



DIGITAL EFFECTS PROCESSOR



OWNER'S MANUAL

CAUTION
TO PREVENT ELECTRICAL SHOCK OR FIRE HAZARD, DO NOT EXPOSE THIS INSTRUMENT TO RAIN OR MOISTURE.
BEFORE USING THIS INSTRUMENT, READ BACK COVER FOR FURTHER WARNINGS.

CLASS B COMPUTING DEVICE: INFORMATION TO USER

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient the receiving antenna
- relocate the equipment with respect to the receiver
- move the equipment away from the receiver
- plug the equipment into a different outlet so that the equipment and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio-television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

INTRODUCTION

The Peavey Digital Effects Processor utilizes the most advanced technologies available to provide high performance digital audio processing in a unique affordable package. Its quality and capabilities are sufficient for both the performing musician and the recording artist.

The Digital Effects Processor provides continuously adjustable delay settings from 0.1 milliseconds to 1310 milliseconds (1.31 seconds) with absolutely no change in signal quality. A full audio bandwidth (20 Hz to 20 KHz) is available at all settings and with any of the effects enabled. This allows for utilization not only with musical instrument signal inputs, but also studio quality signal inputs.

By utilizing the extended range of delay settings, a wide range of digital effects including flanging, doubling, chorusing, and slap-back echo can be obtained through the front panel controls. The front panel controls allow for the addition of LFO modulation of the delay length, feedback or regeneration of the delayed signal, LFO modulation of the output signal frequency and total amplitude and phase control of both feedback and delayed signals. Any of these digital effects can be obtained without sacrificing either audio signal-to-noise ratio, dynamic range or bandwidth.

The feature that allows this Digital Effects Processor to provide the extended bandwidth without aliasing and still provide the effects offered by lower performance units is a unique hybrid Relative Time Monitor (RTM) system utilizing state-of-the-art Time/Frequency Equalization techniques. The RTM allows for modification of the delay length and frequency modulation without altering the necessary sampling rate required for full-bandwidth operation.

This special signal processing implementation provides the ultimate in digital effects at an affordable price without sacrificing performance.

TABLE OF CONTENTS

I. Introduction	1
II. Processor Specifications	2
III. Processor Features	2
IV. Front Panel Description	3
V. Rear Panel Description	3
VI. Circuit Block Diagram	4
VII. Typical Effects Descriptions	5 & 6

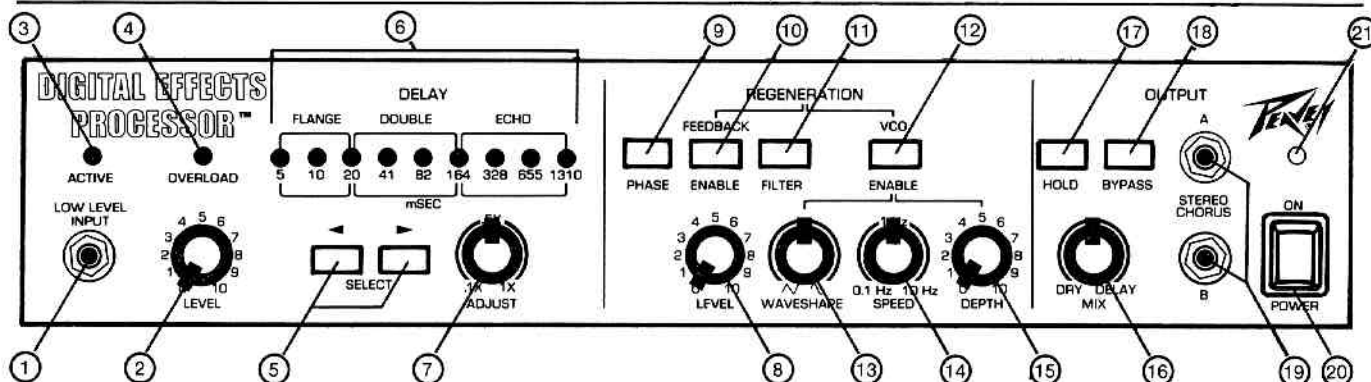
SPECIFICATIONS

<p>DELAY RANGE 0.1 to 1310 milliseconds</p> <p>DELAY ADJUST 0.1 (10%) to 1.0 (100%) of range</p> <p>FREQUENCY RESPONSE 20 Hz to 20 KHz @ all settings (+/-1.0dB)</p> <p>QUANTIZATION 12 Bits A/D & D/A Conversion</p> <p>SAMPLE RATE 50 KHz A/D Conversion Rate</p> <p>ANTI-ALIASING FILTER 20 KHz 6-Pole Chebyshev Low Pass Filter - 36 dB/Octave minimum roll-off</p> <p>SIGNAL-TO-NOISE 70 dB minimum delay 90 dB minimum dry</p> <p>INPUTS Low Level 0.25 Vrms, -12 dBV (Front Panel) Line Level 2.0 Vrms, 6 dBV (Rear Panel)</p> <p>OUTPUTS Low Level Stereo 0.25 Vrms, -12 dBV (Front Panel)</p>	<p>Line Level Stereo 2.0 Vrms, 6 dBV (Rear Panel)</p> <p>HEADROOM Active +6 dB reserve Overload +3 dB reserve</p> <p>VCO MODULATION Complete control of the LFO modulation of the internal VCO</p> <p>LFO Depth Range Up to 20:1</p> <p>LFO Frequency 0.1 Hz to 10 Hz</p> <p>LFO Waveshape Continuously variable from Triangle to Sine wave.</p> <p>HOLD Replays signal in memory indefinitely without degradation</p> <p>REGENERATION Allows feedback of delayed signal for multiple echos or for effects Filter - 5 KHz Low Pass Filter</p> <p>FOOTSWITCH Bypass Hold</p>
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FEATURES

- * Continuously variable delay time from 0.1 milliseconds to 1310 milliseconds (1.31 seconds) with 9 operating ranges
- * Full 20 Hz to 20 KHz bandwidth at all delay settings and with any special effects active.
- * Unique LFO modulation technique utilizing a hybrid Relative Time Monitor (RTM) system with Time/Frequency Equalization.
- * Easily controlled LFO with continuously variable frequency, waveshape and depth for modulation of effects.
- * Wide range of special effects including:

Flanging	Slapback Echo
Chorus	Vibrato
Doubling	Long Delay
- * Hold switch with optional footswitch control for infinite repeat without signal degradation.
- * Low Level and Line Level inputs and outputs for ease of use in a multitude of operational environments
- * Phase control of feedback and delay output signals
- * Feedback filter for low-pass regeneration
- * Stereo Chorus outputs with dry/delay mix control
- * Bypass switch with optional footswitch control



FRONT PANEL

DESCRIPTION

INPUT SECTION

- (1) Low Level Input - Musical instrument input jack set for a nominal input level of 250 millivolts (-12 dBV).
- (2) Input Level Control - Gain control for the input section of the Digital Effects Processor. Used to maximize the signal-to-noise ratio of the unit. Should be adjusted such that the Overload indicator just begins to light.
- (3) Active Indicator - Indicates that the processor input level is sufficient for adequate operation.
- (4) Overload Indicator - Indicates that the processor has only 3dB of headroom available. Continuous illumination of the Red LED indicates that the unit is being overdriven and distortion could result.

DELAY SECTION

- (5) Range Select - Pushbutton selection of the desired delay memory range. Right button increments the delay range. Left button decrements the delay range.
- (6) Range Indicators - Indicates the range of operation of the delay memory. The number under the LED indicates the maximum achievable delay with that particular setting. The LFO may be enabled in any range desired.
- (7) Delay Adjust - Varies the amount of delay from 0.1 (10%) to 1.0 (100%) of the selected delay range. Also varies the maximum amount of modulation achievable on a particular range.

REGENERATION SECTION

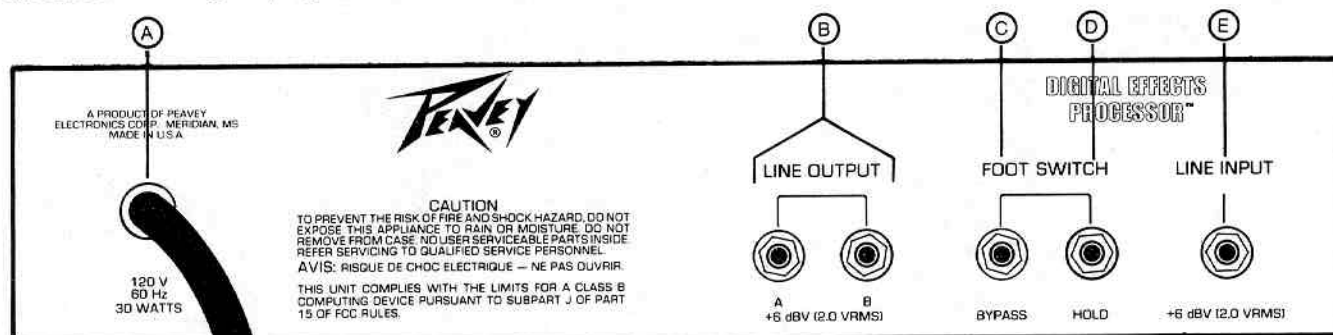
- (8) Feedback Level - Controls the amount of feedback signal and thus the amount of regeneration accomplished.
- (9) Feedback Phase - Controls the Phase of the feedback signal used for regeneration. Controls the resonance or cancellation of frequencies for the flanging effects.
- (10) Feedback Enable - Engages the feedback signal to allow for certain special effects.
- (11) Feedback Filter - Low-pass filter for filtering the feedback signal at 5 KHz to eliminate the build-up of noise at increased feedback levels. Feedback signal is automatically filtered unless the Filter button is depressed.

MODULATION SECTION

- (12) VCO Enable - Engages the Low Frequency Oscillator (LFO) for modulating the delay length or output frequency.
- (13) LFO Waveshape - Controls the waveshape of the LFO continuously from a Triangle wave to a Sine Wave. The two waveshapes are 180 degrees out-of-phase.
- (14) LFO Speed - Controls the frequency of the LFO modulation from 0.1 Hz to 10 Hz.
- (15) LFO Depth - Controls the VCO modulation depth or the maximum and minimum delay length. Maximum achievable range varies with the selected range but can be as high as 20-to-1.

OUTPUT SECTION

- (16) Output Mix - Provides the control of the mix of the dry and the delayed signal. Both in-phase and out-of-phase signals (Stereo Chorus A output and B output) are controlled simultaneously. Output signal can be varied from only dry signal to only delayed signal.
- (17) Hold - Provides an infinite repeat of the signal stored in memory without degradation. Footswitch control option.
- (18) Bypass - Allows the bypass of the Digital Effects Processor regardless of any settings. Footswitch control option.
- (19) Stereo Chorus Output - Provides simultaneous outputs for both in-phase and out-of-phase delayed signal mixed with the original dry signal. Mix is controlled with the Output Mix Control.
- (20) Power Switch - Used to turn on the unit. Energizes the A.C. power for both the +/- 15 volt supply and the 5 volt supply.
- (21) Power On Indicator - Indicates that the power has been applied to the unit. Power should be turned off before plugging in the unit or removing the plug from the A.C. source.



REAR PANEL

OUTPUT SECTION

- (A) A.C. Line Cable - Used to supply main power to the unit. Should be plugged into any standard wall outlet or equivalent. (Domestic 120VAC, Export 220 or 240VAC)
- (B) Stereo Chorus Line Level Output - Line level output jack to provide signal levels of 2.0 Vrms (6 dBV) as an output. Can be used in conjunction with the front panel jacks.

FOOTSWITCH SECTION

- (C) Bypass Switch - Remote control of the Bypass function.
- (D) Hold Switch - Remote control of the infinite Hold function.

INPUT SECTION

- (E) Line Level Input - Line level input jack to accommodate a 2.0 Vrms (6 dBV) level signal input. When used, the front panel jack is disabled.

CIRCUIT DESCRIPTION

Two separate inputs are provided on the Digital Effects Processor. An instrument level input (nominally 250 mVolts, or -12 dBV) is provided on the front panel and a line level input (nominally 2.0 Volts or 6 dBV) is provided on the rear panel. Both inputs are passed through an input gain stage in preparation for processing. If the rear panel line level input jack is used the front panel low level input jack is disconnected.

After the initial gain stage, the input signal is pre-conditioned using a pre-emphasis circuit to provide better Signal-to-Noise characteristics for effects operation.

The INPUT LEVEL control sets the level for the input signal for optimal Signal-to-Noise and ultimately the output level for the processor. The INPUT LEVEL control should be set so that the green ACTIVE indicator is lit and the red OVERLOAD indicator only flashes occasionally. Continued operation with an "OVERLOAD" condition could cause distortion and a noticeable deterioration in sound quality. It should be pointed out that the ACTIVE and OVERLOAD indicators are located after the feedback signal is mixed in, giving an excellent indication of any potential overload condition. The INPUT LEVEL control also ultimately sets the output signal level. If the green ACTIVE indicator is lit and the red OVERLOAD indicator flashes occasionally, the output level will nominally be 250 mV (-12 dBV) at the front panel output jacks and 2.0 V (+6 dBV) at the rear panel output jacks.

To minimize any anomalies due to aliasing, Analog-to-Digital conversion is preceded by a 20 KHz, 6-Pole, 36 dB/Octave Chebyshev Low Pass Filter constructed with precision components to assure flat response and minimum in-band ripple.

The Analog-to-Digital conversion provides a 12-bit digital representation of the analog signal at a 50 KHz sample rate, once again to minimize aliasing effects. The A/D converter components were selected to assure the proper linearity and conversion accuracy for the 72 dB Signal-to-Noise ratio attainable with a 12-bit system.

The digitized signal is then stored in the memory which is constructed with 64K Dynamic RAM providing the 1.31 seconds of possible delay. The control of the memory is derived from a unique Relative Time Monitoring system, an approach which enables the capability to obtain extended effects, extended control, increased bandwidth and increased system performance over competing units costing far more.

The Digital-to-Analog conversion is provided utilizing state-of-the-art CMOS D/A circuitry and corrective equalization to assure no reduction in frequency response due to sampling (SIN X/X windowing).

The Digital-to-Analog conversion is followed by another 20 KHz, 6-Pole, 36 dB/Octave Chebyshev Low Pass Filter for signal reconstruction and glitch removal.

The processed analog signal is then sent to the output mix circuitry in both its in-phase and out-of-phase form so that it can be mixed with the dry input signal and also sent back to the input circuitry as a feedback signal. The output signals are available at the front panel low level Stereo Chorus outputs as both in-phase mixed and out-of-phase mixed signals and at the rear panel line level Stereo Chorus outputs. Both phases of the delayed signal are also available as feedback signals to either accentuate or diminish certain portions of the audio spectrum. The level of the feedback signal is controllable using the Feedback Level control. A 5 kHz low pass filter is available in the feedback loop to allow the reduction of high frequency noise build-up in the prolonged feedback.

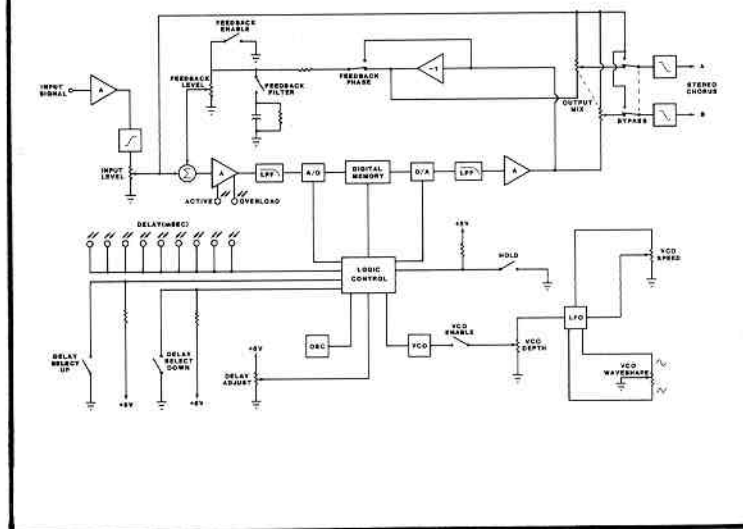
The output signals are separately de-emphasized prior to the output stage in order to restore them to their original levels after processing.

Two remote controls are available on the rear panel as well as manual functions on the front panel. These controls consist of the BYPASS and HOLD controls. The BYPASS control allows the unit to be bypassed entirely, the only active control being the INPUT LEVEL control. The HOLD control allows for the infinite repetition of all the signal data in the memory without any degradation. The footswitch control connects the tip to the barrel of the phone plug to activate the remote functions.

The DELAY SELECT and DELAY ADJUST controls are utilized to select the range of the delay desired and the exact value of the delay or effect. The number under each LED indicator for the DELAY indicates the maximum amount of delay for that range in milliseconds (mSec). The DELAY ADJUST varies the amount of delay within that range from approximately 0.1 to 1.0 times that range setting. Thus a 10-to-1 range is available for each range setting, allowing for more sensitivity in delay adjustment than previously available in competitive units. With the additional use of the VCO, this range can be extended even further.

The VCO controls are also available as front panel manual controls. The Digital Effects Processor utilizes a unique approach to LFO modulation of the delay length and output frequency. The Relative Time Monitor is utilized to assure optimum performance without degrading the processor bandwidth and at the same time extending the effects range to approximately 20-to-1. The VCO controls consist of the VCO WAVESHAVE, which varies the LFO modulator waveshape continuously from triangle to sine wave; the VCO SPEED, which varies the LFO modulator frequency from 0.1 Hz to 10.0 Hz; and the VCO DEPTH which varies the distance through the memory that is traversed by the VCO modulation. By adjusting the VCO DEPTH and the DELAY ADJUST controls, sweeps of the signal spectrum of up to 20-to-1 can be easily accomplished. The VCO modulation may be easily enabled or disabled by using the enable pushbutton on the front panel.

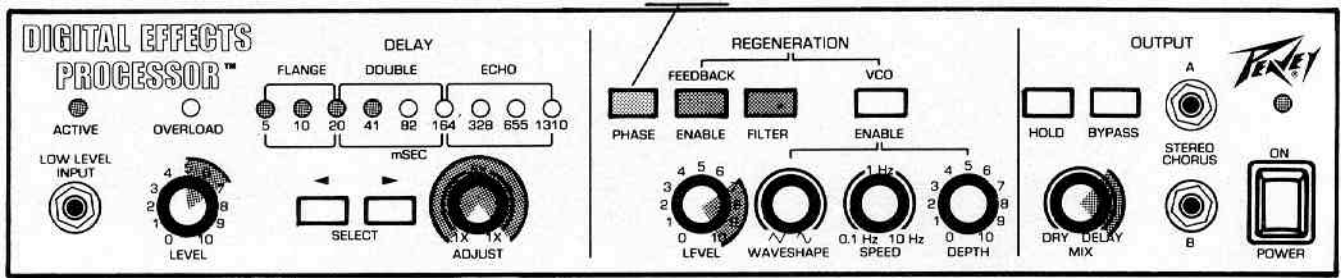
DIGITAL EFFECTS PROCESSOR BLOCK DIAGRAM



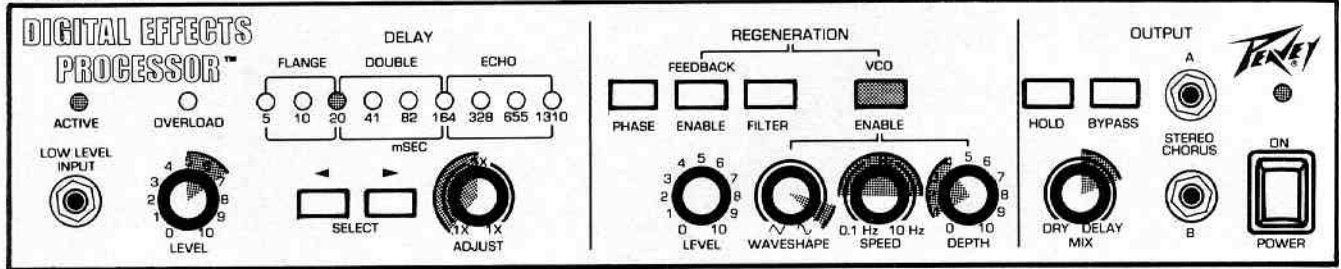
TYPICAL EFFECTS DESCRIPTIONS

Shaded regions indicate areas of activation.

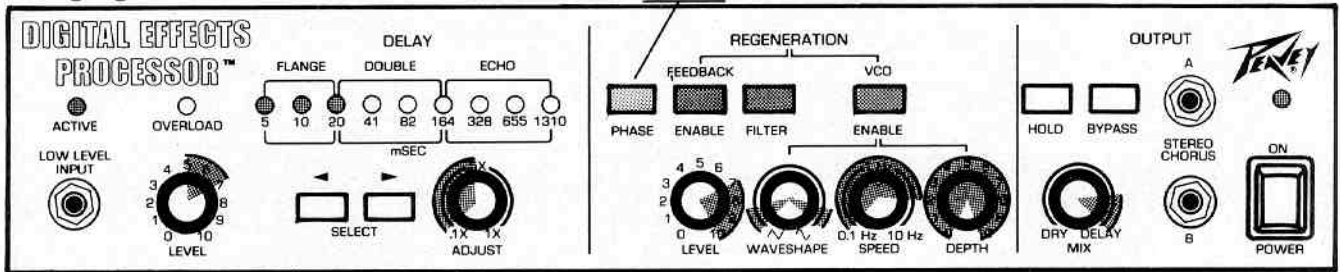
Comb Filtering



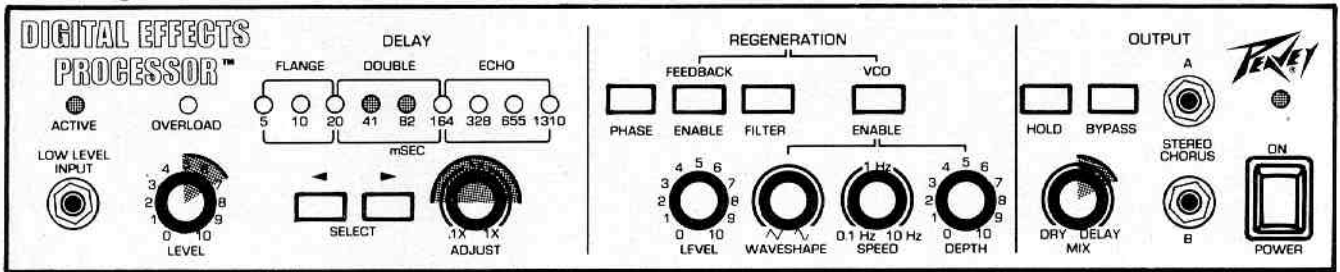
Chorus



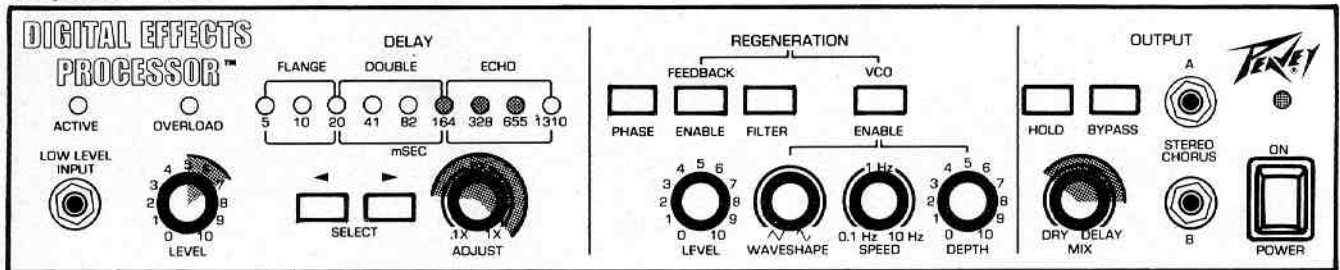
Flanging



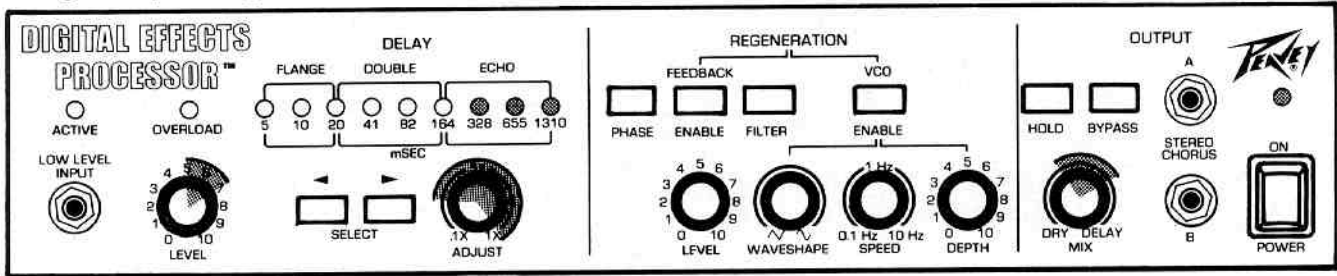
Doubling



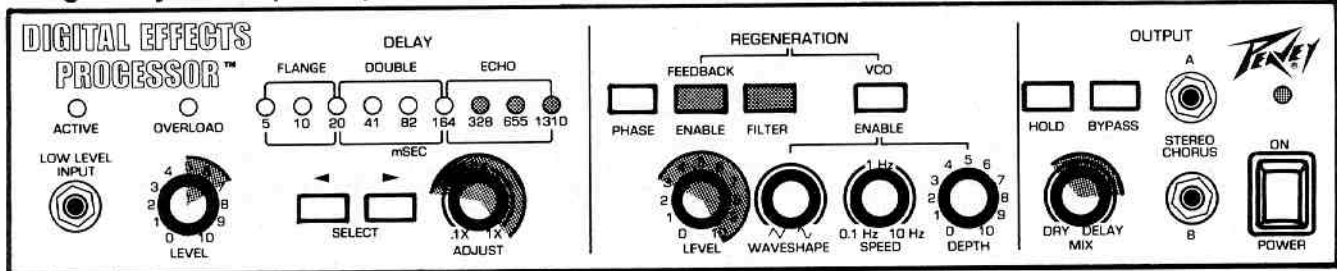
Slapback Echo



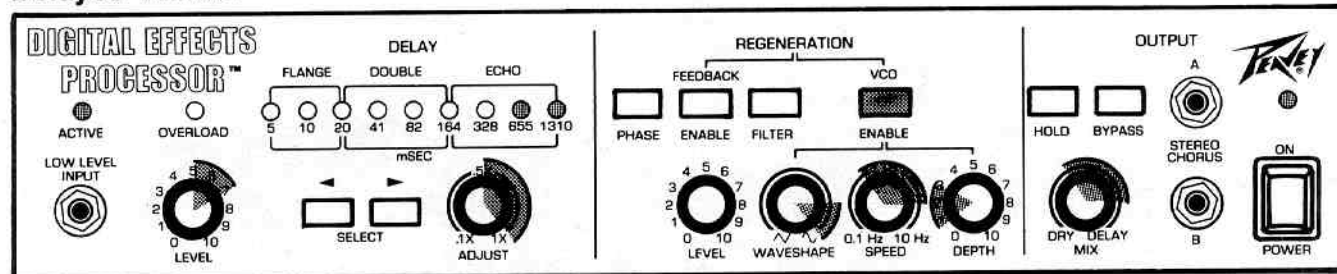
Long Delay - Single Echo



Long Delay - Multiple Repeats



Delayed Vibrato



DANGER

EXPOSURE TO EXTREMELY HIGH NOISE LEVELS MAY CAUSE A PERMANENT HEARING LOSS. INDIVIDUALS VARY CONSIDERABLY IN SUSCEPTIBILITY TO NOISE INDUCED HEARING LOSS, BUT NEARLY EVERYONE WILL LOSE SOME HEARING IF EXPOSED TO SUFFICIENTLY INTENSE NOISE FOR A SUFFICIENT TIME.

THE U.S. GOVERNMENT'S OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) HAS SPECIFIED THE FOLLOWING PERMISSIBLE NOISE LEVEL EXPOSURES:

DURATION PER DAY IN HOURS	SOUND LEVEL dBA, SLOW RESPONSE
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
¾	110
½ or less	115

ACCORDING TO OSHA, ANY EXPOSURE IN EXCESS OF THE ABOVE PERMISSIBLE LIMITS COULD RESULT IN SOME HEARING LOSS.

EAR PLUGS OR PROTECTORS IN THE EAR CANALS OR OVER THE EARS MUST BE WORN WHEN OPERATING THIS AMPLIFICATION SYSTEM IN ORDER TO PREVENT A PERMANENT HEARING LOSS IF EXPOSURE IS IN EXCESS OF THE LIMITS AS SET FORTH ABOVE. TO INSURE AGAINST POTENTIALLY DANGEROUS EXPOSURE TO HIGH SOUND PRESSURE LEVELS, IT IS RECOMMENDED THAT ALL PERSONS EXPOSED TO EQUIPMENT CAPABLE OF PRODUCING HIGH SOUND PRESSURE LEVELS SUCH AS THIS AMPLIFICATION SYSTEM BE PROTECTED BY HEARING PROTECTORS WHILE THIS UNIT IS IN OPERATION.

CAUTION

THIS MIXING CONSOLE/PREAMP/EFFECTS DEVICE HAS BEEN DESIGNED AND CONSTRUCTED TO PROVIDE ADEQUATE SIGNAL (VOLTAGE) FOR PLAYING MODERN MUSIC. IMPROPER USE OF THE GAIN/EQUALIZATION CONTROLS AND/OR IMPROPER USE OF INTERNAL/EXTERNAL BUSES MAY CREATE CLIPPING (SQUARE WAVES) AND POSSIBLY CAUSE SUBSEQUENT DAMAGE TO THE LOUDSPEAKER SYSTEMS. EXTENDED OPERATION OF THE GAIN/EQUALIZATION CONTROLS IN THEIR MAXIMUM POSITIONS IS, THEREFORE, NOT RECOMMENDED. PLEASE BE AWARE THAT MAXIMUM POWER CAN BE OBTAINED WITH VERY LOW SETTINGS OF THE GAIN/EQUALIZATION CONTROLS IF THE INPUT SIGNAL IS VERY STRONG.

IT IS COMMON PRACTICE AMONG USERS OF SOUND REINFORCEMENT EQUIPMENT TO IDENTIFY THE INDIVIDUAL CHANNELS WITH A STRIP OF TAPE PLACED ABOVE OR BELOW THE ROW OF VOLUME FADERS. MANY TYPES OR BRANDS OF TAPE HAVE A VERY STRONG ADHESIVE WHICH CAN INHIBIT THE PAINT ON THE FACEPLATE AND ACTUALLY REMOVE THE PAINT WHEN THE TAPE IS REMOVED. WE STRONGLY RECOMMEND THAT SCOTCH TAPE NOT BE USED ON PAINTED SURFACES NOR ANY OTHER TAPE THAT IS NOT ESPECIALLY DESIGNED FOR SUCH APPLICATIONS. PERIODICALLY CHECK CORDS FOR CUTS OR SIGNS OF STRESS, ESPECIALLY AT THE PLUG AND THE POINT WHERE THE CORD EXITS THE UNIT.

11. The power supply cord should be unplugged when the unit is to be unused for long periods of time.

12. Metal parts can be cleaned with a damp rag. The vinyl covering used on some units can be cleaned with a damp rag, or an ammonia based household cleaner if necessary.

13. Care should be taken so that objects do not fall and liquids are not spilled into the unit through the ventilation holes or any other openings.

14. This unit should be checked by a qualified service technician if:

- The power supply cord or plug has been damaged.
- Anything has fallen or been spilled into the unit.
- The unit does not operate correctly.
- The unit has been dropped or the enclosure damaged.

15. The user should not attempt to service this equipment. All service work should be done by a qualified service technician.

- Read all safety and operating instructions before using this product.
- All safety and operating instructions should be retained for future reference.
- Obey all cautions in the operating instructions and on the back of the unit.
- All operating instructions should be followed.
- This product should not be used near water, i.e. a bathtub, sink, swimming pool, wet basement, etc.
- This product should be located so that its position does not interfere with its proper ventilation. It should not be placed flat against a wall or placed in a built-in enclosure that will impede the flow of cooling air.
- This product should not be placed near a source of heat such as a stove, heater, radiator or another heat producing amplifier.
- Connect only to a power supply of the type marked on the unit adjacent to the power supply cord.
- Never break off the ground pin on the power supply cord. For more information on grounding write for our free booklet "Shock Hazard and Grounding."
- Power supply cords should always be handled carefully. Never walk or place equipment on power supply cords. Periodically check cords for cuts or signs of stress, especially at the plug and the point where the cord exits the unit.