Eventide
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H969 ProPitch™ Harmonizer®

INSTRUCTION MANUAL

EVENTIDE INC. • ONE ALSAN WAY • LITTLE FERRY, NEW JERSEY 07643 • 201-641-1200 • TWX: 710-991-8715

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WARRANTY REGISTRATION FORM Model H969 HARMONIZER®

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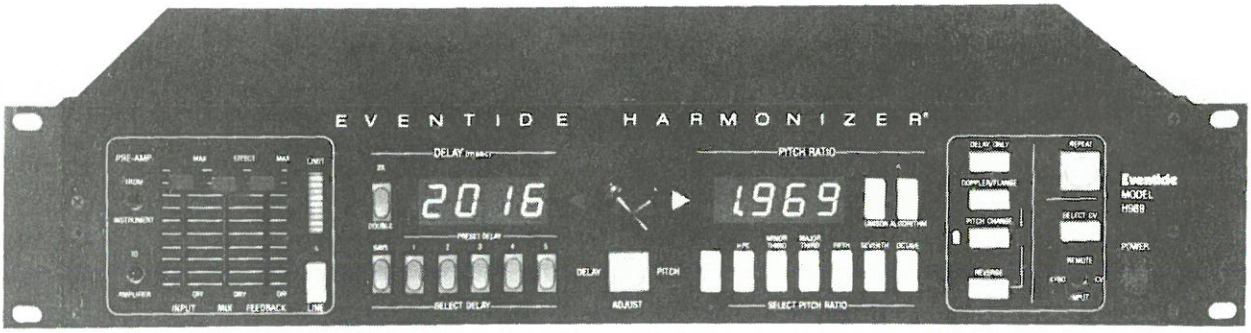

H969 ProPitch Harmonizer

Eventide Harmonizers® have always set the world standard in pitch change technology. The new H969 ProPitch™ Harmonizer maintains Eventide's leadership with the cleanest, highest quality pitch change ever, for the most demanding applications. New effects and convenience features have also been included in the H969. This new top-of-the-line Eventide Harmonizer is ready for you to audition now.

NEW FEATURES OF THE H969

- **ProPitch for Unprecedented Pitch Change Quality**
  Eventide's new ProPitch digital electronic splicing/algorithm system delivers cleaner, more glitch-free performance than ever before. What's more, this new system is active over a wider frequency range. . . a full octave wider. Eventide has also employed 16 Bit Linear PCM coding for the first time in the H969. Dual coarse/fine adjust controls enable the user to set precise and rock-stable pitch ratios easily.

- **Twelve Instant Pitch Presets at Precise Musical Intervals**
  With the H969, setting a precise Minor Third, Major Third, Fifth, Seventh or Octave of pitch change is accomplished instantly, with the push of a button. Each interval can be selected as a sharp or flat. There's also an instant preset for sharp or flat micro pitch change, for vocal doubling and effects.

- **Wide Delay Range and Added Delay Features**
  The H969 extends full-bandwidth delay to 1.5 seconds. And delay quality is superb—FREQUENCY RESPONSE 40Hz-16kHz ± 1db, DISTORTION less than .08% at reference output level, DYNAMIC RANGE greater than 86dB. Double mode extends the delay range to 3 seconds, with 8kHz bandwidth. For added convenience, the user can choose and save any five delay times for instant recall. Delay time and pitch ratio are displayed on independent readouts.

- **Extended Reverse and Repeat Modes**
  The 1.5/3second digital memory of the H969 ProPitch Harmonizer extends the versatility of the reverse and repeat modes. Riffs up to 1.5 seconds (full bandwidth) or 3 seconds (half bandwidth) can be captured and looped with the repeat function, as well as reversed. Varying delay time allows the loop to be edited.

- **New Doppler Effect and Extended Flanging Versatility**
  With wide range speed control, an extensive array of doppler effects are available. New flanging features on the H969 include sweep freeze and sweep start-point select modes.

- **New Front Panel Instrument Preamp Input**
  The H969 makes live performance operation quick and easy.

The H969 ProPitch Harmonizer is an addition to Eventide's full line of Harmonizers. It does not replace any existing model. The H969 represents the state-of-the-art in pitch change technology from Eventide, the world leader in pitch change/special effects units.

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INTRODUCTION

The Eventide model H969 Harmonizer is the latest model in Eventide's family of audio special effects devices. Although the model H969 is a very complex electronic device, it is relatively easy to operate. The Harmonizer's user controls have been designed to allow quick and accurate set-up of all effects.

The best way to familiarize yourself with the Harmonizer is to read through this manual at least once and then try the experiments in the appendix. However,

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*                                                       *
*          IF YOU DON'T READ THE ENTIRE MANUAL          *
*     AT LEAST READ THE FOLLOWING BRIEF PARAGRAPHS      *
*                                                       *
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INSTALLATION

The Harmonizer needs proper installation and ventilation. The front panel brackets alone will not provide sufficient mechanical support to transport the unit. When traveling, the rear of the unit must be supported. It should be supported, in any case.

Leave enough room both above and below the unit for cooling air to circulate. Do not place it above a power amplifier or any other heat source and do not block the air vents in the top or bottom cover.

LINE (MAINS) VOLTAGE SELECTION

Be sure that you have configured the Harmonizer for the available AC operating voltage.

The Harmonizer is shipped from the factory set to operate on 115 volts AC. Please be sure to check the AC voltage if the equipment is to be operated outside the continental United States.

It is very easy to change the Harmonizer from 115 to 230 volts operating voltage and back again (see Input/Output Connections - Rear Panel). Applying 115 volts to a unit set for 230 volts won't hurt it although it won't work. However, applying 230 volts to a unit set for 115 volts will damage it.

If the fuse in the Harmonizer's power line should ever blow, replace it only with an identically rated fuse.

HANDLING

Do not drop the Harmonizer. It is of rugged commercial construction but must be treated with the care that one would give any piece of electronic equipment. It is not considered a sporting orb.

INPUT/OUTPUT CONNECTIONS

Be very careful with the connections that you make to the audio inputs and outputs. Do not cause a ground fault condition. This can cause severe damage. DO NOT USE THE REMOTE CONTROL JACKS UNTIL YOU READ THE SECTION ON THEIR USAGE. These jacks do not function in the same way as similarly labeled jacks on earlier model Harmonizers.

INPUT/OUTPUT CONNECTIONS

REAR PANEL

AC CONNECTOR AND LINE FUSE

The AC voltage selector and line cord connection is located on the extreme left looking at the rear of the unit.

A standard I.E.C. Three Conductor Power Cord is provided with the unit. NEVER CUT OFF THE GROUND CONNECTION. Removal of the ground can induce hum in the output and is a potentially shock hazard.

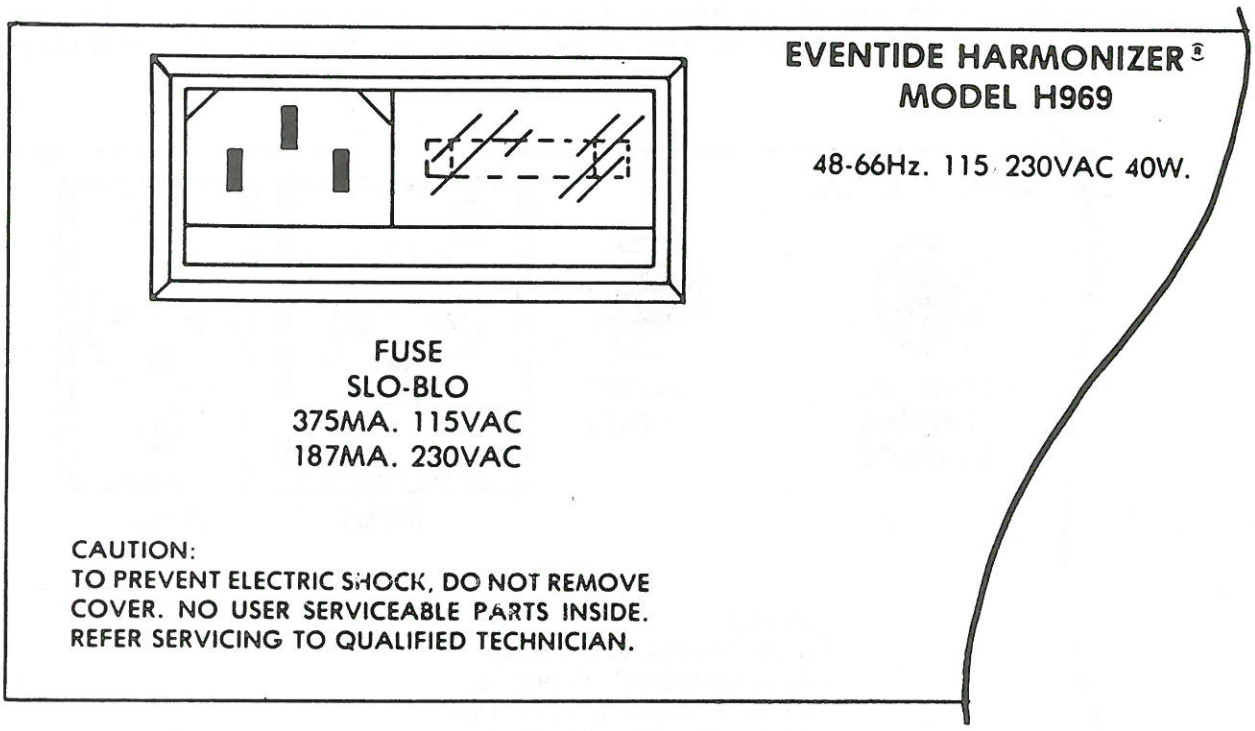
If you replace the power cord plug with any other connector, be sure that the wires are connected correctly and that a power line ground is supplied.

The AC connector has a built-in fuse and line voltage selector. The fuse can be removed by pulling the small lever. Always replace the fuse with the value marked on the rear panel of the Harmonizer unless advised otherwise by the factory.

You must be very sure that the line voltage selector is set properly. With the power cable removed, you can slide aside the plastic door and expose the voltage selector printed circuit card. This card can be removed with small pliers and must be oriented so that the voltage desired is seen on top of the card.

If your local line voltage is significantly higher or lower than either 115 or 230 volts a step-up or step-down transformer may be required.

In some locations, a voltage regulating transformer or surge supressor may be required to insure proper operation.



REMOTE CONTROL VOLTAGE CONNECTOR

The KEYBOARD/CONTROL VOLTAGE is provided for use with potentiometer type controllers. The use of this jack is fully covered in the REMOTE CONTROLS section.

LINE IN/OUT BYPASS CONNECTOR

The IN/OUT BYPASS jack is designed for use as the input point of a remote LINE IN/OUT switch. The use of this jack is fully covered in the REMOTE CONTROLS section.

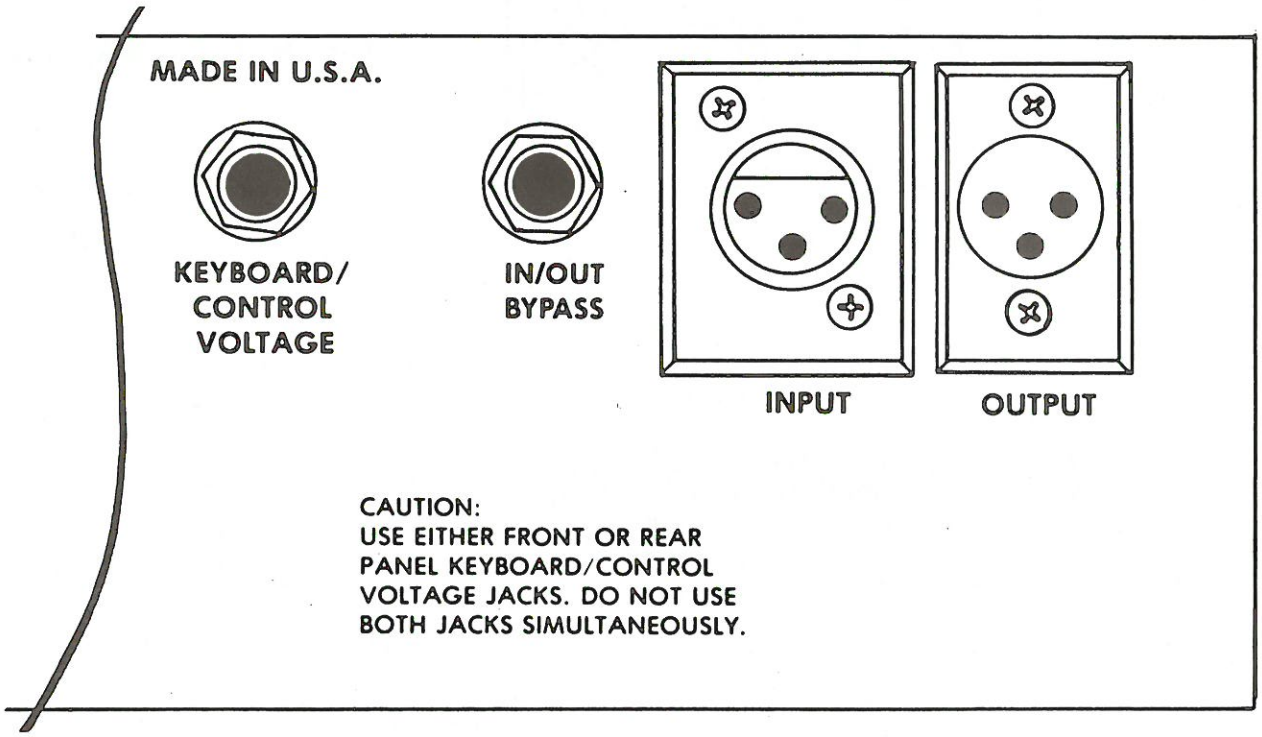
AUDIO XLR CONNECTORS

INPUT	OUTPUT
(THREE PIN FEMALE)	(THREE PIN MALE)
Electronically Balanced Input	Double Ended Output
Input Impedance: 10K OHMS	Output Impedance: 300 OHMS
Maximum Level: +22 dBm	Maximum Level: +20 dBm

Pin 1: Ground Pin 2: - Phase Pin 3: + Phase

The XLR connectors are connected by a DC path whenever the unit's AC power is off or when the front panel LINE IN indicator is not illuminated. The H969 always powers up in the line in condition.

The direct DC path can be used to quickly verify the wiring external to the Harmonizer. If no signal is heard with the unit switched off or with the LINE IN indicator off, the problem is almost certainly in the external circuitry.



FRONT PANEL

PREAMPLIFIER INPUT

The FROM INSTRUMENT input jack on the left side of the front panel can be used as an instrument low level input. The nominal input impedance at the jack is 100K OHMS. Whatever signal enters at the FROM INSTRUMENT jack is preamplified and mixed with the input signal from the INPUT XLR Connector. This mix is then applied to the INPUT Level slider.

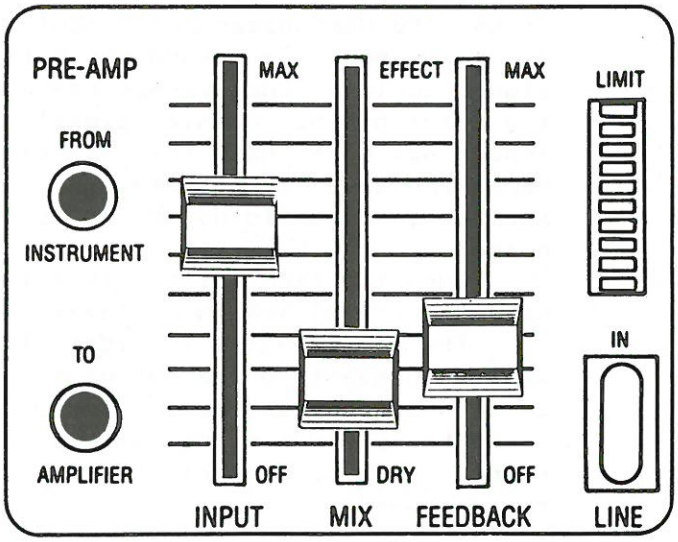
Note that a signal level of approximately 11 dB will cause internal signal clipping if applied at this jack. Any signal applied simultaneously at the rear panel INPUT XLR jack will be added to the signal at this jack.

A signal level of approximately 0 dB is equal to 0.775 volts RMS or 2.2 volts peak-to-peak.

AMPLIFIER OUTPUT

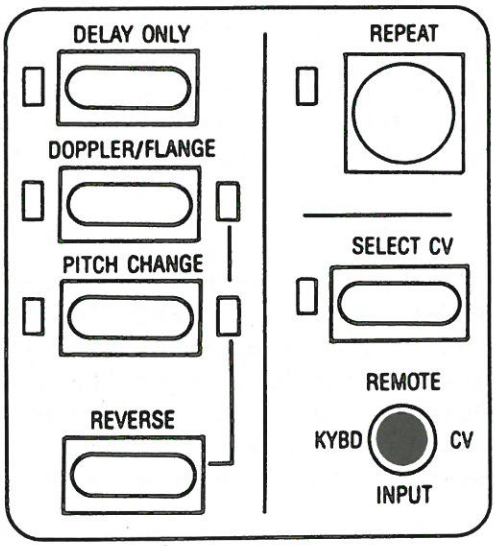
The jack labeled TO AMPLIFIER is a low level output suitable for use as an input to an instrument amplifier. The output impedance at this jack is 620oHm OHMS. This jack, TO AMPLIFIER, provides the same output signal at a reduced level as the normal output signal available at the OUTPUT XLR.

Note that the FROM INSTRUMENT and TO AMPLIFIER jacks are also connected by a DC path whenever the AC power is off or the LINE IN indicator is off.



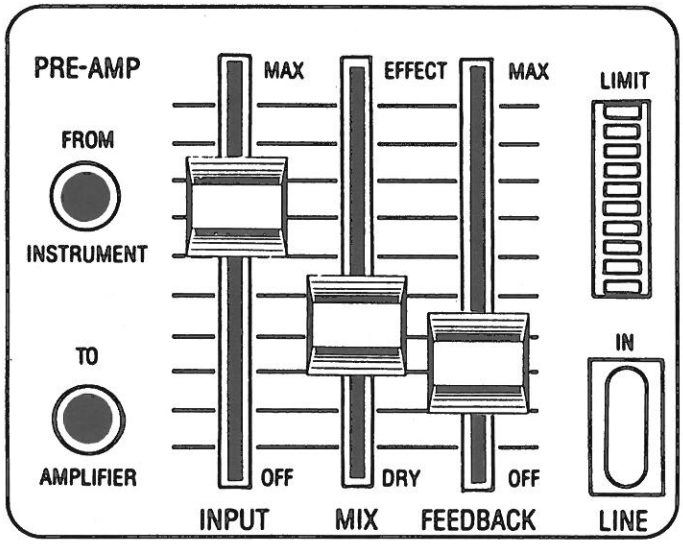
REMOTE CONTROL VOLTAGE CONNECTOR

On the right side of the front panel is a stereo phone jack marked REMOTE KYBD/CV INPUT. This jack is functionally equivalent to the rear panel KEYBOARD/CONTROL VOLTAGE jack and is explained in the REMOTE CONTROLS section.



AUDIO CONTROL

This group of controls consists of three sliders, the LINE IN/OUT switch and the input level bargraph display.



LEVEL CONTROL SLIDERS

The INPUT slider is used to attenuate the mixed direct and pre-amplified audio signals.

Like all signal processing devices, the Harmonizer has a finite dynamic range. To insure the best signal quality, the average operating point of the incoming signal should not be so high that transient peaks are severely clipped. In addition, it should not be so low that the signal is buried in the background noise.

When the INPUT slider is set to its MAX position, the Harmonizer will clip at a rear panel XLR input level of approximately +3 dBm.

The Dry/Effect MIX slider allows control over the amount of processed audio that is present in the output signal. The DRY position results in an output that is 100% unprocessed audio. The MIX position results in 100% processed audio.

The FEEDBACK slider allows mixing of the output of the unit with its input signal. This control has no effect when off and adds feedback as the slider is moved upwards.

BARGRAPH LEVEL DISPLAY

The AUDIO LEVEL display is a ten segment bargraph that indicates the input signal level in 6-dB steps. It is used in conjunction with the input Level control although the feedback level will also affect it.

To utilize the Harmonizer's maximum dynamic range, the INPUT slider should be set so that the uppermost bargraph indicator flashes briefly on signal peaks. If this "clipping" indicator is illuminated continuously the unit may produce excessive distortion.

When feedback is added, continuous clipping may be indicated. This is due to the addition of the feedback signal to the audio signal. If this occurs reduce either the input or feedback level.

LINE PUSHBUTTON

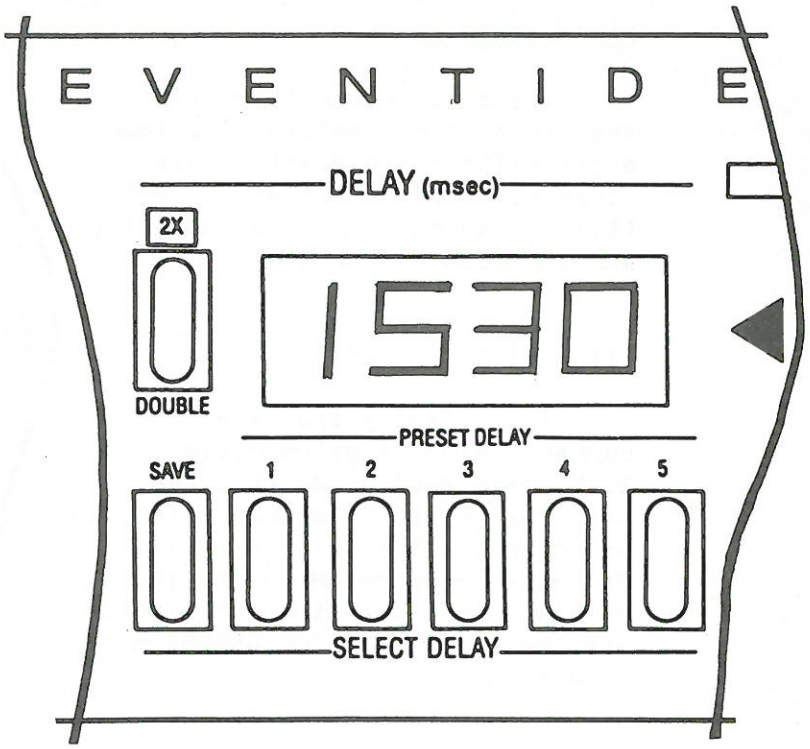
This control enables or disables the XLR inputs and outputs and also the two front panel jacks, FROM INSTRUMENT and TO AMPLIFIER.

An indicator directly over the button is illuminated and reads IN when the Harmonizer is active. When the indicator is off, both sets of Harmonizer Inputs and Outputs are connected by a DC path.

When the Harmonizer is turned on, it is in its LINE IN condition and immediately begins to process the input signal.

DELAY CONTROLS

The delay setting controls are comprised of a four digit display that indicates the current delay setting, a DOUBLE button which doubles the effective delay while halving the unit's bandwidth, five PRESET delay buttons for recalling delay times that have been stored, and a SAVE button for entering delays into the Harmonizer's memory.



DELAY DISPLAY

The DELAY display always indicates the current delay time in milliseconds from 0000 to 1530 ms (1000 ms equals one second). The delay is indicated in 6 ms steps. The DELAY display blanks leading zeros for all delays except zero delay. This is done intentionally so that a 0000 indication is produced instead of blanking the display.

DOUBLE PUSHBUTTON

This control doubles the current delay. When the delay is doubled, the unit's frequency response rolls off at about seven kHz with a six dB per octave slope. The Harmonizer's normal response rolls off at about sixteen kHz at a slope of about 60 dB per octave.

An indicator directly over the button is illuminated and reads 2X when the unit is in the DOUBLE mode.

SAVING PRESET DELAYS

The five PRESET Delay buttons and the SAVE button allow you to store and instantly recall five delays. These delay values are stored in nonvolatile memory and will not be lost when the unit is turned off. When the unit is turned on, the delay value saved as PRESET 1 becomes the active delay.

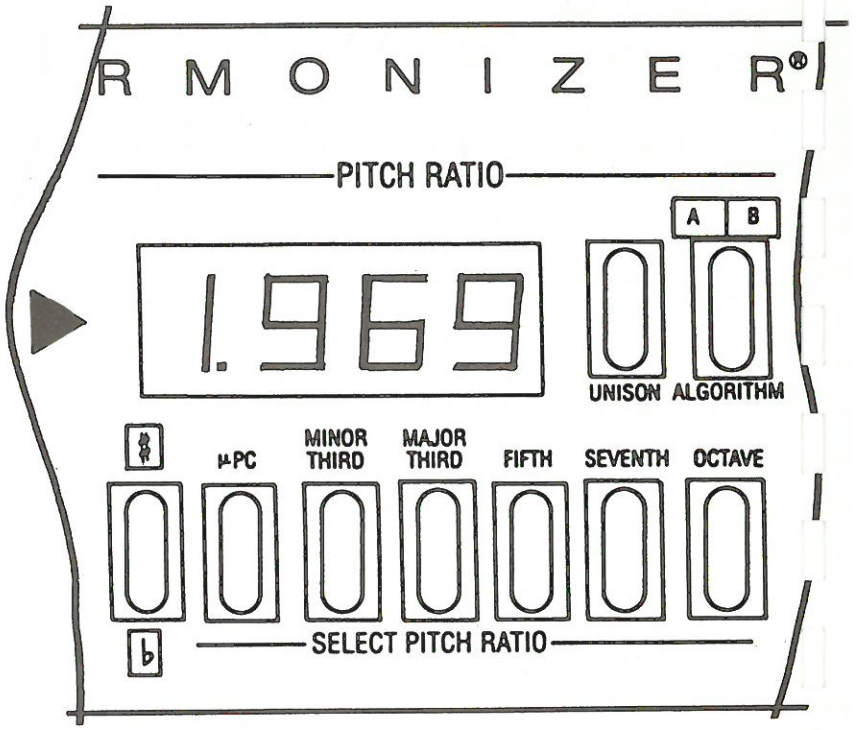
To establish a preset, press and release the SAVE pushbutton. The decimal points in the DELAY display will blink to indicate that the SAVE mode is active. While the decimal points are flashing, pressing one of the five PRESET buttons will store the delay value showing in the display as the corresponding preset.

The SAVE mode will automatically cancel after a few seconds or may be cancelled by pushing SAVE again.

The SAVE and PRESET buttons are always active and will change the delay when pressed. The nonvolatile memory is powered by a lithium battery while the Harmonizer is switched off. This battery will maintain the preset delay values for at least two years.

PITCH CONTROLS

The pitch control section of the Harmonizer consists of a four digit PITCH RATIO display, six fixed PITCH RATIO buttons, a SHARP (#)/FLAT(b) button, a UNISON button and an ALGORITHM button.



PITCH RATIO DISPLAY

This display indicates the current value of pitch ratio in 0.1% steps from 0.000 to 2.000. Note that no pitch change effect is heard unless the unit is in its PITCH CHANGE mode. However, the display shows what the pitch ratio will be when the PITCH CHANGE mode is activated.

SHARP/FLAT BUTTON

This control determines whether the PRESET PITCH RATIO buttons act to raise the pitch ratio above 1.000 or decrease it below 1.000.

When the SHARP indicator (#) is illuminated, the pitch ratio presets act above unity. When the FLAT indicator (b) is illuminated, they act below unity.

SELECT PITCH RATIO BUTTONS

These six fixed PITCH RATIO buttons give some standard musical pitch ratios. They work with the SHARP/FLAT button to give a uPC (Micro Pitch Change), Minor Third, Major Third, Fifth, Seventh or Octave either above (SHARP) or below (FLAT) the original signal.

UNISON BUTTON

This control sets the pitch ratio to 1.000.

ALGORITHM BUTTON

This button selects one of two possible types of operation in PITCH CHANGE mode. In ALGORITHM A, the H969 is always monitoring the signal passing through it and making adjustments to produce a smooth sounding output. At some extreme pitch ratios however, these adjustments may be objectionable. If this is the case, setting the control to select ALGORITHM B will prevent the system from making these adjustments.

Specifically, the ALGORITHM button determines how the Harmonizer handles the "glitches" that result from the pitch change process.

The A algorithm takes advantage of the signal processing and analysis capabilities of the H969. This process allows the Harmonizer to almost completely eliminate the "glitches" produced by all pitch change devices that operate by deleting or adding signal segments. The computer that controls this function determines the optimum splicing point, reducing the potential glitch to inaudibility in many cases.

Algorithm A works best with single instrument program material. If signals containing greatly differing frequency components are used, the process won't work as well. For example, if the signal is a singer with a full-level bass guitar mixed in (not merely channel crosstalk), Algorithm A will usually "lock on" to the voice and the bass guitar will sound wavery.

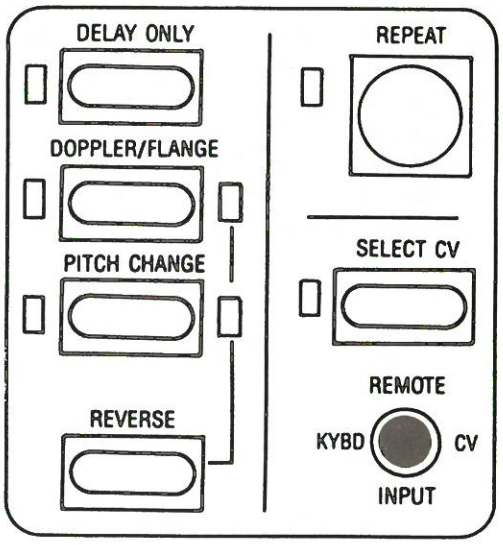
At pitch ratios near 1.000, these so-called "glitches" occur relatively infrequently and are much less apparent than at greater pitch deviations.

Algorithm B is characterized by glitches which occur with increasing frequency as the pitch ratio deviates from unison (fixed splicing). The severity of the glitches depends greatly on the program material.

Algorithm A can be used in most pitch change conditions. Algorithm B is included for those rare situations when Algorithm A produces an output that is unacceptable for a particular application.

Backlit legends A or B will illuminate so that you can tell which algorithm is active. Whenever you enter PITCH CHANGE mode, the Algorithm A legend will be lit, as this is the mode most often used.

OPERATIONAL MODES



The four buttons located in a vertical column to the right of the front panel select the principle operating mode of the H969.

The Harmonizer has four main modes: DELAY, PITCH CHANGE, FLANGE and DOPPLER Shift with the ability to create three additional modes; REVERSE PITCH CHANGE, REVERSE FLANGE, and REVERSE DOPPLER Shift by use of the REVERSE pushbuttom. Short Audio time segments may also be REPEATED.

Six of these modes are mutually exclusive; that is, with the exception of DELAY, only one effect can be used at a time. DELAY, however, can be combined with any other effect.

To enter the DELAY, PITCH CHANGE, or FLANGE mode, hit the appropriate button. The indicator to the left of the button will illuminate indicating the corresponding mode. DELAY and PITCH CHANGE modes have been described in the previous section.

FLANGE/DOPPLER

When the FLANGE mode is selected, the FLANGE legend near the center of the panel will illuminate. After entering the FLANGE mode, repeated hitting of the FLANGE button will cause the unit to alternate between flange and doppler shift effects. Whenever the DOPPLER Shift mode is active, the DOPPLER legend will be illuminated.

When using FLANGE mode you will find that the best sounding flanging will occur if the front panel MIX slider is at its EFFECT position. In any other position the flanging effect will be diminished. You can set the FEEDBACK slider to any position in the DOPPLER Shift mode but be careful when you switch back to FLANGE. YOU MUST USE CARE IN APPLYING FEEDBACK WHEN IN FLANGE MODE. SETTING THIS SLIDER TOO HIGH WILL CAUSE OSCILLATION WHICH CAN BE INJURIOUS TO BOTH EARS AND EQUIPMENT.

When switching between FLANGE and DOPPLER, you may hear a small audio level shift. This is normal and is caused by the mixing action introduced in the FLANGE mode.

The delay PRESET buttons are the only way to change the delay while in the FLANGE or DOPPLER modes.

REVERSE

In the REVERSE mode the Harmonizer reads out its memory data backwards, producing a backward sounding output. Short signal segments are presented in a time-reversed order. The segment length depends on the front panel delay time selected only and not on the pitch ratio. Shorter delays cause shorter segments to be reversed. You can reverse segments lasting up to 1.5 seconds. This implies that you cannot reverse the time order of an entire program as would occur if you played a tape backward. The "tape recorder" analogy to REVERSE mode would be cutting up a tape into segments and splicing the segments back together in the same order after reversing each segment independently. The audible effect is similiar, except for signals which have very long attack or decay times.

While in FLANGE/DOPPLER or PITCH CHANGE modes, pressing the REVERSE button will cause the unit to produce the output audio backwards. An indicator to the right of one of these two mode buttons will illuminate to let you know that REVERSE mode is active. If you alternate between FLANGE/DOPPLER and PITCH CHANGE modes the REVERSE mode indicators will stay lit. If you enter DELAY mode, the REVERSE mode will be cancelled. In REVERSE mode the delay length controls the length of the reversed segments. Since perception of reversal depends upon attack and decay transients, short delays will sound as if the REVERSE mode was inactive.

You can use any front panel control as you usually would, including changing the pitch ratio. However, you should realize that, although the delay variation in normal PITCH CHANGE mode is limited to a very short amount, the varying delay in REVERSE is dependent on the delay setting. This may cause confusion if long delays are used and mixed with non-delayed signals using the MIX slide pot. The effect of REVERSE in FLANGE mode will not produce a reverse flange effect, instead, a mix of delayed and reverse signals will be heard.

REPEAT

Pressing the REPEAT button causes all data in the memory to remain constant. All audio input entering the Harmonizer in this mode is lost. The audio within the memory will remain indefinitely until the REPEAT mode is exited either by pressing REPEAT again, by entering DELAY mode, or by removing AC power from the unit.

In REPEAT, you can select the length of the piece of stored or 'frozen' signal which is read out. This is done by changing the delay. However, in this case, the result also depends on the pitch ratio. When the pitch ratio is greater than 1.000, shorter delays produce shorter repeated segments. When the pitch ratio is less than 1.000, shorter delays produce longer repeated segments.

As with REVERSE mode, REPEAT cannot be engaged while in DELAY mode and will cancel if you enter DELAY.

When you try to capture a segment of audio with the REPEAT control, remember that the segment thus captured is that which is present in the memory at the instant that the button is pressed. If you are listening to a delayed output, part or all of the signal segment which you heard immediately prior to depressing the button will be lost, depending upon the delay setting. It is much easier to select a section to be repeated if you monitor the input signal or set the delay to zero.

PITCH RATIO AND DELAY TIME CONTROL

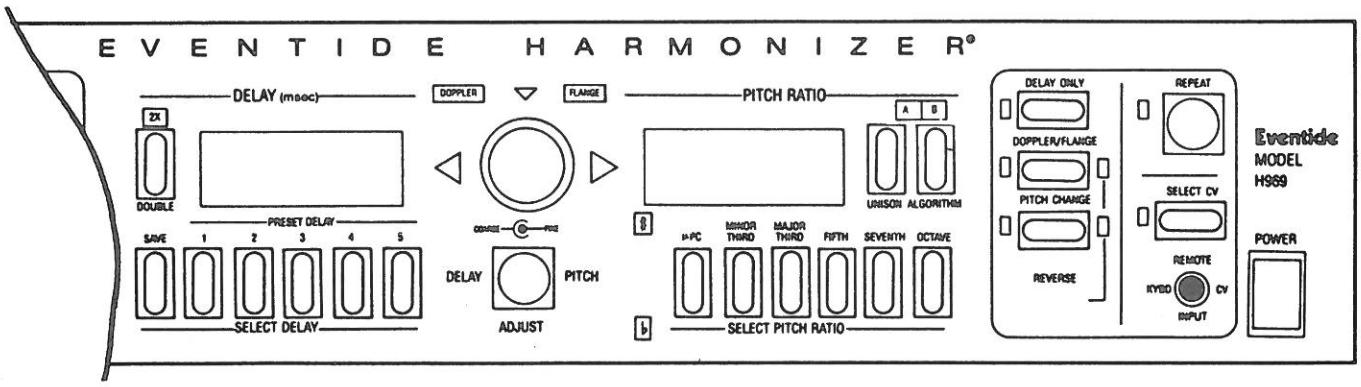
The dual concentric pot between the two displays and the ADJUST pushbutton located beneath it are used to adjust the delay time or pitch ratio.

The software in the Harmonizer gives you a choice of two operating modes for the center pot. These are a POSITIONAL mode or COUNTING mode. In addition, the pot mode is one of the items remembered in the system's nonvolatile memory. This means that the unit will power up in the same pot mode that it was in when turned off.

POSITIONAL control means that the numbers in the display are proportional to the rotation of the pot from its fully counterclockwise position. A familiar example of POSITIONAL control is a volume control where fully counterclockwise corresponds to off and clockwise rotation produces a loudness increase that is proportional to the position of the control.

COUNTING control changes the numbers automatically. If the control is centered, counting does not occur. If the control is moved clockwise, the numbers count up at a rate dependent on the amount of rotation. Likewise, a counterclockwise movement from the center position causes the numbers to count down.

There are three backlit arrows clustered about the center pot. These arrows tell you at a glance how the Harmonizer will react to the pot settings. One of the larger arrows points to the left of the pots towards the DELAY display. This arrow is called the DELAY arrow. The other large arrow points to the right of the pots towards the PITCH RATIO display. This arrow is called the PITCH RATIO arrow. The third arrow is located above the knobs and points down at them. It is smaller than the other two and is called the MODE arrow.



POSITIONAL MODE

If the MODE arrow is not illuminated, the H969 controls are in POSITIONAL mode. If the MODE arrow is lit, pressing and holding the ADJUST button until the arrow goes out places the unit in POSITIONAL control mode.

In this mode, either the DELAY or PITCH CHANGE arrow will be illuminated, indicating which display will be affected by the controls. The illuminated arrow will blink except when the pot is being turned, during which time it will be constantly on. The large knob acts as a Coarse control and the small knob acts as a Fine control. In DELAY mode, the coarse control makes changes in 96 ms steps and the fine control makes 6 ms changes. In PITCH CHANGE mode, the coarse control makes 3% changes and the fine control makes 0.1% changes.

Momentarily depressing the ADJUST button allows you to switch the controls so you can alter either the delay setting or the pitch ratio.

If the Harmonizer is in its POSITIONAL control mode, the DELAY arrow will be blinking whenever you enter the DELAY mode of operation. This is done for your convenience since you will probably wish to alter the delay and not the

pitch ratio. Likewise, whenever you enter PITCH CHANGE mode by pressing the PITCH CHANGE button, the PITCH RATIO arrow will be blinking, again for your convenience in altering the pitch ratio. In either mode, you can switch between pot control of delay or pitch ratio by pressing ADJUST.

In order to avoid inadvertently changing any settings when using the controls to establish a new delay or pitch ratio setting, operation of the ADJUST button does not make the pots active. Only after the pots have been rotated approximately five degrees in either direction do they begin to affect the display indicated by the arrow.

All of the PRESET buttons, however, are always active and change the display with which they are associated whenever they are operated.

COUNTING MODE

The COUNTING mode is enabled by pressing and holding the SELECT button until the MODE arrow lights.

If the unit is in its DELAY or PITCH CHANGE operating mode, either one or both of the large arrows may be lit. The large knob affects the DELAY display and the small knob affects the PITCH RATIO display.

If the large knob is centered, the DELAY display will not be counting and the DELAY arrow will be off. If it is rotated clockwise from center, the DELAY arrow will come on and the delay will increment in 6 ms steps at a rate determined by the amount of rotation. If the knob is rotated counterclockwise the delay will count down.

The small knob behaves the same except that it affects the PITCH RATIO display and counts in 0.1% increments. When the end of the display range is reached while counting the displays will roll over to zero or full scale and continue counting.

Note that counting is inhibited in the small "deadband" near the rotational center of each knob. The large arrows are always <u>off</u> when their respective knobs are centered and counting is stopped.

FLANGE/DOPPLER CONTROL

When operating in either the FLANGE or DOPPLER mode both the DELAY and PITCH RATIO arrows are off. This indicates that you can not alter the delay or the pitch ratio. The two pots now have new functions, OSCILLATOR RATE (outer knob) and MANUAL CONTROL (inner knob).

When you first enter the FLANGE/DOPPLER mode, the FLANGE mode will be functional and the Algorithm A indicator will be lit.

This tells you that the large knob acts as an OSCILLATOR RATE control. You can set the sweep rate from very slow (counterclockwise) to very fast (clockwise) by turning the large knob.

If you press the ALGORITHM button so that the B legend is lit, the sweep will stop. If the small knob is "off" (fully counterclockwise), then when you return to Algorithm A the sweep will resume at the same place. That is, the flanging delay will stop sweeping but won't be altered. If the small knob is not "off" when you stop the sweep, the delay will jump to a point determined by the inner pot setting. Now if you resume the sweep, the effect will start at this new beginning point. This feature lets you choose where the sweep begins and repeat this same effect every time you go in and out of algorithm B in FLANGE mode. Also, you can use the small knob as a manual flanging control if you stay in Algorithm B.

The controls function identically in the DOPPLER mode. You can start and stop the sweep and preset the starting point as outlined above.

FLANGE/DOPPLER ALGORITHM USAGE CHART

	FLANGE or DOPPLER	INNER KNOB		OUTER KNOB		
ALGORITHM	CONDITION	POSITION	STATUS	POSITION	STATUS	
A	ACTIVE	ANY	INACTIVE	ON	ACTIVE	Can control sweep rate by turning outer knob. (Fast = Clockwise)
B	ACTIVE	OFF	INACTIVE	ON	ACTIVE	This setting resumes Flange or Doppler effect at outer knob sweep rate position. (After you have cancelled Flange/Doppler by going to Alg B with inner knob "OFF".)
A	INACTIVE	OFF	INACTIVE	ANY	INACTIVE	This setting stops (CCW) Flange or Doppler effect. Flange will resume at sweep rate position of outer knob when you then return to Alg A.
B	ACTIVE	ANY	ACTIVE	ANY	INACTIVE	Can manually control Flange or Doppler.
B	ACTIVE	ANY	ACTIVE	ANY	INACTIVE	Can turn inner knob to determine point where sweep will begin when you go into Alg A. (You must have previously set sweep rate with outer knob when in Alg A.)

REMOTE CONTROLS

IN/OUT BYPASS JACK

This rear panel jack allows you to remotely control the Line In/Out function. To use this feature connect a normally open momentary switch between the TIP and RING contacts of a phone plug. A MOMENTARY switch must be used for this application.

Most of the front panel will appear to be 'dead' if you use an on-off switch rather than a momentary switch to remotely control the Line In/Out relay from the rear panel jack. This occurs because the computer which looks at the switches and the rear jack debounces most of the switches by waiting for a button to be released; thus, a nonmomentary switch appears as a held down button.

KEYBOARD/CONTROL VOLTAGE JACK

Before attempting to use a remote control please read this paragraph very carefully. Never connect anything other than a totally resistive control or an Eventide supplied accessory to the KEYBOARD/CONTROL VOLTAGE jacks. Voltages in excess of five volts or ground faults from line operated equipment will destroy the unit.

A potentiometer control must be wired with the ends of the pot connected across the RING and SLEEVE contacts of a standard stereo plug. Connect the pot's wiper to the TIP contact.

The best way to use this feature is to place the unit in the POSITIONAL control mode. This will allow the remote control to vary either delay or pitch ratio depending on the position of the ADJUST switch. Additionally when operating in the FLANGE/DOPPLER mode you can adjust sweep speed. When the remote control is active, an indicator located next to the SELECT CV button will be illuminated.

GROUNDING

As with any piece of audio equipment, good grounding practices should be followed when connecting the Harmonizer.

A sure sign of a grounding problem is an unexpected hum or buzz that is present even when the H969 is turned off or not in a LINE IN (active) condition. Remember that there are relays in the Harmonizer that bypass the unit in both of the above conditions. This feature permits rapid evaluation of external equipment and eliminates the Harmonizer as a potential source of trouble.

A grounded line cord must always be used with the Harmonizer. Faulty grounding can result in a potentially dangerous condition in addition to creating unacceptable audio hum.

IS IT NORMAL IF.....?

Sometime you may think that the Harmonizer is not working properly. This may only be the result of perfectly normal operational characteristics. This list outlines some of the more common items.

1. The Harmonizer may react unpredictably if the AC power fluctuates significantly or if the power switch is rapidly switched off and on. Turn the unit off and wait at least ten seconds before turning the power on again to reset the unit.

2. In general, changing modes using the mode buttons (DELAY, PITCH CHANGE, and FLANGE/DOPPLER) is relatively noiseless. However, you may notice a series of 'burbling' noises for about 1/2 second when entering PITCH CHANGE mode. This is done by software control in order to assure proper synchronization of the pitch change circuitry.

3. It is possible, although unlikely, for the pitch change circuitry to become 'confused'. The audible effect will be either an increasing delay or a tempo change. Pressing the PITCH CHANGE mode button or switching to DELAY mode and back to PITCH CHANGE mode should fix the problem. Turn the AC power off and on only if this does not work.

4. Using the Harmonizer at pitch ratios less than 0.500 may result in signal distortion. This distortion will depend on the program material. Signals with significant high frequency content will probably begin to include beat notes or whistles at pitch ratios less than 0.400. Any signal will begin to sound quite strange at pitch ratios less than 0.300. However, these pitch ratios can be useful for special effects, for which reason they are made available.

5. Using the Harmonizer in REVERSE and/or REPEAT modes at pitch ratios much different from 1.000 will cause a tempo change. This is normal.

6. The bottom LED of the bargraph audio level display does not go on at a fixed level. It should illuminate at about -60 dBm, although this figure may be off by as much as $\pm$10 dB. The purpose of the display is to show relative levels; it is not a calibrated instrument.

7. When both the rear and front panel audio inputs are in use, the Harmonizer may clip the input signals even though the bargraph display continues to indicate normal levels. This is because the two input signals are mixed together before they are applied to the level control and because the bargraph is driven after the level control. This problem can not be remedied by adjusting the LEVEL slider since the clipping occurs before the signals are mixed. The only way to overcome this is to lower the input level external to the unit. See Audio XLR Connectors section (page 4) for maximum recommended level.

8. When switching between DOPPLER and FLANGE modes a small level shift will occur. This is due to an internal level change which is necessary to avoid clipping in FLANGE mode.

9. The REPEAT button does not work in DELAY mode.

10. The REVERSE button does not work in DELAY mode.

11. When The 2X indication is lit (DOUBLE mode) the delay is doubled. When in PITCH CHANGE and FLANGE/DOPPLER modes, the delay is always varying over a limited range. When the unit isn't in 2X mode, the maximum delay is short enough to be relatively imperceptible. In 2X mode the delay range is also doubled and may be noticeable, especially in a mixdown session where several tracks are being combined.

12. If the pots are set to COUNTING mode and you enter the FLANGE/DOPPLER mode, DELAY and PITCH RATIO will begin to count when you exit this mode unless you center the pots first.

13. If strange things happen frequently, check your line voltage and be sure that the unit is properly ventilated. Remember, the Harmonizer is actually a complex computer system with two processors. Like your personal or office computer, it is susceptible to line voltage spikes and brownouts. If problems persist, you may want to use a spike protector, various types of which are available from several manufacturers at computer stores.

14. The rear panel regulator is touchable yet mounted on a mica insulator. The insulator prevents hum in the output. There is no exposed high voltage on the regulator.

APPENDIX A
EXPERIMENTS

CONTENTS

INTRODUCTION

This section should help you learn to use the H969. The Harmonizer may seem complex, but it is easy to use. Once you have read the preceding sections, take a few minutes to try some of the following examples. You'll find the experiments more useful if you do them in order, as they flow from one to the next. These experiments explore some of the basic Harmonizer operational modes. Feel free to try any combination of buttons and controls (see WARNING! below). If you get confused, reread the description of the various controls.

Each experiment includes initial settings and a step-by-step procedure. If a parameter is not noted as initialized, the Harmonizer will perform the described functions independent of the setting of that parameter. This is described as a "Don't Care" condition.

WARNING!

TAKE CARE OF YOUR EARS AND SPEAKERS. DO NOT WEAR HEADPHONES UNTIL YOU ARE FAMILIAR WITH THE OPERATION OF THE H969. KEEP MONITOR OR AMP LEVELS MODERATE WHEN USING FEEDBACK. ADDING TOO MUCH FEEDBACK IN THE FLANGE MODE CAN MAKE THE HARMONIZER OSCILLATE OR 'HOWL' WHICH IS HARD ON YOUR EARS AND EQUIPMENT.

AUDIO HOOKUP

Before using the Harmonizer, let's go over how to connect audio signals to and from it.

Line level: connect the line level to the INPUT XLR and connect the rear panel OUTPUT XLR to a monitor channel.

Instrument level: connect a guitar or microphone to the FROM INSTRUMENT phone jack on the front panel and connect the front panel TO AMPLIFIER phone jack to an instrument amplifier input.

Note that you can mix these up somewhat if you wish. For instance, you can connect a line level input to the INPUT XLR and obtain a low level output at the TO AMPLIFIER jack. It is assumed that you will have proper input signals levels in all experiments; that is up to you.

EXPERIMENT #1: DELAY Mode, DOUBLE Mode and PRESETS

INITIAL CONDITIONS:

MIX slider to EFFECT
FEEDBACK slider to OFF
Press DELAY button

The input signal is connected on power up (note that the LINE IN indicator is lit). You can tell that the unit is in the DELAY mode since the DELAY indicator is lit. Set audio INPUT slider to MAX or a bit less so that the bargraph only occasionally reaches full scale (clipping). You are now listening to the delayed output of the Harmonizer.

If the small red indicator arrow over the center pot is lit, press and hold the ADJUST button until it goes out. The control mode now active is called the POSITIONAL mode. The green indicator arrow pointing left from the pot should be blinking showing that the pot will control the left (DELAY) display. Rotate the center pots to change the delay. Notice that the large knob changes the delay in 96 ms (millisecond) steps (Coarse) and the small knob changes the delay in 6 ms steps (Fine). This type of alteration is POSITIONAL -- the delay depends on pot position.

Press the DOUBLE button. The delay will be doubled as shown by the 2X indicator, the DELAY display, and the audio output itself. You may notice a lessening of the output frequency response. Press the DOUBLE button again to return to normal.

Using the center pots, set the delay to 30 ms. Press the SAVE button and while the DELAY display decimal points are flashing, press PRESET 1. Repeat this to store four other values of delay in PRESET 2 through PRESET 5.

Turn the power switch off. Wait about ten seconds and turn it back on. Note that the delay is 30 ms. The Harmonizer always sets the delay to the PRESET 1 value when the unit is turned on. Try pressing the other PRESET buttons to recall the delays you stored. You may now set any preset delays you desire.

Press the ADJUST button once (don't hold it down). Note that the green arrow pointing to the DELAY display goes out and that the yellow arrow pointing right to the PITCH RATIO display begins to blink. Adjusting the center pots now changes the PITCH RATIO display but has no audible effect. This is due to the fact that the unit is still in DELAY mode.

Press ADJUST again. The arrow now points left to the DELAY display and is blinking. Notice that even though you moved the center pot in the PITCH CHANGE mode, the DELAY display hasn't changed from where you left it. Now move either knob. The Harmonizer waits for either knob to turn a small amount before the DELAY display reflects the current pot position. Press any delay PRESET button. Try the pot again and observe the same control characteristic. This feature keeps the delay from returning to the pot setting after you release the PRESET button.

Set the delay to 600 ms. Slowly increase the FEEDBACK slider. Note the reverberation effect. Decrease the FEEDBACK slider to MIN.

Set the MIX slider to the center. Notice that the output now contains both the original and delayed signals. Now set the MIX slider to DRY. The delay will be completely gone. Restore the MIX slider to EFFECT.

Try pressing the LINE button repeatedly. Note that when the line is not "IN" the signal actually bypasses the Harmonizer, leaving the original signal.

Many different types of program material (vocals, percussion sounds, acoustic, and electronic instruments - virtually anything) can be made more interesting by experimenting with different settings. For instance, a vocal accent can be set to have a repeat which coincides exactly with the rhythm of the song by setting the delay properly.

EXPERIMENT #2: PITCH CHANGE Mode, ALGORITHM Select and PRESETS

INITIAL CONDITIONS:

MIX slider to EFFECT
DELAY set to ZERO
Press UNISON
Press PITCH CHANGE
FEEDBACK to OFF

You are now listening to the pitch change mode but no actual change is occuring.

As you press the buttons under the PITCH RATIO display, you will hear the difference. Try both the SHARP (#) (pitch ratio above 1.000) and FLAT (b) (pitch ratio below 1.000) positions of the leftmost button with the other buttons.

You can also adjust the pitch ratio using the center pots.

Press the ADJUST button and the arrow will point to delay. Try adjusting the delay. Notice that the delay change is immediate, unlike the pitch ratio change from the last experiment. Press ADJUST again and observe that the pitch ratio doesn't change until you move one of the knobs or push a PITCH RATIO PRESET button. You have already seen that using the pitch ratio buttons has a similiar effect with respect to the knob position as do the delay PRESET buttons in DELAY mode. That is, the pitch ratio doesn't follow the pot position until you move the knobs.

Now set the pitch ratio to 2.000. Press the ALGORITHM button. Notice that the B legend comes on. You may or may not notice a change in the output signal but the automatic deglitching is defeated in Algorithm B. Now set the pitch ratio to 1.010 by using the SHARP (#) setting with the uPC (MICRO PITCH CHANGE) button. Set the delay to zero, and return to Algorithm A.

Slowly move the FEEDBACK control up. You will notice a very unusual effect. This is due to the recirculation of the output audio. Every time a signal is pitch changed, it recirculates and is pitch changed again (and again and...). Note that the 'arpeggiation' is up in pitch. This is due to the SHARP (#) pitch ratio. Press the #/b (SHARP/FLAT) button so that b is illuminated. Press uPC again and the pitch ratio will go to .990. Note that the effect now goes down in pitch.

Now try each of the delay presets that you stored before. Note that the additional delay lengthens the recirculation time and makes the effect sound even stranger. Feel free to try any combinations of DELAY, PITCH RATIO and FEEDBACK settings that you like. You may also wish to engage DOUBLE mode. The arpeggiating effect is unusual, and is one of the most fun to play with by changing control settings. However, be careful that the unit isn't driven into clipping. If the input level indicator indicates clipping reduce the level of the FEEDBACK or INPUT sliders.

A popular use of the PITCH CHANGE mode is to raise or lower the pitch slightly (1.010) and then either sing or play an instrument into the H969. The MIX fader should be somewhere in the middle with FEEDBACK at off.

EXPERIMENT #3: COUNTING and POSITIONAL Control Modes

INITIAL CONDITIONS

DELAY set to ZERO
PITCH RATIO set to UNISON (1.000)
Control Knobs Both Centered

Press and hold the ADJUST button. After a few seconds, the small arrow over the knobs will illuminate. Both big arrows should be off. This indicates that the controls are now in COUNTING mode. Verify this for yourself by turning each knob. Note that the large knob affects the DELAY display and causes the DELAY arrow to light. The smaller knob affects the PITCH RATIO displayand causes the PITCH RATIO arrow to light. When an the pots are centered, counting is inhibited and the arrows are off.

Set both display counting speeds to some moderate rate. Press a delay PRESET. Observe that the DELAY display immediately alters to the preset delay and continues counting. Press a pitch ratio PRESET. Notice a similar effect on the PITCH RATIO display.

Restore the Harmonizer to POSITIONAL mode (small arrow off) by pressing and holding the SELECT button again. Although you needn't confirm it now, you will find that your choice of POSITIONAL or COUNTING modes is maintained even when you turn the Harmonizer off.

EXPERIMENT #4: FLANGE and DOPPLER Effects

INITIAL CONDITIONS:

DELAY set to ZERO
Both adjust pot knobs fully counterclockwise
MIX on EFFECT

Press The FLANGE/DOPPLER button. Observe that the indicator next to the button illuminates, as well as the word FLANGE above the control knobs. Press the button again. Now the word DOPPLER illuminates. This is how to tell if you are in FLANGE or DOPPLER mode.

Return to FLANGE mode by pressing the button again. You will hear a slow flanging sweep. Turning the larger knob clockwise will increase the flange sweep rate. Try this, and when done, return the knob to center position.

Be sure the small knob is fully counterclockwise. Press the ALGORITHM button. Notice that the sweep stops and the 'B' indication is lit to notify you of this ('A' is lit when the sweep is running). Press the button again and the sweep resumes. You may wish to try this a few times to verify that the sweep resumes where it left off.

Move the small knob. Press the ALGORITHM button twice. Try this several times and you will observe that when the sweep resumes it does so from a controllable starting place each time. The small knob controls the sweep starting position.

Press the ALGORITHM button as needed to place the unit in ALGORITHM B and observe that the small knob acts as a manual control when the sweep is stopped. Return to ALGORITHM A.

Press the FLANGE/DOPPLER button to place the unit in DOPPLER mode. You can do the same sweep and manual experiments just completed to see that controlling the doppler shift effect is identical to that used with FLANGE mode.

The only way to change the delay while in FLANGE or DOPPLER modes is to use the delay PRESETS or to set the delay before entering these modes.

Add various delays and amounts of feedback to get a feel for the range of these two effects.

CAUTION: Short delays or no delay with maximum feedback can cause system feedback which can damage your ears and/or equipment!

FLANGE and DOPPLER effects are particularly effective on long sustaining program material such as guitar slides, long-held vocal notes, synthesizers and widely spaced percussion sounds.

EXPERIMENT #5: REVERSE and REPEAT Function

INITIAL CONDITIONS:

DELAY set to ZERO
Press PITCH CHANGE Button
Press UNISON
MIX slider to EFFECT
FEEDBACK slider to OFF

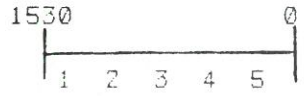
You are now in UNISON RATIO PITCH CHANGE mode. Press REVERSE. Note that the indicator to the right of the PITCH CHANGE button is lit. Press FLANGE/DOPPLER. Note that the unit stays in reverse and that the REVERSE mode indication 'follows' the mode. Press DELAY ONLY and then PITCH CHANGE. Note that the REVERSE mode is cancelled.

Press REVERSE again. Observe that the audio output sounds 'warbly'. This is because the reversed segments are short. Press ADJUST to allow the control knobs to change the Delay time. Lengthen the delay and observe that the segments also lengthen when the Delay is greater than zero. Press ADJUST again and alter the PITCH RATIO. Observe a tempo change as the pitch ratio is altered.

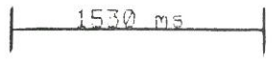
Set the delay to ZERO and the pitch ratio to UNISON. You should be able to do this without any help by now (you may find it helpful to set one of the PRESETS to zero since you will often wish to zero the delay). Defeat the REVERSE mode by pressing the REVERSE button as needed to shut off the indicator.

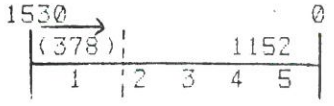
Press REPEAT. The LED next to the button will be lit to indicate that this mode is active. Observe that the output signal sounds like a 'buzz'. This is because the repeated segment is very short. Use the knobs to lengthen the delay and note that the repeated segment becomes longer. This mode can be easily demonstrated with a mic and voice input to the H969. Set the delay to 1530 ms. Count 1,2,3,4,5 and then press repeat. The repeat will capture the preceding 1530 ms signal. The amount of memory will be determined by the amount of delay. Double mode works also but at half bandwidth. While holding the signal in the full REPEAT mode (1530 ms) you can pitch-change the repeat upwards (try hitting the pitch presets in the # mode). Since the memory is really just a delay that is held and repeated, the amount of delay you set will determine the amount of memory you will hear.

For instance, assuming that you start off with 1530 ms of delay, say "1,2,3,4,5" (fast enough to fit within 1530 ms) and immediately press REPEAT. Now change the delay to 1152 ms (approx.), making sure that the pitch is at unison. You have now temporarily removed the first 378 ms (1530 - 1152 = 378) from the memory (the "1" of the 1,2,3,4,5 count will be missing). By continuing to decrease the delay, the memory will begin its ever-shortening cycle further and further into the memory.



Full memory.

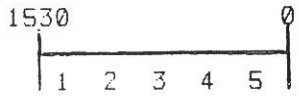




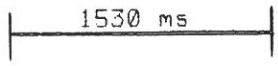
Segment is shortened (from the beginning of memory) as you lessen delay when pitch is at or above UNISON.

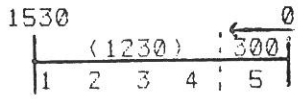
If you put the delay back to 1530 ms, you will hear all of your memory. However, if you pitch change below-unison, you will hear nothing. to hear the full memory at a below-unison pitch change, you must set the delay to zero ms. As you add milliseconds to the delay display, you are actually "removing" memory from the back end of the repeat.

For instance, by having 300 ms of delay displayed (pitch below unison), you would hear "1,2,3,4" of a 1,2,3,4, 5 count.



Full Memory.





Segment in memory is shortened (from the back end of memory) as you add delay when pitch is below UNISON.

You can always get the full amount of original signal in memory by setting the delay to zero when the pitch is below unison, or 1530 ms when pitch is at or above unison.

You may wish to try to isolate some section of what you saved in REPEAT mode by using the DELAY and PITCH CHANGE controls.

The above experiments illustrate how the pitch ratio and delay both affect the repeated segment length. This is different from the REVERSE mode where only the delay setting matters.

The REPEAT function is cancelled either by pressing the REPEAT button again or by entering the DELAY mode.

You may notice that changing the pitch ratio from above 1.000 to below 1.000 does not immediately change the segment length. This is due to the fact that the currently recirculating segment must finish before a new one of different length can begin.

Additionally, activating or deactivating DOUBLE mode when in REPEAT mode will apparently change the tempo and pitch. This occurs because the DOUBLE mode alters the Harmonizer's sampling rate and the currently recirculating segment is read out of the memory at twice or half speed, depending on whether you were in NORMAL or DOUBLE mode when REPEAT was pressed. A similar effect is heard in DELAY mode or PITCH mode, but only momentarily.

There are many more interesting, confounding and truly strange effects you will undoubtly discover as you gain experience in using the Harmonizer. These five experiments are provided to start you on your way. Check the "Is It Normal If....." section of this guide if the things that you discover seem too unusual.

LIMITED WARRANTY
and other legal stuff, terms and conditions

The H969 is built to exacting quality standards, and should give years of trouble free service.

If you are experiencing problems which are not cleared up (or explained as normal) in this manual, your recourse is this warranty.

WHAT THE WARRANTY DOES AND DOES NOT COVER

The H969 is warranted for a period of one year against defects in material and workmanship. During this period we will repair or replace (at our option) the unit.

This means that if the unit fails under normal operation, because of parts that become defective, or because of defects in construction that later become apparent, (such as bad solder joints, PC traces, etc.,) we will repair the unit at no charge for parts and labor. We also assume a limited responsibility for shipping charges, as detailed below.

The warranty DOES NOT COVER damage or defects due to accident or abuse. The H969 is a complex piece of equipment that does not react well to being dropped, bounced, crushed, soaked, or exposed to excessively high voltages. If the unit becomes defective for these similar causes, and the unit is deemed to be economically repairable, we will repair it and charge our normal rates.

It DOES NOT COVER shipping damage, either to or from Eventide. If you receive a new unit FROM US in damaged condition, notify us and the carrier; we will arrange to file an insurance claim and either repair or exchange the unit.

If you receive a new unit FROM A DEALER in damaged condition, notify them and the carrier.

If WE received the unit FROM YOU with apparent shipping damage, we will notify you and the carrier. In this case, YOU must arrange to collect on any insurance. We will await your instructions on how to proceed with the unit, but will charge for all repairs on damaged units.

WHO IS COVERED UNDER THE WARRANTY

The warranty applies to THE ORIGINAL PURCHASER from an AUTHORIZED EVENTIDE DEALER, providing that the dealer sold a NEW unit. DEMO units are also covered under warranty under slightly different circumstances (see below), and units that are USED, or have been used as part of a rental program, are NOT COVERED under any circumstances.

It is your responsibility to prove or be able to prove that you have purchased the unit under circumstances that effect the warranty. A copy of your purchase invoice is normally necessary and sufficient for this.

If you have any questions about who is an AUTHORIZED EVENTIDE DEALER, call us.

UNITS WITH THE SERIAL NUMBER PLATE DEFACED OR REMOVED WILL NOT BE SERVICED.

WHEN THE WARRANTY BECOMES EFFECTIVE

The one-year warranty period begins on the day the unit is purchased from an authorized dealer, or, if the unit is dropped-shipped from Eventide, on the day shipped, plus a reasonable allowance for shipping delays. This applies WHETHER OR NOT YOU RETURN YOUR WARRANTY FORM.

When we recieve a unit, this is how we determine whether it is under warranty:

1: IF the unit was shipped within the past CALENDAR YEAR, we assume that it is, unless there is evidence to the contrary, such as it's having been sold used, rented, etc.

2: IF the unit was shipped LONGER THAN A CALENDAR YEAR AGO, we assume it ISN'T UNDER WARRANTY UNLESS:

   A: There is a warranty form on file showing that it has been purchased within the past year under appropriate conditions.

   B: You send a copy of your purchase invoice indicating warranty status along with the unit.

3: If the unit was used as a DEMO, the warranty runs from the date that it was received by the dealer. The original purchaser gets the unexpired portion of that warranty.

When you send a unit for repair, you should indicate whether or not you believe it to be under warranty. IF YOU DO NOT SAY SO, AND WE CHARGE YOU FOR THE REPAIR, we will NOT REFUND unless the charge was caused by an error on our part. If you believe the unit to be under warranty and you DO SAY SO, but WE DISAGREE, you will not incur any charges until the dispute is resolved.

Reading the above, you can see that it is to your advantage to send in the warranty form when you purchase the unit. Also, if we know who you are, we can send you updates, notifications, and advise you of new products. It will also enable you to receive pre-shipment of parts discussed below.

WHO PERFORMS WARRANTY WORK

The ONLY company authorized to perform work under this warranty is EVENTIDE, Little Ferry NJ. While you are free to give it to anyone, (or to work on it yourself), we will not honor claims for payment for LABOR or PARTS from you or from third parties.

HOWEVER, we and our dealers do try to be helpful in various ways:

1: Our dealers will assist, usually without charge during the warranty period, in:

   A: Determining whether there IS a problem requiring return to the factory.

   B: Alleviating "cockpit error" or interconnection problems that may be preventing the gear from operating to its full capability.

2: We are available for telephone consultation if the dealer is unable to assist.

3: If a part fails during the warranty period, and you wish to replace it yourself, we will normally ship the part immediately at no charge providing your warranty form is on file. (We reserve the right to request that the defective part be returned.)

RESPONSIBILITY FOR WARRANTY-REPAIR SHIPPING

For us to work on your unit, it must be here. Shipping suggestions are given elsewhere in the manual. This section details who pays for it all.

SHIPPING WITHIN THE 50 UNITED STATES

You are responsible for getting it to our door at no cost to us. We CANNOT ACCEPT COD or COLLECT SHIPMENTS.

We will return it to you PREPAID, at OUR EXPENSE, using an expeditious shipping method, normally by United Parcel Service. In areas not served by UPS (to the best of our knowledge, only Alaska and certain Hawaiian Islands) we will ship by US Mail.

If you are in a hurry, and want us to use a PREMIUM SHIPPING METHOD (such as air express, next day air, etc.,) be sure you tell us so, and agree to pay shipping charges COLLECT. If you specify a method that does not permit collect or COD charges, remit sufficient funds to prepay shipping.

SHIPPING OUTSIDE THE UNITED STATES

If you purchased the unit from a dealer in your country, consult with them before returning the unit.

If you wish to return it to us, please note the following:

1: The unit must be PREPAID TO OUR DOOR. This means that you are responsible for all shipping charges, INCLUDING CUSTOMS BROKERAGE. When a unit is shipped to us, it must be cleared through United States customs, by an authorized broker. YOU MUST MAKE ARRANGEMENTS for this to be done. Normally your freight forwarder has a branch in the US which can handle this transaction. We CAN arrange to clear incoming shipments for you. If you want our assistance, you must NOTIFY US BEFORE SHIPPING goods for repair, giving full details of the shipment, and including a minimum of $250.00 in US funds to cover the adminstrative and brokerage expenses. Any balance will be applied to the repair charges, or refunded. If a balance is due to us, we will request a further prepayment.

2: ALL SHIPMENTS WILL BE RETURNED COLLECT. If this is impossible because of shipping regulations, or money is due us, we will request prepayment from you for the appropriate amount.

3: All funds must be in $US. Payment may be effected by checks drawn on any bank in the US, or by telegraphic fund transfer to our bank. If you send US Currency, be sure that it is sent by a method you can trace such as registered mail. If you wish to pay by Letter of Credit, be sure that it affords sufficient time for work to be performed and the L/C negotiated, and that it is free from restrictive conditions and documentation requirements.

4: WE RESERVE THE RIGHT TO SUBSTITUTE FREIGHT CARRIERS. Although we will attempt to honor your request for a specific carrier, it is frequently necessary to select a substitute because of difficulties in communication or scheduling.