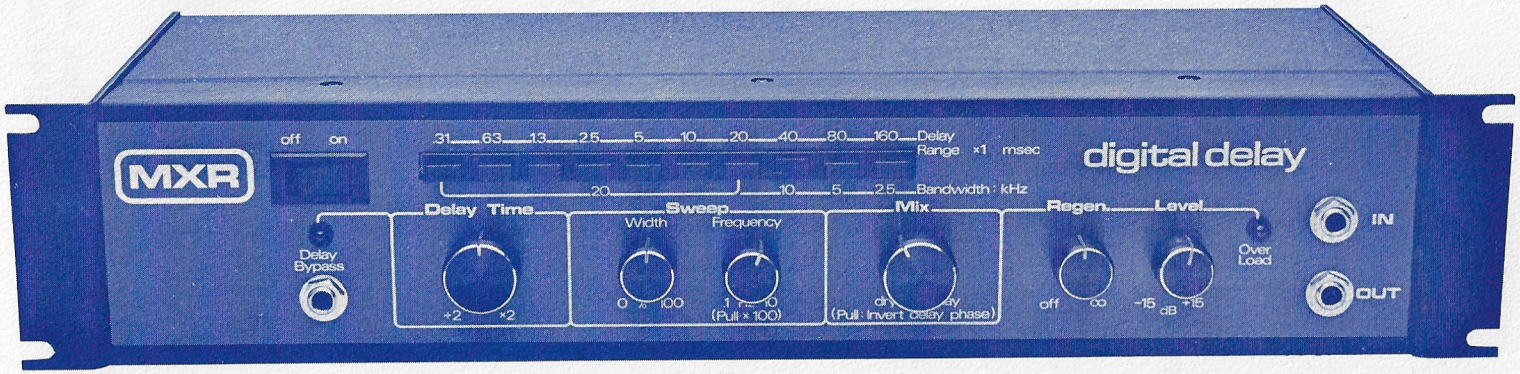
MXR

digital delay

OPERATION MANUAL


MXR
off on
31 63 13 25 5 10 20 40 80 160 Delay Range ×1 msec
20 10 5 2.5 Bandwidth : kHz
digital delay
Delay Time
Sweep
Width
Frequency
Mix
Regen
Level
Delay Bypass
÷2 ×2
0 100
1 10
(Pull × 100)
dry
(Pull : Invert delay phase)
off ∞
-15 dB +15
Over Load
IN
OUT

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INTRODUCTION

The MXR Digital Delay is a self-contained audio delay line which utilizes sophisticated technology to achieve a new standard of professional quality performance. The culmination of an intensive design program, the MXR Digital Delay is unparalleled in versatility, ease of operation, and creative application.

Although the MXR Digital Delay is capable of a wide variety of effects, the basic function of the unit is quite straightforward. The input signal is processed through circuitry which delays the signal by a specific amount of time. It is then mixed back with the 'dry' or undelayed signal at the output of the delay. The effect produced will depend upon the amount of delay time chosen. The basic effects that can be obtained by using appropriate portions of the wide delay range provided by the MXR Digital Delay include discrete echoes, vocal doubling, and hard reverberation. In addition to these basic effects, the MXR Digital Delay contains associated circuitry which allows such unique effects as flanging, pitch alterations (vibrato, pitch bending), frequency modulation and infinite (non-deteriorating) repeat-hold.

The MXR Digital Delay employs digital random access memory to produce a time-delayed signal. This technique, derived from computer technology, represents a departure from previous shift register methods. The analog input signal is converted to digital form, stored in the memory circuitry and removed at some designated later time. It is then converted back to analog form and fed to the output.

This method provides the user with the advantages of a wider usable delay range, more precise control of delay time, and preservation of signal quality. The MXR Digital Delay makes available delay times ranging from 0.08 msec. to 320 msec. (1 second = 1000 msec.), fully variable, without excessive noise or mechanical reliability problems. This delay range is expandable to 1280 msec., in increments of 320 msec., by means of up to three additional plug-in memory boards. These boards are available from MXR and are easily installed by the user.

The MXR Digital Delay is designed for a wide variety of applications including recording, P.A., and amplified musical instruments. The unit is rack-mountable for studio installation, and an optional road case is

available for onstage use by the traveling musician.

Like all MXR professional products, the Digital Delay is manufactured in the U.S.A. to exacting specifications, using the highest quality components and materials combined with reliable construction techniques.

OPERATION

The MXR Digital Delay is human engineered for ease of operation. All controls are clearly labeled and logically grouped according to function. The following discussion explains the control functions in greater depth. The operating controls may be broken down into the following six categories:

- Time Delay Selection
- Delay Sweep Controls
- Output Mix Control
- Regeneration Control
- Level Matching Adjustment
- Externally Controlled Functions

Time Delay Selection

Each pushbutton in the row labeled DELAY RANGE selects a specified 4:1 (two octave) range of delay (the longest available delay in any given range is four times the length of the shortest delay in that range). The number above each pushbutton indicates the center of the designated range.

The actual delay time within any given range is adjusted by means of the control labeled DELAY TIME. This control allows continous variation over the full 4:1 range provided by the selected range pushbutton. The characters '÷2' and 'x2' at the extremes of this control's rotation operate on the delay time designations above the DELAY RANGE pushbuttons.

As an example of the interaction of the DELAY RANGE and DELAY TIME controls, if the '80 msec.' range is selected and the DELAY TIME control is rotated fully clockwise, the actual delay time obtained is 160 msec. As this control is rotated counter-clockwise to its center position, the delay time will decrease to 80 msec. Further rotation to a

fully counter-clockwise position will decrease the delay time to 40 msec. By means of these controls the user may quickly and accurately select any delay time over the entire available range of the device.

Delay Sweep Controls

The sweep oscillator provides automatic control of the delay time. The WIDTH control determines the effect of the sweep oscillator on the delay time. The FREQUENCY control varies the rate of sweep. When the WIDTH control is turned fully counter-clockwise to '0%', the oscillator is deactivated, and the delay time is controlled manually as described previously. As the WIDTH control is rotated clockwise, the sweep oscillator gradually engages. The effect which occurs is identical to that produced by a regular back-and-forth rotation of the DELAY TIME control. The characters '0%' and '100%' refer to the portion of the delay range which is swept automatically by the oscillator. This portion grows larger as the control is rotated clockwise. At positions less than '100%', the location within the overall range of the swept portion is determined by the DELAY TIME control. At '100%' the oscillator sweeps over the entire two octaves of the selected delay range. In this position, the DELAY TIME control has no effect. In its 'in' position, the FREQUENCY control varies the rate of sweep over a 0.1 Hz to 10 Hz range. This control may be pulled out , giving a second range of 10 Hz to 1 kHz (1000 Hz). Thus any sweep rate from 0.1 Hz to 1 kHz may be obtained. The FREQUENCY control will have no effect when the WIDTH control is set at '0%'.

Output Mix Control

The MIX control varies the relative levels of the dry and delayed signal. When it is fully counter-clockwise, only the dry signal is present at the output. As the MIX control is rotated clockwise, the dry signal level decreases as the delayed signal level increases. In the center position the dry and delayed signals are equal in level. When the control is rotated fully clockwise, only the delayed signal is present at the output. The MIX control may be pulled out to invert the delayed signal before it is mixed with the dry signal. This can be useful for certain effects such as flanging.

Regeneration Control

The REGENERATION control allows a variable amount of the delayed signal to be fed back to the input and delayed again. As the control is rotated clockwise, the level of the regenerated signal is increased. At long delay times the REGENERATION control allows the user to obtain multiple repeating echoes. At shorter delay time a 'reverb' effect is possible. The REGENERATION control is designed to allow maximum effect before 'runaway' begins to occur.

Level Matching Adjustment

The LEVEL control allows the user to adjust the input-output circuitry for an optimum match between the incoming signal level and the operating levels required by the Digital Delay's internal circuitry. Associated with this control of signal levels is internal limiting circuitry to prevent overdriving the input during high level peaks. The LED (Light Emitting Diode) labeled 'OVERLOAD' is activated when limiting occurs. For optimum dynamic range, the LEVEL control should be adjusted so that the OVERLOAD LED is activated only on signal peaks. This optimum level will be towards the '–15 dB' mark for low level signals and nearer the '+15 dB' mark for high signal levels.

Externally Controlled Functions

In addition to the versatility afforded by the front panel controls, auxiliary effects may be obtained by means of the external control jacks. The DELAY BYPASS jack, on the front panel, allows the delay circuitry to be removed from the signal path by means of an external switch. The LED labeled 'DELAY BYPASS' will be on when the Digital Delay is in its normal (unbypassed) mode. When bypassed, the LED will turn off.

The EXTERNAL DELAY TIME and REPEAT HOLD jacks are located on the rear panel. The EXTERNAL DELAY TIME jack disables the front panel DELAY TIME control and allows external control of the delay time. A 50K ohm linear potentiometer will duplicate the action of the front panel control. The delay time may also be controlled by a voltage of 0 to 10 volts, such as is typically available from a synthesizer envelope generator.

The REPEAT HOLD jack allows an external switch to be used to activate the repeat hold function. This unique feature enables the user to simulate sequencer effects. A pattern of notes may be programmed into the memory of the unit and repeated, without deterioration, as long as desired. The number of notes which may be entered is determined by the delay time; the longer the delay time, the more notes that can be entered. The user may play another line against the repeating sequence, allowing a single performer to create a solo-with-accompaniment texture.

A foot switch is available as an accessory for controlling the DELAY BYPASS or REPEAT HOLD functions.

NOTE: Care should be taken in placing the Digital Delay away from heat generating equipment such as power amps, power supplies or tube type equipment. With proper placement of the Digital Delay, it can be expected to run warm but not hot.

EXTERNAL CONNECTIONS

Input

The Digital Delay has a high impedance input bridging a balanced line (ring-tip-sleeve). This allows the system to be fully compatible with balanced lines commonly found in professional applications such as studio or sound reinforcement systems. The high impedance characteristics will not degrade the performance of the delay when used with low impedance sources yet allows the use of high impedance unbalanced sources such as musical instrument pickups. The only source which might not provide optimum performance with this type of input stage is a low impedance microphone, depending on the output level in the application. If the LEVEL control is fully counter-clockwise (the most sensitive position) and the OVERLOAD LED is not activated during signal peaks, some means of external level matching is required. Should this problem arise with a low impedance microphone, a low-to-high impedance matching transformer will correct the level mismatch.

Output

The Digital Delay has a low impedance, unbalanced output. This type of output is fully compatible with any type of input. When using the Digital Delay in a low impedance balanced line application, simply plugging a ring-tip-sleeve phone plug into the Digital Delay's OUTPUT jack will work well. The ring or low side of the line will then be referenced to the chassis of the Digital Delay and allow common mode or ground signals to be rejected at the input of the following unit. For unbalanced high or low impedance applications (musical instrument amps or line inputs) simply use a two conductor phone plug in the OUTPUT jack.

Delay Bypass

A jack has been provided for applications where it is desirable to bypass the delay circuitry. With a phone plug inserted into the DELAY BYPASS jack, shorting the tip and sleeve (i.e. with a switch) will activate the delay system and BYPASS LED. Opening the connection will bypass the delay circuitry (LED off). When the delay circuitry is bypassed, power is still required to allow a signal to pass. When bypassed, the Digital Delay will

pass a signal level approximately 20 dB above the level where the OVER-LOAD LED is activated before clipping. However, the Digital Delay's maximum output level specification still pertains.

An incoming signal is still stored in memory when the Digital Delay is bypassed. Bypassing has the same effect as turning the MIX control to 'dry' except that regeneration will not occur in the bypassed state.

Repeat Hold

The requirements for using the repeat hold function are the same as for the delay bypass function. With a phone plug inserted into the REPEAT HOLD jack, shorting the tip and sleeve will activate the repeat hold function, while opening this connection will return the unit to normal operation. Repeat hold operation is independent of the delay bypass function. A signal may be stored in memory while the Digital Delay is bypassed and retrieved later by deactivating the delay bypass.

External Delay Control

As stated previously, a 50K ohm linear potentiometer connected to a phone plug inserted in the EXT DELAY jack is all that is required to externally control the delay time. The wiper of the pot should be connected to the tip of the phone plug and either side of the pot's resistive element should be connected to the sleeve. The direction of control action is such that the greater the resistance, the greater the amount of delay time. The external control device may be something other than a potentiometer, such as a synthesizer control voltage. Whatever the device is, it should have a voltage source characteristic, since the external delay input appears as a high impedance with a constant current source of approximately 0.2 ma. The control voltage should be between zero and ten volts. A voltage beyond these limits will have no further effect on delay time.

APPLICATIONS

The following discussion is presented to describe a few of the virtually unlimited number of applications of the MXR Digital Delay. (It is assumed that your Digital Delay is equipped with one memory board. If your Digital Delay has additional memory boards, the increase in the delay time should be compensated for.)

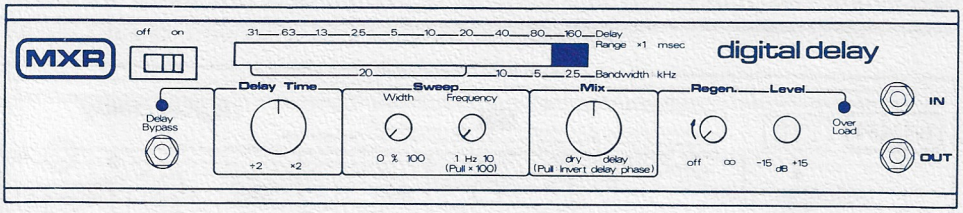


Figure 1

Discrete Echo

Control Settings:

- DELAY RANGE-greater than 50 msec.
- DELAY TIME-variable
- SWEEP WIDTH-'0%'
- SWEEP FREQUENCY-no effect
- MIX-center
- REGENERATION-off

Play a short note, and that note will be repeated (echoed) a short time later. With this control configuration, there will be exactly one echo. Multiple echoes may be added by gradually advancing the regeneration control. The speed of these echoes may be slowed down by clockwise rotation of the DELAY TIME control. Counter-clockwise rotation of this control will speed up echoes. If the DELAY TIME control is operated while a note is echoing, the pitch of that note will be affected. Shortening the delay time will raise the pitch of the delayed signal; lengthening the delay time will lower the pitch. If the DELAY RANGE is changed while a note is echoing, the pitch of that note will be changed by one octave for each step up or down in delay range. These octave transpositions will occur instantaneously, without the portamento created by the rotation of the delay time control. (Note: The delay range switches may produce an audible click when operated in this fashion.)

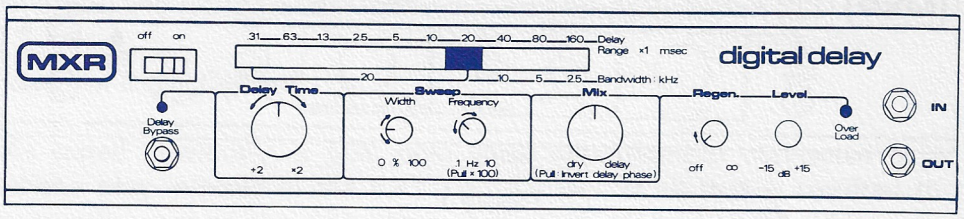


Figure 2

Doubling

Control Settings:

- DELAY RANGE-20 to 40 msec.
- DELAY TIME-adjust for best effect
- SWEEP WIDTH-'9 o'clock'
- SWEEP FREQUENCY-'11 o'clock'
- MIX-center
- REGENERATION-off

This control configuration will produce a 'doubling' effect, which enables a single vocalist to create the sound of two vocalists singing in unison. The sweep of the oscillator will constantly vary the pitch relationship between the dry and delayed voices, thereby closely simulating true doubling, where the two voices will never be perfectly in tune. To obtain the best results with other sources, the amount of delay and delay sweep must be adjusted to allow the best subjective doubling effect with the program material used.

Reverberation Effects

By reducing the width to '0%' and advancing the REGENERATION CONTROL, a reverb effect may be obtained. The effect produced is like being in a room with 'hard' walls. The amount of delay time will control the apparent room size and the REGENERATION CONTROL will adjust the delay time or how 'live' the apparent acoustics are.

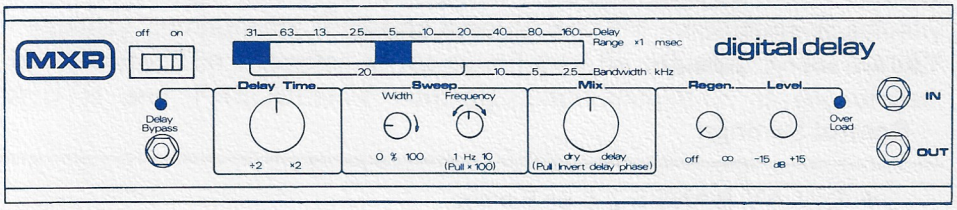


Figure 3

Flanging

Control Settings:

- DELAY RANGE-0.31 to 2.5 msec.
- DELAY TIME-no effect
- SWEEP WIDTH-'100%'
- SWEEP FREQUENCY-variable
- MIX-center

- REGENERATION-variable

These settings enable the user to produce the 'flanging' effect previously obtainable only by means of multiple tape machines or 'bucket brigade' (analog delay) devices. The delay range selected will depend on the register of the program material being processed. The shortest delay ranges will be most effective on high frequency material such as cymbals and drums; the longer ranges will prove effective for instruments such as guitar, organ, electric piano, and bass. Note that the speed of repetition at these ranges is great enough to create audible pitch changes, which will rise and fall as the oscillator sweeps. Advancing the REGENERATION CONTROL will heighten the perceived intensity of the effect.

As noted previously in the Output Mix Control section, it is possible to reverse the phase relationship between the dry and delayed signals. When flanging, this will invert the notch pattern of the flanged sound. Notches will become peaks, and peaks will become notches. This effect tends to cancel bass frequencies which may prove useful in certain creative situations.

Vibrato (See Figure 3)

Control Settings:

- DELAY RANGE-2.5 or 5 msec.
- DELAY TIME-center
- SWEEP WIDTH-'9 o'clock'
- SWEEP FREQUENCY-variable
- MIX-'delay'
- REGENERATION-off

This configuration will produce a true 'vibrato' (actual pitch variation, not to be confused with 'tremolo', in which amplitude is varied, while pitch is unchanged). This feature enables a piano or even guitar, to closely simulate a rich, organ-like sound.

Frequency Modulation (See Figure 3)

Control Settings:

- DELAY RANGE-2.5 to 5 msec.
- DELAY TIME-no effect
- SWEEP WIDTH-'100%'
- SWEEP FREQUENCY-pull out (10 Hz to 1 kHz), variable
- MIX-center
- REGENERATION-off

FM (frequency modulation) allows the user to obtain an effect previously available only with synthesizers. The sound is similar to 'ring modulation', the major difference being that FM modulation is much richer in frequency components than ring modulation. FM modulation is actually fast vibrato. The character of the sound may be adjusted by the SWEEP WIDTH and FREQUENCY controls. Experimentation is encouraged.

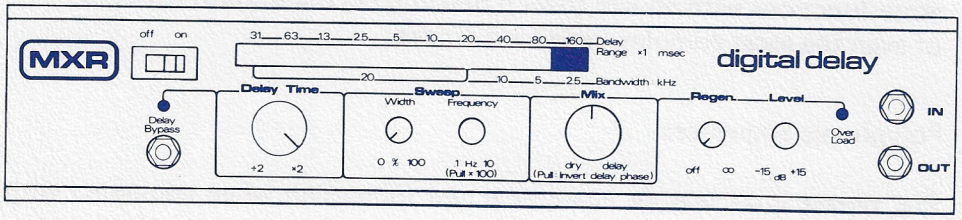


Figure 4

Repeat Hold

Control Settings:

- DELAY RANGE-160 msec.

- DELAY TIME-'x2'
- SWEEP WIDTH-'0%'
- SWEEP FREQUENCY-no effect
- MIX-center
- REGENERATION-off
- Connect foot switch to REPEAT HOLD jack on rear panel

To use the repeat hold function:

1) Play the desired sequence

2) Depress the foot switch. The sequence is now 'locked' in memory and will repeat indefinitely.

3) Depress the foot switch again to erase or program a new sequence.

With practice, the user will develop the ability to coordinate the program-erase functions with an aim toward maximizing the smooth rhythmic flow of even the most complex varied sequences.

Polyphonic Sequences

The repeat hold feature acquires a new dimension when combined with the REGENERATION control by allowing sequences to be added on top of each other. Although regenerated material suffers some signal degradation, it should be possible to create textures of up to eight distinct parts using this technique. Beyond this point, the first programs in the chain are no longer recoverable. The polyphonic sequencing capability allows monophonic instruments to build dense harmonic textures which are otherwise impossible.

NOTE: Any program which is entered by means of the repeat hold function remains under the control of the DELAY RANGE and DELAY TIME controls. An existing program may be speeded up or slowed down, then recovered intact, any time after it is entered. The sweep oscillator also remains functional.

The applications outlined in the preceeding pages constitute a partial representation of the capabilities of the MXR Digital Delay. It should be emphasized that the actual possibilities of the unit are nearly unlimited, and the user is encouraged to experiment and discover for himself the various ways in which he may adapt the MXR Digital Delay as an integral part of his own unique creative process.

TECHNICAL DESCRIPTION

In the following discussion a brief description is given of each stage in the signal chain. Refer to the block diagram following this section.

Differential Amplifier

The input signal is first buffered by a differential amplifier. The purpose of this stage is to provide a balanced input and buffering between a high impedance source such as a musical instrument pickup or microphone and the lower impedance circuitry within the delay system.

Adjustable Gain Stage

The next stage allows the user to adjust the Digital Delay's input-output levels to provide an optimum match between input source levels and the internal levels used by the delay system.

Input Filter

The audio signal is then processed by a low pass filter. The purpose of this filter is to prevent errors which occur in the analog to digital converter when the incoming signal has frequencies (or harmonics) above half the sample rate. The analog to digital converter in the Digital Delay operates by making conversions on discrete samples of the incoming analog signal. An accurate representation of the incoming signal can only be maintained at sample rates greater than twice the frequency of the incoming signal. At sample rates less than twice the frequency of the incoming signal (or it's harmonics), a type of distortion known as aliasing becomes apparent.

The filter section is programmable so that the user can make the trade-off between delay time and bandwidth. It is necessary to make a trade-off since it is desirable to have as low a sample frequency as possible in order to obtain the maximum amount of delay with a given amount of memory. However, a higher sample frequency will allow a greater bandwidth without aliasing. The MXR Digital Delay provides selectable bandwidths of 2.5, 5, 10, and 20 kHz with corresponding delay ranges depending on the amount of memory in the system.

It is noteworthy that, because of the importance of the filters in the performance of the Digital Delay, MXR developed computer programs to assist in the in-house design of these filters to meet stringent requirements at a minimum cost to the user.

Compressor-Limiter

The next signal processing stage is a compressor-limiter. The compressor provides linear compression up to a level close to the maximum the delay circuitry can process. At this level the limiter is activated and prevents the signal from exceeding the maximum operating level of the delay circuitry. When the signal reaches the level which activates the limiter, it also turns on the OVERLOAD LED to indicate that the limiting condition exists. One should avoid excess amounts of limiting as audible distortion may result.

Analog to Digital Converter

After compression the audio signal is sampled. The digital logic section provides the necessary timing and temporary storage to convert the sampled audio into a series of digital words. This process is known as analog to digital conversion. The words which represent the digitized audio information are then stored in NMOS dynamic random access memories. These memories represent one of the most advanced devices to come out of digital I C technology in recent years. This is similar to the technology which has made microprocessors and hand held calculators a reality. Each memory is capable of holding 4096 'bits' of information and yet the chip is only about 1/64 square inches in size.

Digital Logic

The digital logic section performs the task of selecting the amount of memory used, depending on the delay length chosen, as well as allocating the proper memory locations for input and output data. The digital logic section also provides the proper timing signals for the memory read, write and refresh timing. The repeat hold function, when activated, suppresses the write signal and only allows data to be read from the memory.

Expander

As information is read from the memory, it is converted back into analog form at the digital to analog converter and is processed by the expander. The expander performs the inverse of compression. This compression-expansion process is commonly known as 'companding' and greatly improves the dynamic range of the delay system. Companding is a process which is becoming quite popular in recording studios to keep noise to a minimum in multitrack recording.

Regeneration

It is at this stage that the signal may be fed back into the delay circuitry for regeneration. The REGENERATION control allows the user to adjust the amount of delayed signal that is fed back. The signal is fed back before limiting to prevent the delay circuitry's maximum operating level from being exceeded. With the regeneration high enough so that multiple repeats are heard, the user may overide the signal that is recirculating in the delay by introducing a signal of high enough level to activate the limiter. This insures that the most recent information is predominant in the recirculating loop. An electronic switch, which is controlled by the DELAY BYPASS, allows regeneration only when the Digital Delay is unbypassed (LED on). This allows the user to 'clear' what is in the delay circuitry by bypassing the delay circuitry for one cycle and then reactivating it, with the delay circuitry now clear.

Output Filter

The next stage is the output programmable filter. This filter prevents high frequency noise that results when the audio signal is digitized from passing through to the output.

Inverter

After expansion and filtering, the signal may be inverted or remain unaltered by the switchable inverter stage. To create the flanging effect, the delayed signal is normally combined in phase with the dry signal, producing a series of peaks and notches in the output frequency response. The switchable inverter allows the delayed signal to mixed out of phase, interchanging peaks and notches.

Mix Control

The MIX control allows mixing of the delayed signal with the dry signal in any proportion. Another electronic switch performs the bypass function (when selected) at this stage.

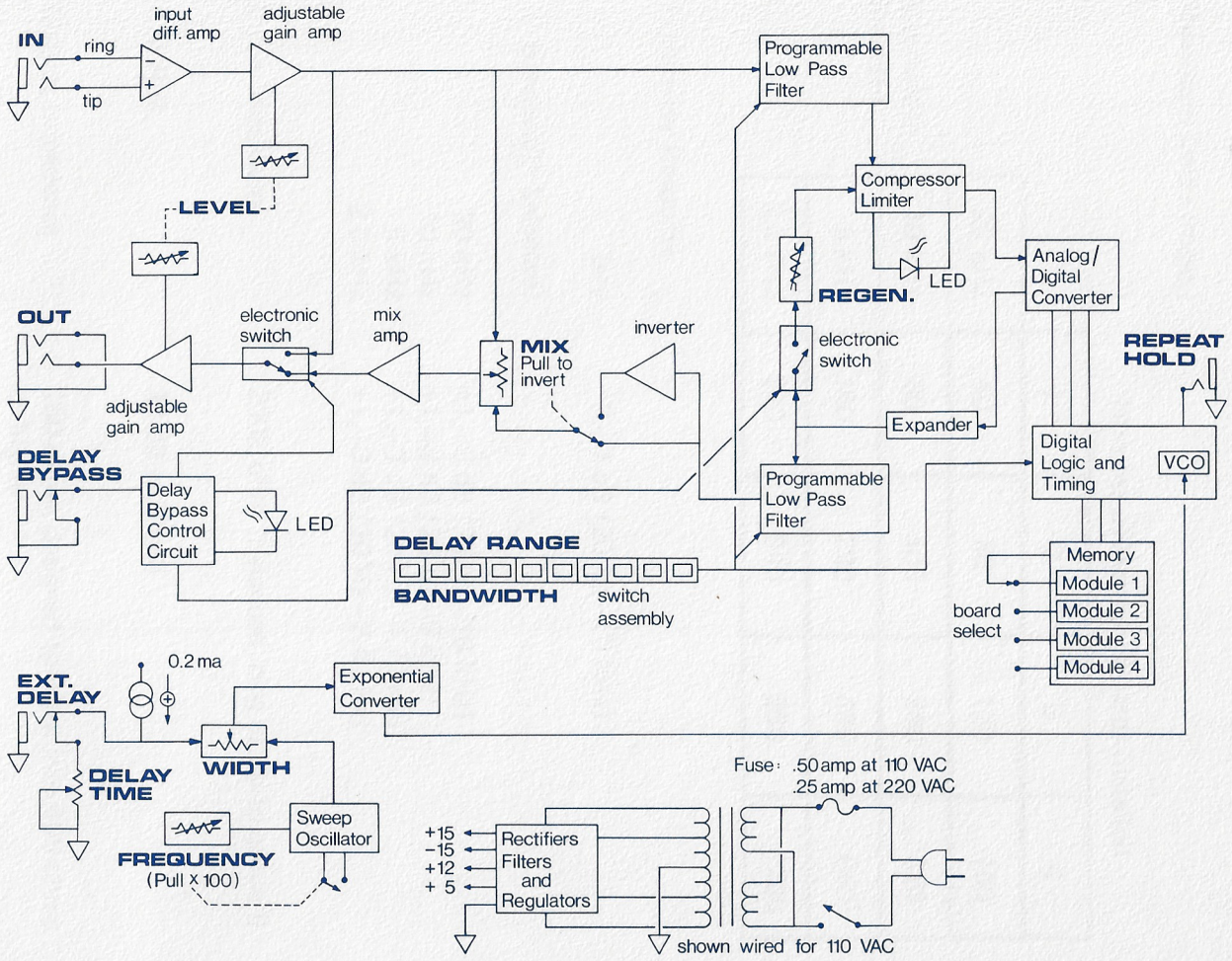
Output Stage

An output adjustable gain amp completes the signal path. The gain of this stage is controlled by the LEVEL control as is the input adjustable gain stage. The gain of the output stage complements the input stage to restore the signal to the level at the input.

Delay Time Controls

The Digital Delay provides several means of controlling the amount of delay time. The DELAY RANGE pushbuttons perform the function of selecting the amount of delay time by one of two methods. The seven pushbuttons furthest to the left change the delay time by selecting the amount of memory used. The three pushbuttons furthest to the right increase the delay time by reducing the memory cycle rate and the audio bandwidth. The DELAY TIME control adjusts the frequency of the system's master clock pulse generator, and, as a result, the memory cycle rate.

The sweep oscillator allows the amount of delay to be swept automatically. The FREQUENCY control allows adjustment of the sweep oscillator's sine wave over a wide frequency range. The WIDTH control mixes the sweep oscillator output with the DELAY TIME control voltage. The WIDTH control's mix amp output is connected to an exponential converter which drives the system's master clock pulse generator. The net result is a smooth and even sweep characteristic.


IN
ring
tip
input
diff. amp
adjustable
gain amp
Programmable
Low Pass
Filter
LEVEL
Compressor
Limiter
LED
REGEN.
Analog/
Digital
Converter
OUT
electronic
switch
mix
amp
MIX
Pull to
invert
inverter
electronic
switch
REPEAT
HOLD
adjustable
gain amp
Expander
DELAY
BYPASS
Delay
Bypass
Control
Circuit
LED
Programmable
Low Pass
Filter
Digital
Logic and
Timing
VCO
DELAY RANGE
BANDWIDTH
switch
assembly
Memory
board
select
Module 1
Module 2
Module 3
Module 4
EXT.
DELAY
0.2 ma
Exponential
Converter
WIDTH
DELAY
TIME
Sweep
Oscillator
FREQUENCY
(Pull x 100)
Fuse: .50 amp at 110 VAC
.25 amp at 220 VAC
+15
−15
+12
+ 5
Rectifiers
Filters
and
Regulators
shown wired for 110 VAC

SPECIFICATIONS

Maximum Delay (msec.)

Number of Memory Boards Installed

Bandwidth Selected	1	2	3	4
20 kHz	40	80	120	160
10 kHz	80	160	240	320
5 kHz	160	320	480	640
2.5 kHz	320	640	960	1280

Frequency Response

Dry +0,–1 dB (20 Hz–20 kHz)

Bandwidth Selected:

20 kHz +1,–3 dB (20 Hz–18 kHz)
10 kHz +1,–3 dB (20 Hz–9 kHz)
5 kHz +1,–3 dB (20 Hz–4.7 kHz)
2.5 kHz +1,–3 dB (20 Hz–2.4 kHz)

Input Impedance 200k ohm (balanced, ring or tip to ground)

C.M.R.R. 36 dB (typical)

Output Impedance 100 ohms, designed to work into 600 ohms or higher

Maximum Input Level	+20 dBm, LEVEL control past '3 o'clock' or 20 dB above limit threshold
Maximum Output Level	+20 dBm (unloaded) +18 dBm (600 ohm load) (LEVEL control past '3 o'clock')
Residual Noise	greater than 80 dB below limit threshold
T.H.D.	less than 0.1% near OVERLOAD level (1 kHz) less than 0.5% near OVERLOAD level (40 Hz—7 kHz)
I.M.	less than 0.1% (60 Hz/7 kHz, 1:1) less than 0.5% (60 Hz/7 kHz, 4:1)
Level Matching Range	—20 dBm to +15 dBm
Regeneration Range	0 to 100%
Variable Delay Range	4:1 (continuous)
Sweep Frequency Range	0.1 Hz to 1 kHz (two ranges)
Sweep Width	0 to 100% (4:1)

Power Requirements	105–125 Volts AC, 50–60 Hz 0.3 Amp, 37.5 Watts 210–250 Volts AC, 50–60 Hz, 0.15 Amp, 37.5 Watts
Dimensions	3.5"h. (8.9 cm) 17"w. (43.2 cm), 19" (48.3 cm) including mounting ears 7" d. (17.8 cm), 6.13" (15.6 cm) behind mounting surface
Weight	9 lbs (4.1 kg)

FULL WARRANTY

The MXR Digital Delay is warranted against defects in material and workmanship for a period of one year from date of purchase. MXR Innovations Inc. will replace defective parts and make necessary repairs at no charge if factory inspection reveals faulty material or workmanship. This warranty does not cover any consequential damages, or damage to the unit due to misuse, accident or neglect. MXR Innovations Inc. retains the right to make such determination on the basis of factory inspection. Products returned to the factory must be shipped prepaid. This warranty remains valid only if repairs are performed by MXR Innovations Inc., and provided that the serial number on the unit has not been defaced or removed.