
H910

User Guide

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Original Marketing Material circa 1976

Eventide **MODEL H910** the next step **HARMONIZER®**

THE ORIGINAL STUDIO HARMONIZER SPECIAL EFFECTS UNIT — THE H910 HARMONIZER IS THE DEPENDABLE, COST-EFFECTIVE, AND MULTIPURPOSE PACKAGE THAT REVOLUTIONIZED AUDIO EFFECTS PROCESSING.



FEATURES OF THE H910 HARMONIZER

PITCH CHANGE -- One octave up, one down. The H910 preserves all harmonic ratios and thus all musical values since it incorporates advanced circuitry which actually transposes input signals. Any musical interval can be achieved by the continuously variable pitch change control. The pitch ratio selected is shown on the 3-digit LED readout. An optional keyboard allows for pitch change to be produced in discrete musical steps.

DELAY AND REVERB -- The economical H910 is a versatile digital delay line. It can be used for "doubling" vocals, delay equalization in sound reinforcement, and for many special effects, including several types of reverb and echo. Two outputs are available, each with a variable delay, which allow for vocal multiplying, distributing speaker systems (especially useful for PA work), and even more effects.

ANTI-FEEDBACK -- Feedback caused by energy buildup due to room resonance is decreased by shifting successive repetitions of the same signal away from the resonant frequency. The H910 incorporates a control which periodically shifts the signal pitch up and down to accomplish this. Unlike heterodyne "frequency shifters," no dissonances are introduced.

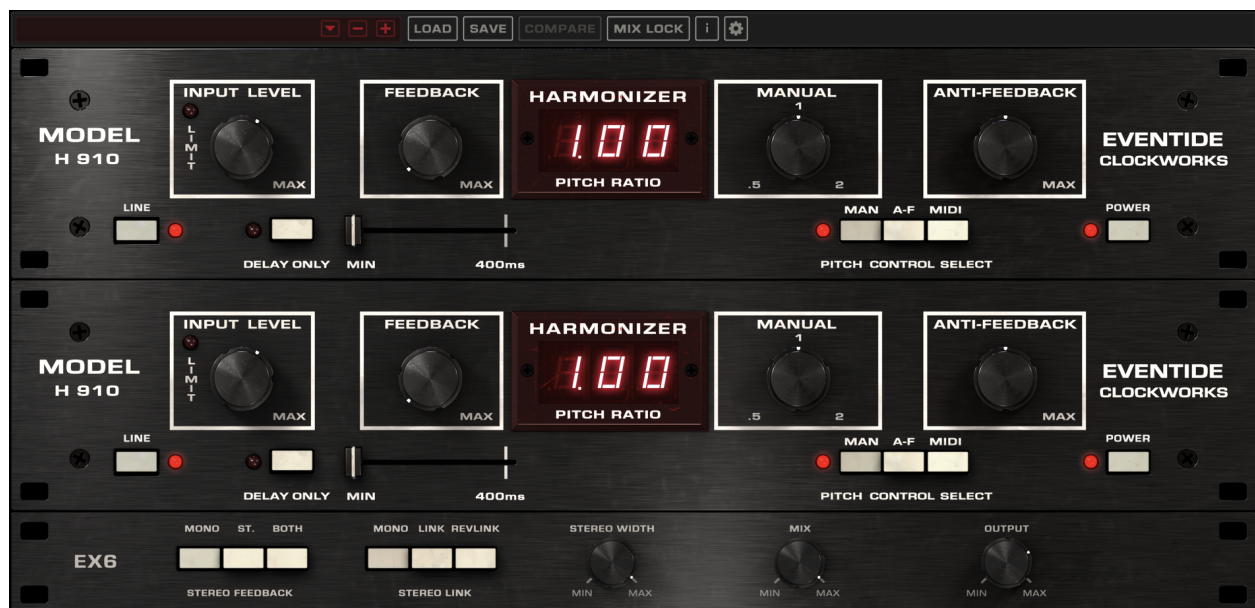
SPECIAL EFFECTS -- Simultaneous use of feedback, delay, and pitch change can be used to create a variety of audio effects. Maximum delay and one interval of pitch change combined with feedback generates a musical progression of a single note. Pitch change and feedback with no delay gives an unusual robot or alien speech effect. Short delay with feedback but no pitch change gives a hollow flanging or tunneling effect; long delay generates a distinctive reverb.

eventideaudio.com

H910 Single Harmonizer®



H910 Dual Harmonizer®



1.1 About This Product

Thank you for your purchase of the Eventide H910 Harmonizer® plug-in. The product recreated in this plug-in was among the first introduced by Eventide - and among the world's first commercially available professional recording products. For over 40 years, innovative products like these have made Eventide an industry leader, and we are extremely proud that they continue to be in demand today. This package includes a stunning recreation of the H910 Harmonizer®, as well as a Dual H910 version, which recreates the popular technique of running two H910 units in parallel to create lush doubling and other interesting effects.

We'll get into more depth on the product soon but, before you forget, please take a few minutes to register online. This helps us keep you informed of any important software updates, and any special offers that may only be available to registered users.

Introduction

Produced between 1975 and 1984, the H910 Harmonizer® was the world's first harmonizer - and one of the first commercially-available digital audio products. The ability to manipulate time, pitch and feedback with just a few knobs and switches made it easy to alter audio in ways that otherwise required at least a couple of tape machines and, often, rearranging furniture. Suddenly anyone could be Les Paul (recording engineer not guitar player). The H910's electronics were primitive and the processing almost entirely analog. The digital bits of the design did "as little as necessary." Only delay was digital. Everything else - filtering, feedback, mixing, pitch modulation, etc. - was analog. And it sounded it.

The H910 was also just a tiny bit unstable. And it showed. In a time long before CDs, MIDI, or any standards for sample rate or bits, Light Emitting Diodes (LEDs) had just become "the latest, greatest thing" and the H910's iconic, flickering display was the first 'digital readout' to appear in many studios. And that flickering readout belied a secret - the H910 was inherently 'jittery'. The H910's master clock wasn't crystal-based but, instead, it was a tuned LC (inductor/capacitor) oscillator. The result is that the system was not locked to a specific frequency and the entire system's clocking would drift slightly, slowly and unpredictably. In fact, all of the oscillators in the H910 are of the 'free-running' sort and this randomness adds to the sound (and the fun). The H910 was groundbreaking when introduced and now the circuitry, the functionality and the 'sonic behavior' of the original has been modeled in software and is available in your DAW. Note that while presets are a good starting point, you'll get the most out of the H910 if you push buttons and turn knobs - just as you would when searching for a sound using the hardware. That was always, and is now, once again, the fun of it.

Genesis of the H910

Prior to 1970 there were no digital audio products of any kind, in any studio, anywhere. The first digital audio product to appear was a one-trick-pony, the DDL (Digital Delay Line). First introduced in 1971, DDLs from Eventide and Lexicon were as simple as simple can be - audio goes in now and comes out a bit later. Eventide's 1745, was a big, costly box full of shift registers with a front panel dominated by big 'wafer' switches. Designed in 1972, during the very early days of ICs (Integrated Circuits), the only chips with enough memory (storage) to be dangerous/useful were 1K bit shift registers. RAMs were expensive and teeny. Each 1kbit shift register could delay audio by 2 mS, so that, by filling a box with 'only' 100 of these chips an amazing 200 mS of delay became possible!

Studios bought Eventide's 1745 to use as a pre-delay for a plate reverb or for ADT (automatic double tracking). Eventide's audio design sounded 'good enough' to satisfy even the most critical ears (some early digital audio products sounded awful) thanks, in large part, to Eventide's custom designed ADC (analog to digital converter). And so, fueled by the sales of a handful of 1745s, Eventide took the next step and developed the successor to the 1745, the 1745M. The 1745M was also a simple DDL but it was modular DDL and used RAM instead of shift registers making fine control of delay possible for the first time. And it had 7 segment numerical LED readouts! The introduction of a "pitch change" module for the 1745M set the stage for the development of the H910. By 1974, most of the pieces needed to design a "Harmonizer" were in place.

The Rack Mount H910

The H910 was conceived as a box that a vocalist might use to create real-time harmonies and reverb. In fact, the prototype sported a keyboard for selecting musical pitch intervals. (An optional keyboard controller was offered in production.) Much of the H910's analog circuitry is borrowed from the DDLs. RAM storage was used for delay. By giving the user real time, interactive control of pitch, delay and feedback, the H910 ushered in the digital effects era and became a key instrument allowing engineers and producers to shape sounds in new ways. In a pre-software world, the H910 achieved its groundbreaking effects through the judicious application of analog circuitry, custom converters, and digital logic gates.

The H910 Plug-in

This plug-in models the hardware to the best of our ability. It even emulates the randomness of the hardware (not that you can copy 'random' with any degree of exactitude). The controls have the same range and characteristics as the front panel controls of the hardware. The pitch change splicing method is the same as the hardware's - the glitch is back! The aforementioned HK940 keyboard option is also included, and even augmented with modern MIDI control that allows you to "play" the desired pitch using MIDI notes or bend it via pitch wheel. The plug-in also includes Mixer and Envelope Follower sections which let you use the second delay output and control voltage input options from the original H910.

We've done exhaustive listening tests and compared it to the best relics that we could find. This plug-in models the quirkiness of one vintage H910. In fact, we've tweaked the plug-in to sound as close to the 'golden' relic as possible. (If this plugin sounds different from your H910, you may want to get your hardware adjusted.)

H910 Harmonizer® Controls

PART 3

Main H910 Panel



LINE

When the LINE control is IN the LED is on and the unit is actively processing audio; when it is OUT the LED is off and the unit is bypassed and passes audio directly from input to output.

INPUT LEVEL

The input LED will light at -0.5 dBFS. (Note that the Limit Indicator is "after" the INPUT LEVEL and FEEDBACK controls, so it will illuminate when internal clipping is about to occur due to excessive input level or feedback.) Adjust the INPUT LEVEL so that the Limit Indicator flashes only on input peaks.

PITCH CONTROL SELECT

The four switches in this group allow you to select whether the pitch change is set by the manual knob (MAN), the anti-feedback oscillator (A-F), the HK941 keyboard and MIDI (KYBD), or the Envelope Follower (ENV).

- **MAN** – This switch activates the MANUAL control knob. When fully counterclockwise, the output pitch is decreased by 1 octave (ratio=.5). When centered, the ratio is unity. When fully clockwise, the output pitch is increased by 1 octave (ratio=2). Intermediate settings produce fractional octave ratios with the changes “band-spread” around unity.
- **A-F** – This switch activates the ANTI-FEEDBACK knob, allowing you to add small amounts of an up-and-down frequency shift to the output signal. This serves to decrease the effect of room resonance peaks on the signal which ultimately return to the microphone. Note that higher settings will make the effect more audible, so care should be taken to find a setting which provides adequate feedback reduction with minimal audience/performer disturbance.
- **KYBD** – When selected, pitch ratio is determined by the HK941 keyboard below, or by receipt of MIDI Note On and Pitch Bend messages (see “Working with the Harmonizer®” for more detail).
- **ENV** – When selected, pitch ratio is determined by the ENVELOPE FOLLOWER. The pitch ratio is nominally 1.0, but when input signal is applied it will modulate toward the setting of the MANUAL knob as determined by the ATTACK, RELEASE, and SENSITIVITY knobs.

PITCH RATIO

The display shows the numerical pitch ratio. (See also ‘Pitch Ratio Readouts for Various Musical Relationships’.) Note that, just as in the original unit, when the knob is set between two values, the display will “jitter” between the two. This is visual jitter only, and does not affect the audio.

DELAY	Allow you to insert additional delays before the output. When in DELAY ONLY mode, select delay times in 7.5 ms increments to a maximum of 112.5 ms. (7.5+15+30+60). When in pitch mode only the right two buttons are active for 30 ms each, allowing for up to 60 ms of additional delay (30+30).
OUTPUT 2 DELAY TIME	The OUTPUT 2 delay buttons control the amount of delay time for the second output. This second delay tap is fed from the same input as the first, and it also allows you to mix another delay into the wet output using the mixer section in the second panel.
FEEDBACK	Used to determine the decay time of the output delay. Clockwise rotation increases decay time until feedback reaches unity, at which point the system will begin to oscillate.
POWER	When the POWER button is IN the unit is powered up and operational, and when it is OUT the unit is powered off and the plug-in bypasses.

Secondary (HK941) Panel Controls



MIX	This control sets the overall balance of wet (effected) signal to dry (original) signal.
MAIN LEVEL	This control sets the level from the H910's main output, which can be set to either shift pitch or output delay only. The main output is also the source for the Feedback buss.
OUT 2 LEVEL	This control sets the level from the H910's OUTPUT 2, which is delay only. This output is also fed from the feedback from the main output, but it does not feed back into the Feedback buss itself.
ENVELOPE FOLLOWER ATTACK	When the PITCH CONTROL SELECT is set to ENV this sets the attack time of the Envelope Follower.
ENVELOPE FOLLOWER RELEASE	When the PITCH CONTROL SELECT is set to ENV this sets the release time of the Envelope Follower.
ENVELOPE FOLLOWER SENSITIVITY	When the PITCH CONTROL SELECT is set to ENV this sets the Sensitivity of the Envelope Follower.

HK941 KEYBOARD

When the PITCH CONTROL SELECT is set to KYBD the HK941 Keyboard is an automatable keyboard which can be operated by your mouse and which automatically sets the H910 to musical intervals. This two octave keyboard is set up in such a way that the center C key represents a pitch ratio of 1.0, with each key to the right shifting the pitch ratio one further half-step up and each key to the left shifting the pitch ratio one further half-step down. This allows you to use the keyboard to easily transpose the incoming signal up or down by a musical interval related to the center C.

In KYBD mode the H910 plug-in also responds to MIDI Note Number input in the same way, using the MIDI notes centered around middle C. To use this mode you must route MIDI from your MIDI source to the H910 plug-in in your DAW.

HK941 KEYBOARD GLIDE

The GLIDE control sets the rate at which the H910 shifts from one ratio to the next when the PITCH CONTROL SELECT is set to KYBD.

HK941 KEYBOARD HOLD

By default the H910 responds to notes momentarily, which means that the pitch ratio returns to unison (1.0) when no key is pressed. By turning the HOLD mode on, the H910's pitch ratio will stay at the value set by the last pressed key until it gets another update.

3.1 H910 Dual Harmonizer® Controls

The H910 Harmonizer® plug-in comes bundled with the H910 Dual Harmonizer® plug-in, which recreates two H910 units running in parallel, an application that was frequently used in the hardware version to create doubling effects. Of course, you can also use the H910 Dual to create a wide variety of other interesting sounds. The H910 Dual plug-in includes two Main Panels (as described above), and an Expansion Panel with several additional controls.

Expansion Panel Controls



STEREO FEEDBACK

The three buttons in this group allow you to control the feedback routing between the two H910 units. In MONO mode, the output from a single unit only feeds back into that unit. In STEREO mode, the output from the top unit feeds back into the bottom unit, and vice versa. In BOTH mode, the output of each unit feeds back into both itself and the other unit. An interesting application of these modes is when using feedback combined with pitch shifting, which based on the Pitch Ratios of the bottom and top units, can cause the incoming signal to shift up/down continuously, shift up and then down continuously, or shift away from a Pitch Ratio of 1 in both directions.

STEREO LINK

The three buttons in this group allow you to more easily control the plug-in, by linking corresponding controls in the bottom and top units. In MONO mode, all controls can be set independently. In LINK mode, changing a control on one unit will cause the corresponding control on the other unit to follow that change. Reverse Link mode behaves much like `cvalueLink` mode, but changing the Pitch Ratio on one unit will cause the other unit's Pitch Ratio to move in the opposite direction. This is especially useful for creating stereo detuned and doubling effects.

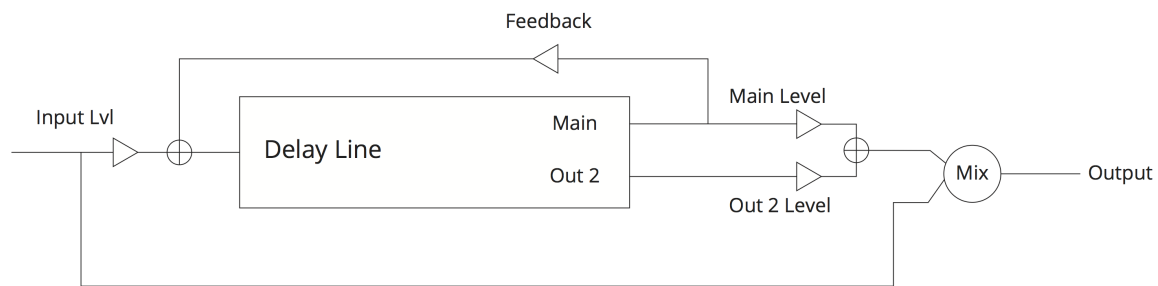
STEREO WIDTH

Allows you to control how “wide” the output of the plug-in is, from mono to full stereo.

Mix	Controls the total Wet/Dry mix of the H910 Dual plug-in.
OUTPUT	Controls the output level H910 Dual plug-in.

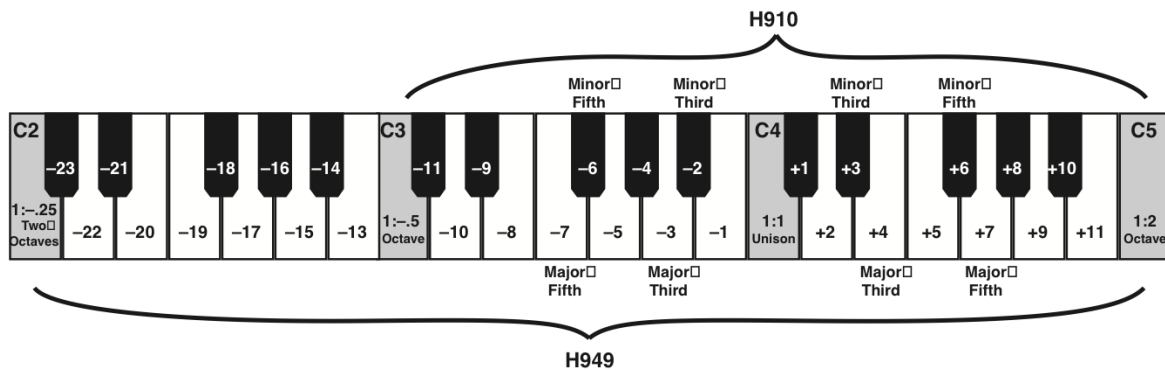
4.1 Signal flow of the H910 Single

The original H910 Harmonizer® had additional inputs and outputs which would have traditionally been attached to external studio gear to work. In order to make this plug-in work well in a DAW environment, we've built some of this external gear, like an envelope follower and a mixer, into the H910 Single plug-in itself. Because of this, the signal flow in the H910 Single can be difficult to understand. Please refer to the following figure if you have any difficulties.



4.2 Playing the Harmonizers with a MIDI Keyboard

A MIDI keyboard set to send MIDI on the H910's MIDI Channel can be used to control the pitch ratio in discrete musical steps. Middle C on the keyboard will set Unison on the Harmonizers; 1.00 on the display. Playing the E above Middle C will produce a harmony of a Major 3rd. Playing the E-Flat above Middle C will produce a Minor 3rd and so on. Refer to the graphic below and the chart on the following page.



The Harmonizers respond to MIDI Note On and Pitch Bend messages. The bend range covers two octaves, from 0.5 to 2.0. The MIDI response for all plug-ins is OMNI, i.e. messages received on *any* of the 16 channels will be accepted.

Figure 4.1: Pitch Ratio Readouts for Various Musical Relationships

-3/4	-1/2	-1/4	Note	Relationship		Note	+1/4	+1/2	+3/4
.958	.972	.986	1.000	Unison		1.000	1.015	1.029	1.044
.904	.917	.930	.944	-1	+1	1.060	1.075	1.091	1.106
.853	.866	.878	.891	-2	+2	1.123	1.139	1.155	1.172
.805	.817	.829	.841	-3	+3	1.189	1.207	1.224	1.242
.760	.771	.782	.794	-4	+4	1.260	1.278	1.297	1.316
.717	.728	.738	.749	-5	+5	1.335	1.354	1.374	1.394
.677	.687	.697	.707	-6	+6	1.414	1.435	1.456	1.477
.639	.648	.658	.667	-7	+7	1.498	1.520	1.542	1.565
.603	.612	.620	.630	-8	+8	1.587	1.611	1.634	1.658
.569	.578	.586	.595	-9	+9	1.681	1.706	1.731	1.756
.537	.545	.553	.561	-10	+10	1.781	1.808	1.834	1.861
.507	.515	.522	.530	-11	+11	1.888	1.915	1.943	1.971
.479	.486	.493	.500	Octave		2.000			
.452	.459	.465	.472	-13		NOTE The lowest octave is only available with the H949. For use with the H910, round each figure to 2 decimal places.			
.427	.433	.439	.446	-14					
.403	.407	.414	.420	-15					
.380	.381	.391	.397	-16					
.359	.364	.369	.375	-17					
.339	.344	.349	.354	-18					
.320	.324	.329	.334	-19					
.302	.306	.310	.315	-20					
.285	.289	.293	.297	-21					
.269	.273	.277	.281	-22					
.254	.257	.261	.265	-23					
			.250	Two Octaves					

4.3 Preset Bar



Located at the top of the H910 Harmonizer® Plug-In, the Preset Bar lets you load and save presets, along with several other features.

When H910 Harmonizer® is installed, a library of settings is placed into the <user>/Music/Eventide/H910 Harmonizer/Presets folder (Mac) or the <user>/Documents/Eventide/H910 Harmonizer/Presets folder (Windows). These presets have a .tide extension and can be saved or loaded from the H910 Harmonizer® preset bar in any supported DAW.

In many DAWs there is an additional generic preset bar that saves DAW-specific presets to a separate location. We recommend saving your presets using the Eventide preset bar to ensure that your presets will be accessible from any DAW. You can also create sub-folders inside the preset folders, if you wish.

LOAD/SAVE	Use these buttons to load and save your presets in .tide format.
COMPARE	Click to toggle between two different settings for the plug-in. This is useful for making A/B comparisons.
MIX LOCK	Pressing this will enable a global mix value that will be the same on every preset that is loaded. This is especially useful on an effect return track where the mix should always be set to 100.
INFO	Click this button to open this manual.
SETTINGS	Opens a drop-down menu with various user interface settings. <ul style="list-style-type: none">• Scaling – Sets the overall size of the plugin.• Always Show Values – Sets knob values to be displayed at all times. This setting will apply to all instances of the plugin.

We hope you enjoy the H910 Harmonizer® plug-in and put it to good use in all of your mixes. Please be sure to check out Eventide's other native plug-in offerings for more unique and interesting effects.