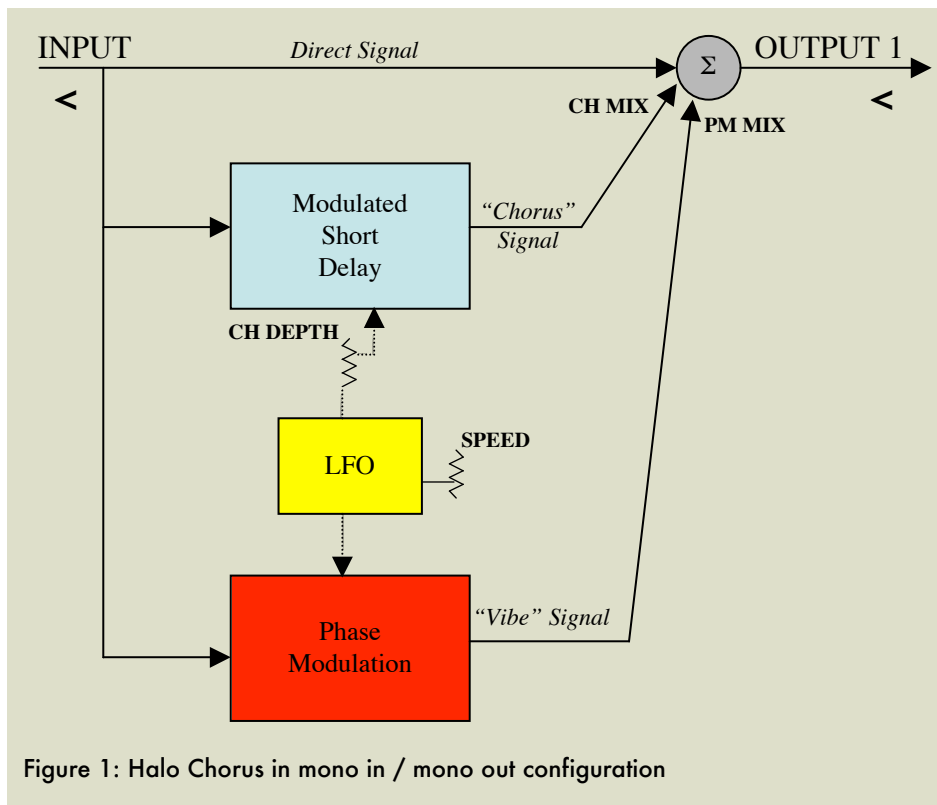
## CONFIGURATIONS AND CONTROLS

The Halo Chorus can be set up in three basic configurations depending on your input and output requirements - mono, mono in / stereo out, and stereo in / stereo out.

**IMPORTANT - Stereo amp configurations and grounding:** Use caution whenever connecting the Halo Chorus to multiple amplifiers. Ensure both amps are safely grounded and share the same ground. If in doubt, ask a qualified technician - ground faults can result in severe injury and death.

### MONO

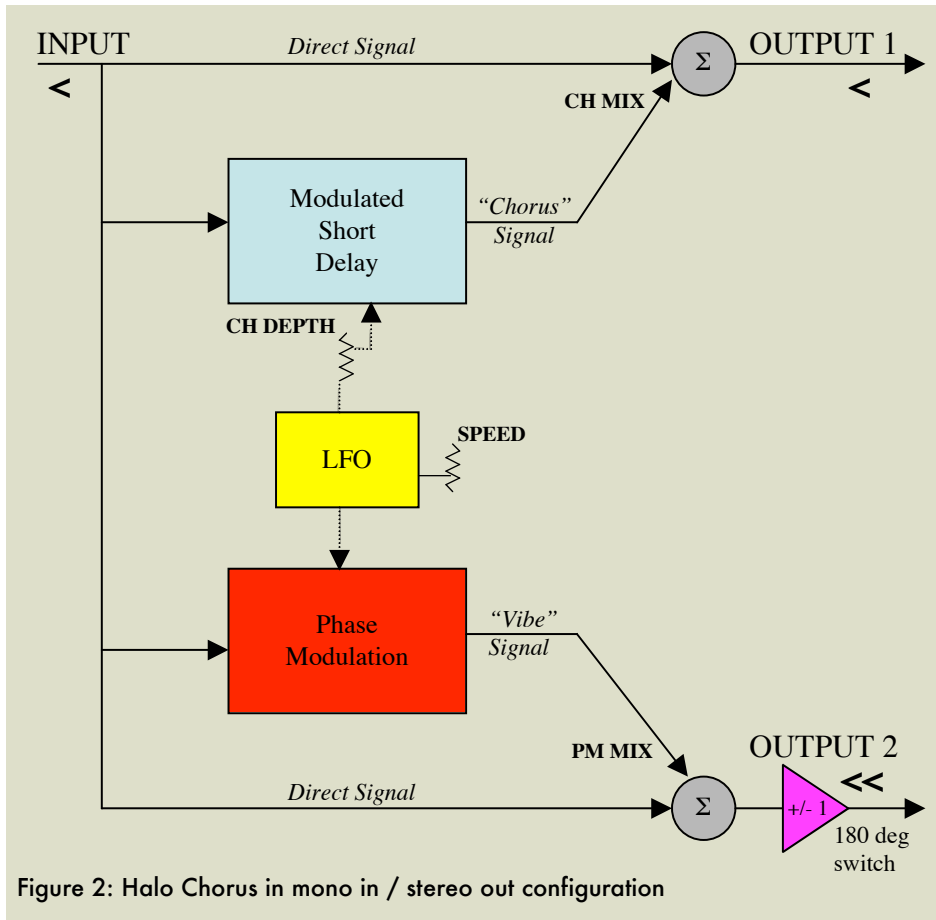
In this configuration, the input signal (either from a guitar or from the previous pedal in the chain) is brought into the ‘<’ input, with the output taken from the ‘<’ output. The internal circuitry will automatically configure to parallel sum both the ‘chorus’ pitch modulation and ‘vibe’ phase modulation effects, illustrated below in Figure 1:



In the mono configuration, the 180 degree phase switch has no effect on the output sound.

### MONO IN / STEREO OUT

In this configuration, the input signal (either from a guitar or from the previous pedal in the chain) is brought into the ‘<’ input, with the output taken from both the ‘<’ and ‘<<’ outputs. The internal circuitry automatically configures to the topology shown below in Figure 2:



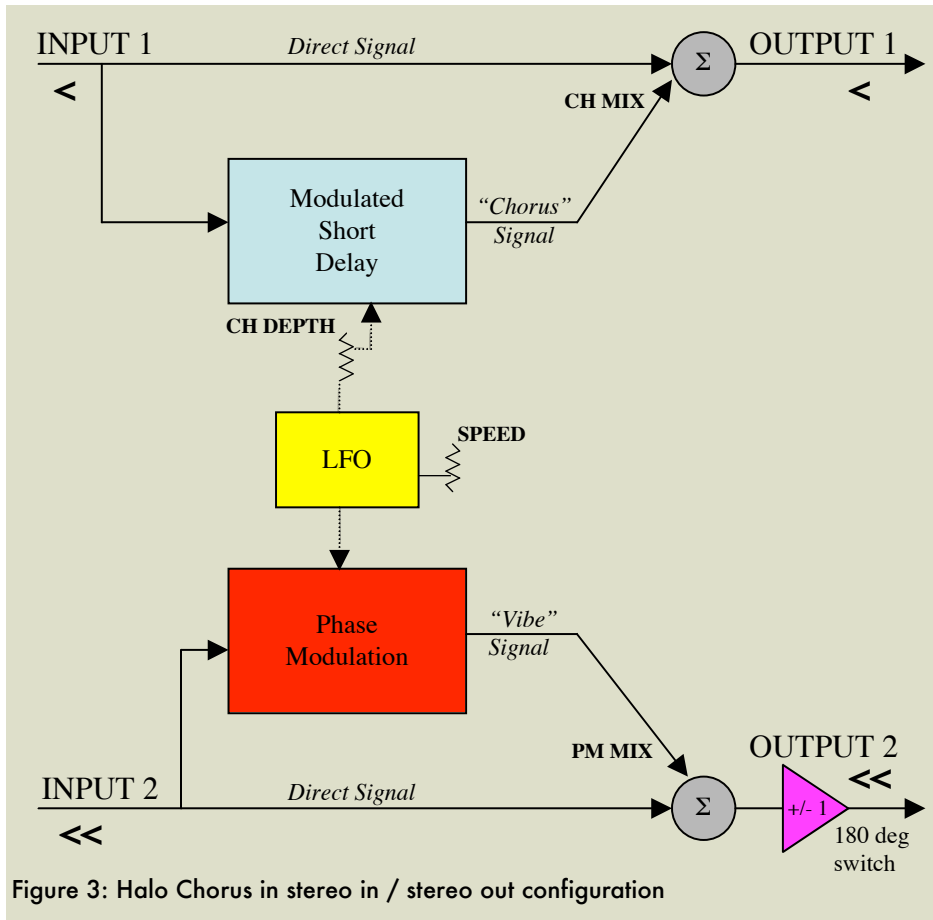
In this topology, the Halo doesn't parallel sum the 'chorus' pitch modulation and 'vibe' phase modulation effects, but instead sends each to separate output channels (still controlled by a common LFO speed).

It's important to note that although the **SPEED** control affects the LFO speed of both pitch and phase modulations, the **CH DEPTH** control affects only the amount of pitch detuning of the pitch modulation section.

#### STEREO IN / STEREO OUT

In this configuration, the input signal (either from a stereo guitar [e.g. Rickenbacker 360] or from the previous stereo pedal in the chain) is brought into the '<' and '<<' inputs, with the output taken from both the '<' and '<<' outputs. The internal circuitry automatically configures to the topology shown below in Figure 3:

*Note: Diamond Pedals is neither endorsed by, affiliated with, or specifically endorses any particular guitars, pedals and amps of other manufacturers mentioned in this manual, for which their registered trademarks are the sole property of those manufacturers.*

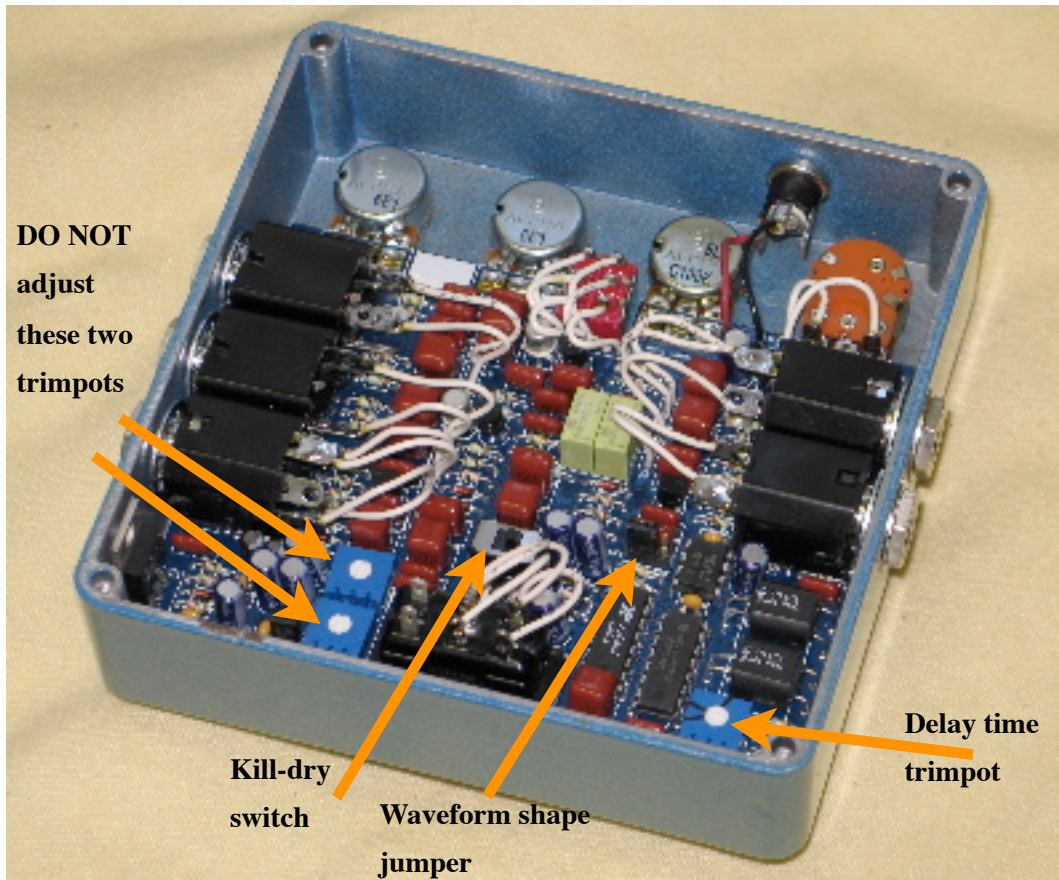


### CONTROLS

Halo front controls are summarized in the table below:

Halo controls at a glance	CH DEPTH	SPEED	PM MIX	CH MIX	180 deg
	Sets the amount of pitch detuning in the chorus signal before mixing back in with the direct signal.	Sets the speed of the Low Frequency Oscillator (LFO) for both chorus and phase modulation. Approx 0.2 to 10 Hz range.	Sets the level of phase modulation in the output mix. Does not affect direct level.	Sets the level of overall chorus effect in the output mix. Does not affect direct level.	Inverts the phase of the 2nd output channel. Does not affect mono output.

The Halo also has a few internal controls reached by taking the back off the enclosure:



1. Kill-dry switch: this is factory set to the 'off' position, which you would use for typical in front of the amp and in amplifier serial FX loops. For amplifiers with parallel FX loops, this should be set to the 'in' position when placed in such a loop.

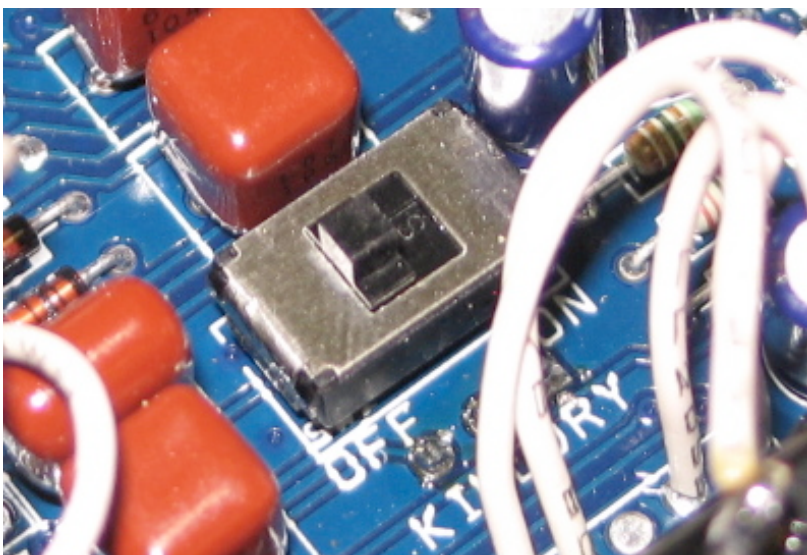


Figure 4: Kill-dry in the 'off' position (factory setting)

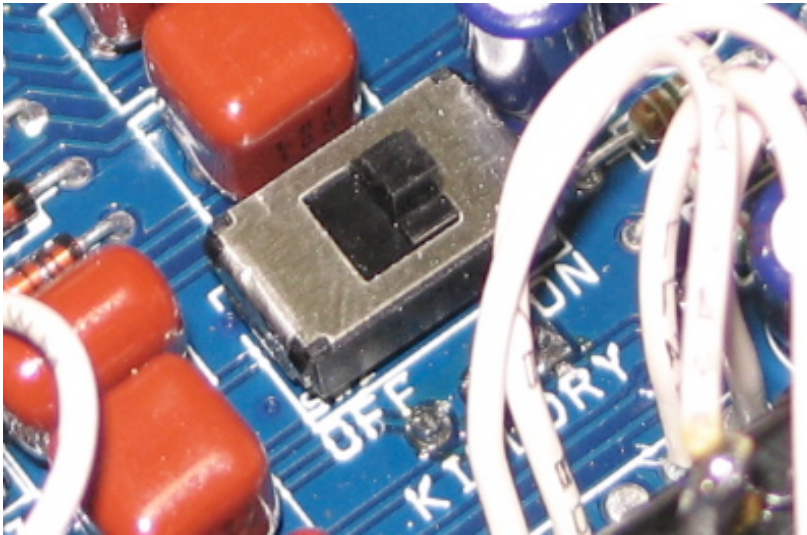


Figure 5: Kill-dry in the 'on' position

2. Sine / triangle wave mode: this is factory set to sine wave mode for the smoothest possible LFO, but by moving the jumper over from pins 1 and 2 to instead cover pins 2 and 3, the LFO can be changed to a triangle wave shape, giving a deeper pitch modulation effect.

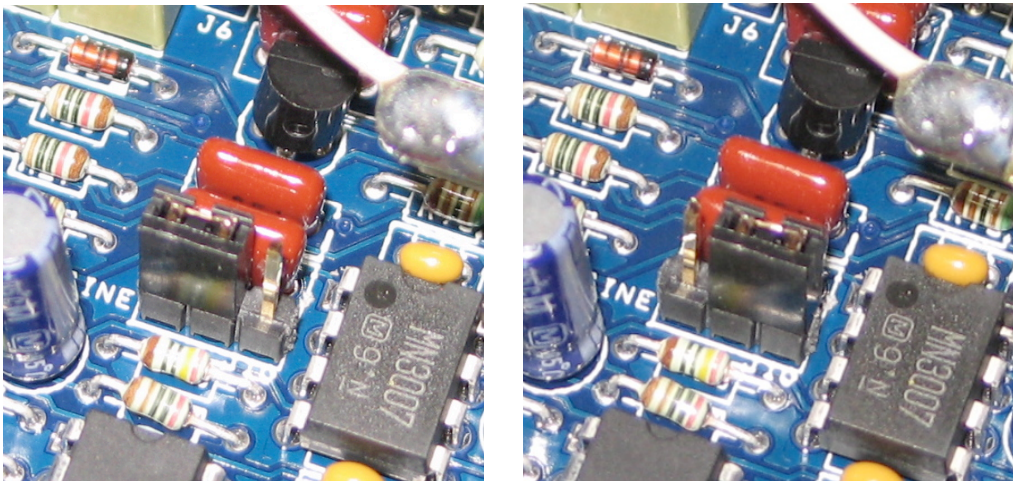


Figure 6: LFO waveform jumper selection - sine (left) factory setting, triangle (right)

3. Delay trimpot: this is factory set to approx. a 10 ms chorus path delay, indicated by the middle pen marking. Delays of 7.5 and 20 ms are also marked on the trimpot dial as a guide for experimenting - for instance longer delays will give deeper modulation.



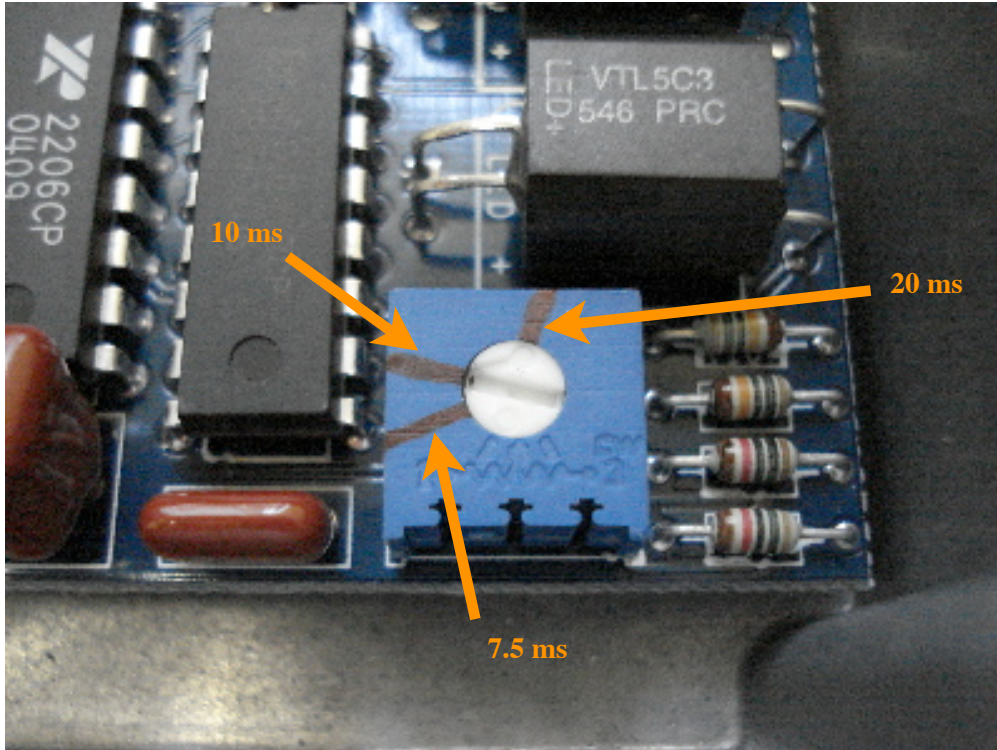


Figure 7: Chorus delay time trimpot (factory set at 10 ms - middle marking)

## EXPRESSION PEDAL

An expression pedal can be plugged into the jack marked ‘EXP’ to control the speed of the LFO by foot. We’ve found the Boss EV-5 to give the best utility and feel of expression pedals tested so far. It’s low maximum resistance of 10K does limit the LFO range from approximately 1.8 to 10 Hz, but gives a nice controlled feel throughout this range.

## POWERING

The Halo Chorus ships with a compact 24VDC switching adapter (identical to the one used with the Memory Lane). Since the Halo is internally regulated to 15V, any DC power source from 18 to 24V, positive pin configuration, providing 100 mA of current, can be used to power the unit. With appropriate cabling, many commercially available pedal power supplies such as the Voodoo Labs Pedal Power 2, Dunlop DC brick and pedalgear Juicebox can be used to power the Halo Chorus. Also, if you already have a Memory Lane and are using the provided 24VDC adapter, the Halo Chorus can be run at the same time as the Memory Lane from the single adapter with an inexpensive break-out cable available from Boss. Email us at [info@diamondpedals.com](mailto:info@diamondpedals.com) if you have any questions at all about powering scenarios and cabling.

*Note: the Halo Chorus immediately powers up upon insertion of power to the DC power jack - this is different than the Memory Lane which requires both DC power AND the insertion of a plug into the input jack.*

## PRESETS

Several presets are listed below as starting points to experiment with the Halo Chorus:

### *HALO CLEAN SIGNATURE*

Everything set to just past noon.



### *MAPLE SYRUP*

Thick and liquid.



### *THE FINAL FRONTIER*

Spatialization using a very slow LFO.



### *OPEN AIR CONCERT*

A nice phase & amplitude modulation, no de-tuning.

