



D1500 DIGITAL DELAY

OPERATING MANUAL

Introduction

The Yamaha D1500 is a high-performance digital delay system that is capable of providing top-quality delay and special effects in a broad range of applications. The D1500 uses state-of-the-art digital technology to provide a delay time range of 0 to 1023 milliseconds (1.023 seconds)—in 1-millisecond increments—with full 20 Hz to 18 kHz frequency response throughout the delay range. Noise and distortion are also exceptionally low.

The D1500 has the distinction of being the world's first MIDI (Musical Instrument Digital Interface) compatible delay system. It can be remotely controlled from a MIDI keyboard or other MIDI equipment, vastly broadening its versatility and range of possible applications.

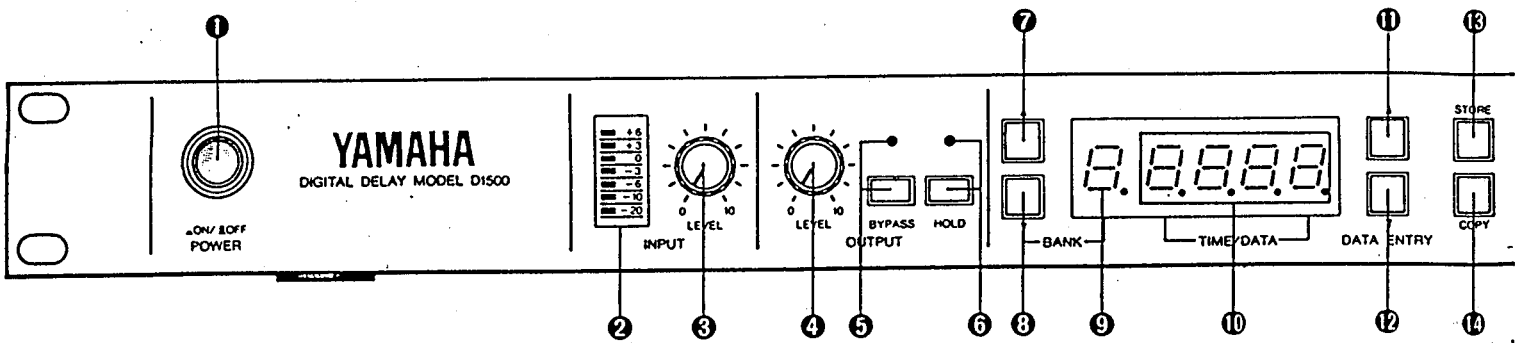
In general, the D1500 offers a wealth of useful control features, professional performance and comprehensive operation via light-touch control buttons and digital displays.

In order to obtain the best possible performance from your D1500, we urge you to read this operation manual thoroughly.

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FRONT PANEL CONTROLS



1 Power Switch

This switch turns power to the D1500 ON or OFF. The digital LED display panel lights when the power is ON.

2 Input Level Meter

This 7-point LED level meter monitors the input signal following the input level control. The meter display range is from -20 dB to +6 dB.

3 Input Level Control

Use this control to adjust the D1500 input sensitivity for optimum matching with the source used. The level control should be set so that program peaks read about 0 dB. For most sources this setting should provide maximum signal-to-noise ratio and minimum distortion.

4 Output Level Control

This control adjusts the output level to the rear-panel OUTPUT MIX connectors (13 and 14). It should be used to set the optimum output level for the following equipment (music instrument amplifier, mixer, etc.). The output level control has no effect on the DELAY OUT signal (11).

5 Bypass Switch and LED

When this switch is pressed, the LED located above it lights indicating that the input signal is being sent directly to the OUTPUT MIX connectors (no delay). Pressing the switch a second time restores normal delay operation.

* When the POWER switch is turned ON, the bypass mode is automatically engaged for approximately 3 seconds in order to avoid loud "thumps" caused by the turn-on transient. Bypass is active when POWER is OFF.

* When the bypass mode is engaged, no signal appears at the DELAY OUT connector.

6 Hold Switch and LED

This switch activates the D1500 "sampling" function. At the instant the HOLD switch is pressed, the audio signal currently in the D1500 memory is held and repeated. The D1500 memory holds approximately a 1-second signal segment. The memory is then "cycled", causing the held signal to be output continuously at 1-second (approx.) intervals. Pressing the HOLD switch a second time restores normal operation.

7 Program Bank Selector (Increment)

8 Program Bank Selector (Decrement)

The D1500 has 16 memory banks (0 through F hexadecimal: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, F) which can be programmed with different delay settings. A program-

med delay "sound" can then be recalled simply by selecting the appropriate bank, so you don't have to go through and reset all the necessary parameters individually. When shipped, banks 0-9 contain no data, and banks A-F are preprogrammed with 6 useful delay settings. Refer to page 4.

These two buttons are used to select the desired bank. The increment button (up arrow) increases the bank number, while the decrement button (down arrow) decreases the bank number.

9 Bank Number Display

This digital LED display displays the number of the selected bank in hexadecimal format (0 through F). If the display is incremented past F, the highest bank number, the word "PASS" will appear on the display. In this condition only the direct signal (no delay) will be output. Pressing the increment button (7) again returns to bank 0. The same occurs if the display is decremented below bank 0. Decrementing past "PASS" returns to bank F.

10 Time/Data Function Display

This 4-digit LED display shows parameters being programmed using Function Keys (11 through 14). When one of the function keys is pressed, the display shows the programmed value of the corresponding function, which can then be altered using the Function Data Increment and Decrement Keys (11 and 12, below).

11 Function Data Increment Key

12 Function Data Decrement Key

These keys increment (increase) and decrement (decrease) the value of the selected delay parameter (Function Keys, 11 through 14). Pressing either of these keys once increments or decrements the corresponding parameter by one step. If the button is held, however, the parameter will increment or decrement continuously until the button is released.

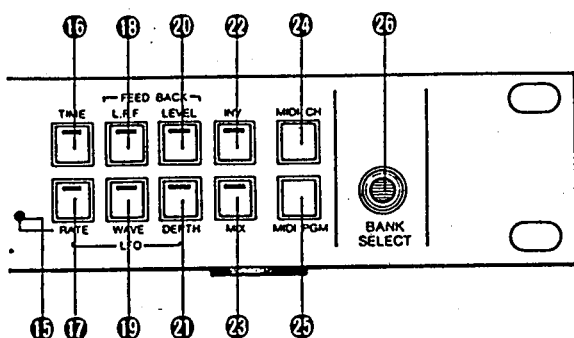
13 Bank and Data Store Key

This key is used to store a delay setting into any desired memory bank. If this key is held and then either Program Bank Select Key (7 or 8) is pressed, the current delay setting will be stored in the displayed bank number.

14 Copy Key

This key is used to copy a delay setting from one bank number to any other. This makes it simple to copy one delay setting and "edit" it to create a different sound.

First, the bank containing the data to be copied is selected. Then, while holding the COPY key, Program Bank Select



Keys ⑦ and ⑧ are used to select the bank to which the data is to be copied (this permits changing bank number while maintaining the same delay parameters — note that the displayed delay parameter value does not change). Then the Bank Data Store Key is used to store the data in the new bank as described in ⑩ above.

⑬ LFO Rate Display LED

⑭ LFO Rate Select Key

The LED flashes at a speed corresponding to the LFO rate programmed using the LFO Rate Select Key (⑭). Pressing the LFO Rate Key displays the selected bank's LFO rate in Hertz. The LFO rate can be adjusted using the Function Data Increment and Decrement Keys (① and ②). The selectable LFO rate frequencies (Hz) are as follows:
 0.1/0.2/0.3/0.4/0.5/0.6/0.7/0.8/0.9/1.0/1.1/1.2/1.3/
 1.4/1.5/1.6/1.7/1.8/2.0/2.2/2.4/2.6/2.8/3.0/3.2/3.4/
 3.7/4.0/4.5/5.0/5.5/6.0/6.5/7.0/7.5/8.0/8.5/9.0/10/
 11/12/13/14/15

⑮ Time Display Select Key

Pressing this key causes its LED to light, and the delay time programmed in the currently selected bank to be displayed on the Function Display (⑩). Once the delay time has been called to the display, it can be adjusted using the Function Data Increment and Decrement Keys (① and ②). The delay time is displayed directly in milliseconds (range = 0–1023 ms), and can be adjusted in 1-millisecond increments.

* The time display is automatically selected when POWER is initially turned ON, when a new bank number is selected, and when one of the MIDI function keys are operated.

⑯ Feedback LPF Cutoff Frequency Select Key

The D1500 features a programmable low-pass filter in the feedback loop. Pressing this key calls the currently selected LPF cutoff frequency to the display. Once called, the cutoff frequency can be adjusted using the Function Data Increment and Decrement Keys (① and ②).

The selectable cutoff frequencies are as follows.
 2.5/4/6/8/10/20 kHz. The LPF cutoff slope is 6 dB per octave.

⑰ LFO Waveform Select Key

The D1500 offers a choice of square or sine LFO (Low Frequency Oscillator) waveforms to create different modulation effects. Pressing the LFO WAVE key calls the currently selected waveform to the display ("SQ" or "SIN"). Pressing the Function Data Increment Key (①) selects the square LFO waveform, and the Function Data Decrement Key (②) selects the sine waveform.

⑱ Feedback Level Key

The amount of feedback applied in the D1500 basically determines the number of repeats or "echoes" produced. The feedback level value range is 0–99. When set to 0, only one delay will be produced. Too high a feedback level setting will produce a continuous string of repeats.

Pressing this key calls the currently selected feedback level value to the display. The desired value can then be selected using the Function Data Increment and Decrement Keys (① and ②).

⑳ LFO Depth Key

The LFO Depth setting determines the degree of modulation applied to the delay time. Modulation is most commonly used to produce phasing or flanging effects. Higher LFO Depth settings can produce a vibrato (pitch variation) effect. The LFO Depth range is 0–99.

Pressing this key calls the currently selected LFO Depth value to the display. The desired value can then be set using the Function Data Increment and Decrement Keys (① and ②). The LFO (modulation) rate is set using the LFO Rate Key (⑭). If the LFO Rate is set to 0, the Rate LED will remain off and no modulation will be produced.

㉑ Delay Phase Invert Key

This key permits setting the delay signal to be in or out of phase with the direct signal. The "in phase" mode is indicated by a "+(+)" display, and the "out of phase (180 degrees)" mode is indicated by a "--(-)" display.

㉒ Direct/Delay Mix Key

This function permits adjustment of the "mix" (balance) between the direct and delay sound. Pressing this key calls the currently selected mix value to the display. The desired value can then be set using the Function Data Increment and Decrement Keys (① and ②). The data range is 0–99.

A 0 setting delivers the direct sound only, while a setting of 99 delivers only the delay sound. Both direct and delay signals are output at equal levels (both 3 dB down from max. level) with a setting of 49.

㉓ MIDI Channel Key

When using a MIDI keyboard or other MIDI equipment to remotely control the D1500 (see Application Examples, "MIDI Performance System"), this function is used to set the MIDI channel number (1–16) via which the D1500 will receive control data. First press the MIDI CH key, and then use the Function Data Increment and Decrement keys to select the desired channel. Pressing the MIDI CH key a second time stores the data and disengages the MIDI channel selection mode.

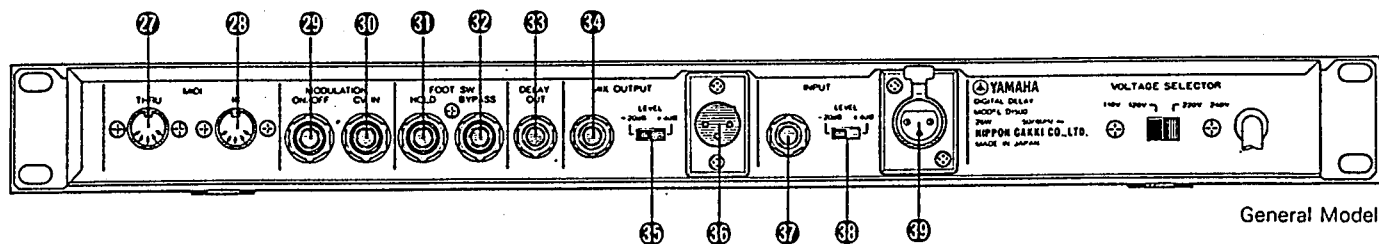
* The D1500 can not receive MIDI data while the MIDI channel select mode is engaged.

㉔ MIDI Program Change Key

External MIDI control can be used to remotely select the desired D1500 bank number. This function determines which D1500 bank number is selected when a given MIDI program number is received.

When this key is pressed, both the current bank number and MIDI program number will be displayed (while the MIDI PGM mode is engaged, the D1500 can not receive MIDI data).

FRONT PANEL CONTROLS/REAR PANEL OPERATION



The Function Data Increment and Decrement Keys (Ⓐ and Ⓑ) are then used to select the desired MIDI program number, then the Bank Select Keys (Ⓒ and Ⓓ) are used to select the bank that will be selected by that MIDI program number. Pressing the MIDI PGM key a second time stores the data and disengages the MIDI Program Change function.

Ⓔ Bank Select Footswitch Jack

This 1/4" phone jack accepts a momentary-contact footswitch. The footswitch can be used to increment the D1500 bank number.

Ⓒ MIDI THRU

This connector outputs the MIDI signal as received at the MIDI IN connector. This is useful when additional MIDI compatible equipment is to be "daisy-chained" and controlled from the same MIDI transmission equipment. In this type of application, each piece of receiving equipment must be set to a different MIDI receive channel in order to permit independent control of the receiving devices.

Ⓓ MIDI IN

This connector receives the MIDI control signals from the transmitting keyboard, MIDI computer or other MIDI equipment. A standard MIDI connection cable is used (sold separately).

Ⓓ Modulation ON/OFF Footswitch Jack

This 1/4" phone jack accepts an alternating-contact type footswitch which can be used to switch LFO modulation ON or OFF. When modulation is turned OFF, the front-panel LFO Rate LED will remain OFF.

Ⓒ Control Voltage Input Jack

This 1/4" phone jack permits varying the D1500 LFO rate by means other than the internal clock. An external oscillator or function generator could be used where a specific waveform is required. Or a foot controller could be hooked up to provide manually controllable modulation. This input requires a voltage in the range of 0 to +10 volts DC. The internal clock is automatically disconnected when a plug is inserted into this jack.

Ⓒ Hold Footswitch Jack

This 1/4" phone jack accepts an alternating-contact type footswitch which can be used to control the D1500 hold function. The footswitch functions in the same way as, but takes priority over, the front-panel HOLD switch (see Ⓒ).

Ⓓ Bypass Footswitch Jack

This 1/4" phone jack accepts an alternating-contact type footswitch which can then be used to control the D1500

bypass function. The footswitch functions in the same way as, but takes priority over, the front-panel BYPASS switch (see Ⓒ).

Ⓒ Delay Output Jack

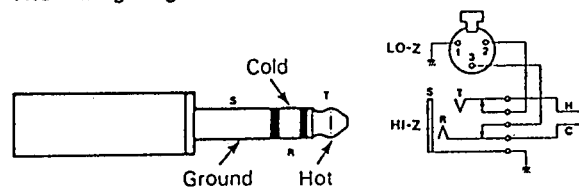
The phone jack outputs the D1500 delay-only signal. This is useful when it is desired to mix the direct and delayed sound at a separate master mixing console in sound reinforcement or recording applications. Nominal output level is +4 dB.

Ⓒ Mixed Output Jack (Balanced TRS Phone)

Ⓒ Mixed Output Jack (Balanced XLR)

The mixed (direct and delay signal, mix ratio set using the front-panel MIX function) output of the D1500 is provided with electronically balanced TRS phone jack and XLR connectors. If an unbalanced signal is required, it can be obtained simply by plugging a standard mono 1/4" phone plug into the phone jack.

TRS wiring diagram



Ⓒ Mixed Output Level Selector

This switch sets the nominal OUTPUT MIX level to either -20 dB or +4 dB for optimum matching with the following equipment.

Ⓒ Input Jack (Balanced TRS Phone)

Ⓒ Input Jack (Balanced XLR)

The D1500 offers both electronically balanced TRS phone jack and XLR input connectors. Unbalanced sources can also be input simply by plugging a standard mono 1/4" phone plug into the phone jack.

Ⓒ Input Level Selector

This switch sets the nominal input level to either -20 dB or +4 dB for compatibility with the broadest range of sources.

SAMPLE SETTINGS

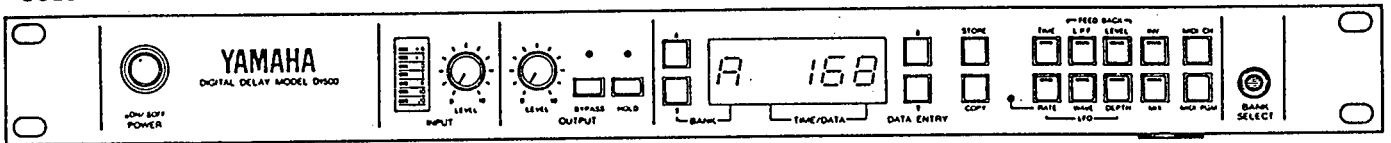
D1500 PRE-PROGRAMMED DELAY SETTINGS

6 of the D1500's 16 memory banks come ready-programmed with 6 useful delay effects that you can use right away. Of course, you can use them as is, edit them to create new

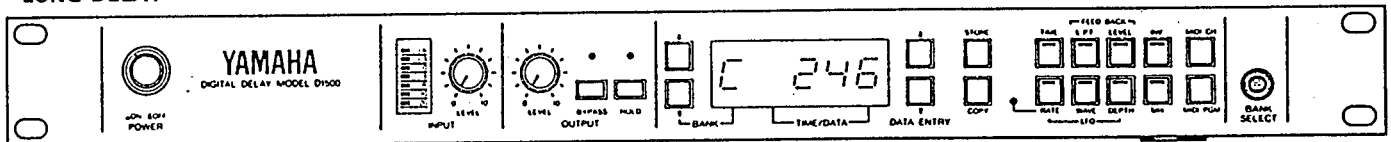
sounds, or completely re-program them according to your requirements. The following charts show the pre-programmed data settings.

	Bank No.	TIME	L.P.F.	LEVEL	INV	RATE	WAVE	DEPTH	MIX
SOLD LEAD	A	168	10	35	+	2.6	SIN	0	32
EFFECT	b	141	6	84	+	1.3	SIN	1	48
LONG DELAY	C	246	10	72	+	8.0	SIN	3	49
SHORT SLAP DELAY	d	94	20	20	-	0.1	SQU	0	46
CHORUS	E	30	8	0	+	0.7	SIN	21	50
BACKING	F	125	20	42	-	1.6	SIN	1	33

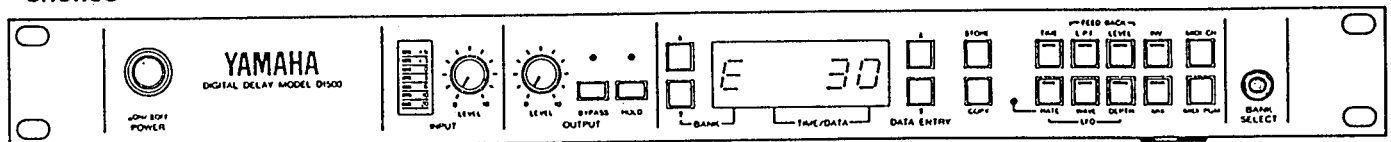
• SOLO LEAD



• LONG DELAY



• CHORUS



D1500 COMMONLY USED DELAY SETTINGS

The data table below will give you an idea of how to program other commonly used delay effects.

	TIME	L.P.F.	LEVEL	INV	RATE	WAVE	DEPTH	MIX
LONG DELAY	500	10	15	+	0.1	SIN	0	10
VIBRATO	25	10	5	+	0.1	SIN	10	50
DOUBLING	40	10	10	+	0.1	SIN	5	50
FLANGING	1.0	20	80	+	0.3	SIN	90	50

APPLICATION EXAMPLES

A MIDI Performance System

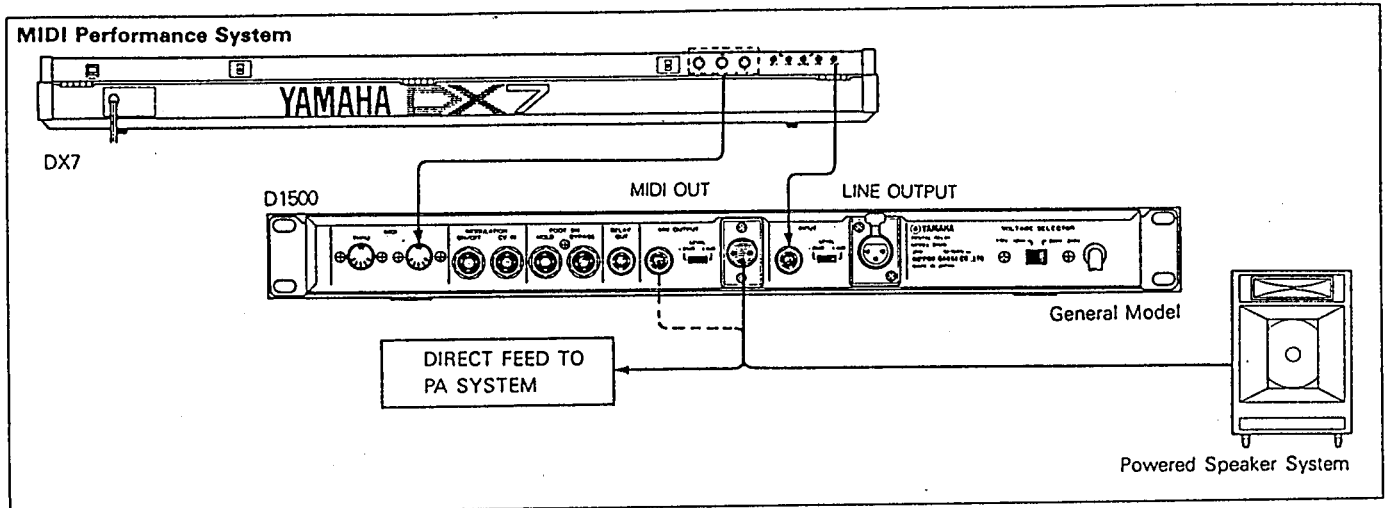
In this example, the D1500 is used with a Yamaha DX7 Digital Programmable Algorithm Synthesizer and either a music instrument amplifier or a direct feed to a sound reinforcement console. A Yamaha DX9 or DX1 Digital Programmable Algorithm Synthesizer could be used, as could just about any MIDI compatible keyboard or other MIDI equipment. The MIDI interface is used to permit remote control of the D1500 directly from the DX7 control panel.

The output from the DX7 is fed to the D1500 phone jack input via a standard instrument cable (unbalanced 1/4" phone jacks). The MIDI OUT connector of the DX7 is connected to the MIDI IN connector on the D1500 via a standard MIDI connection cable. The MIDI transmit channel of the DX7 and the MIDI receive channel of the D1500 (set using the MIDI Channel Select function: see 24) must be matched. The data which the D1500 receives as the MIDI Program Number is transmitted by the DX7 when one of its voice selector buttons are pressed (1 through 32).

* The same applies to the DX9 except only voices 1 through 20 are available. With the DX1, the MIDI Program Numbers correspond to the channel A voice selectors 1 through 32.

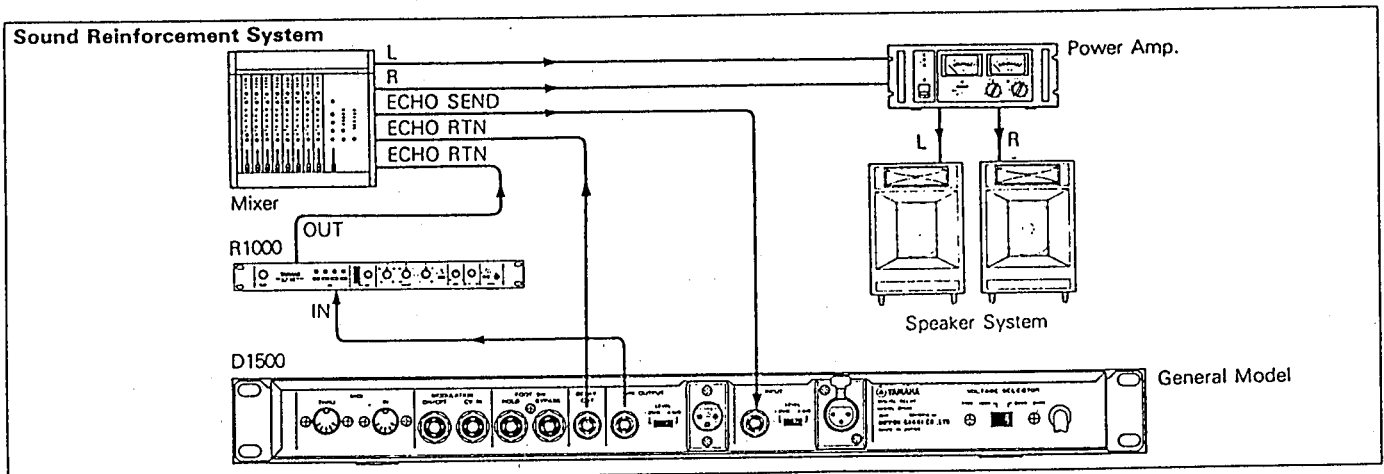
The D1500 MIDI Program Change function (see 24) is then used to determine which of the D1500's 16 memory banks will be selected when a given DX7 voice selector is pressed. This makes it possible to set each DX7 voice to automatically select its own delay or effect setting. The PASS bank can be selected for voices which do not require delay effects.

The D1500 mixed output is then fed either to an instrument amplifier via a standard instrument cable connected to the phone jack output, or to a sound reinforcement console via the XLR connector.



A Sound Reinforcement System

In this system, the D1500 is coupled into the echo send/return loop of a sound reinforcement mixing console, in combination with a Yamaha R1000 Digital Reverberation unit. One of the mixing console's echo send outputs feeds the D1500 input. The D1500 MIX function is used to set up the direct/delay sound balance so that the signal appearing at the MIX OUT connector is mostly delay. The D1500 MIX OUT is then fed to the input of a Yamaha R1000 Digital Reverberation unit, the output from which is fed back to one of the mixing console's echo returns. The returned signal consists of mostly the delay signal with reverb added. The DELAY OUT of the D1500 is then fed directly to the remaining echo return input on the console. A rich, spacious delay/reverb effect can then be achieved by panning one echo return input (mixed direct/delay + reverb) to the left house speakers and the other (delay only) to the right.



SPECIFICATIONS

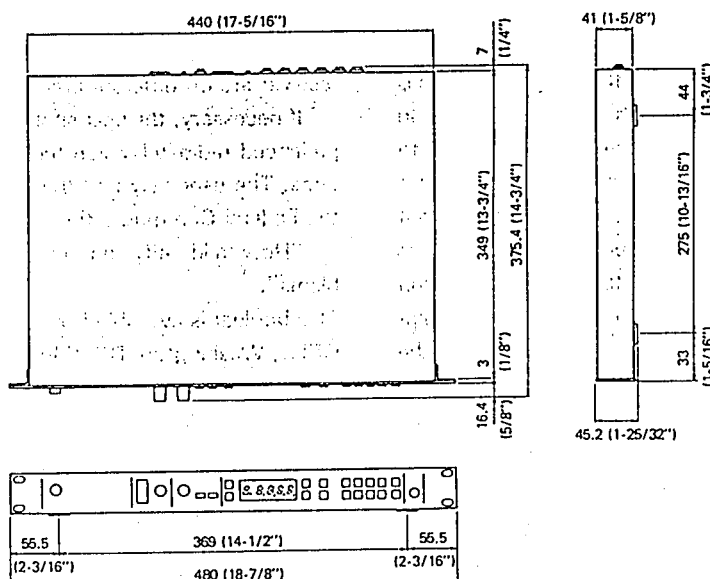
Delay Time	0~1023 msec/1 msec step
Frequency Response	Direct 20 Hz~20 KHz + 1, -2 dB Delay 20 Hz~18 KHz + 3, -3 dB
THD	Direct 0.008% Delay 0.08%
Dynamic Range	90 dB
Input	
Level	Nominal + 4 dB/-20 dB
Impedance	20 Kohms
Form.	Electronically balanced input (XLR type and Phone)
Number	1 XLR type and 1 Phone Jack
Mix. Output	
Level	Nominal + 4 dB/-20 dB
Impedance	100 ohms
Form.	Electronically balanced output (XLR type and Phone)
Number	1 XLR type and 1 Phone Jack
Delay Output	
Level	Nominal + 4 dB
Impedance	100 ohms
Form.	Unbalanced output (Phone)
Number	One
LFO Modulation	
Depth	0~100%
Rate	0.1~15 Hz
Wave	Sine and Square
MIDI Function	Change bank number, Receive MIDI channel and program number
Bank Number	Total 17 programs (0 to 9 and A, b, C, d, E, F, Pass) 6 presets programs by Factory (A to F)
Battery Backup Data	All bank data Bank number and Working data MIDI channel number MIDI program and bank data

Indicators	
Bank Number	7 segment LED x 1
Data	7 segment LED x 4
Headroom	7 point LEDs array (-20, -10, -6, -3, 0, 3, 6)
Bypass	LED
Hold	LED
LFO Rate	LED
Function Key	LED
Controls and Switches	
(Front Panel)	Input Volume, Output Volume, Bypass Switch, Hold Switch, Bank increment/decrement Key, Data increment/decrement Key, Store Key, Copy Key, Time Key, Feedback LPF Key, Feedback Level Key, Phase Invert Key, LFO Rate Key, LFO Wave Key, LFO Depth Key, Mix Key, MIDI Channel Key, MIDI Program Key
(Rear Panel)	Input Level Switch Output Level Switch
Terminals and Jacks	
(Front Panel)	Bank Select Foot Switch
(Rear Panel)	MIDI Input (5 pin DIN connector) MIDI Thru. (same) Modulation on/off Foot Switch CV IN (0 ~ 10 volts) Hold Foot Switch Bypass Foot Switch
Power Requirements	AC 120 Volts 60 Hz (US and Canadian Models) AC 110~120, 220~240 Volts 50/60 Hz (General Models)
Power Consumption	26 Watts (all models)
Dimension	Standard 19" rack mount type 480 (W) x 375.4 (D) x 45.2 (H) mm (18-29/32" x 14-3/4" x 1-25/32")
Weight	5.2 Kg (11 lbs 7 oz)

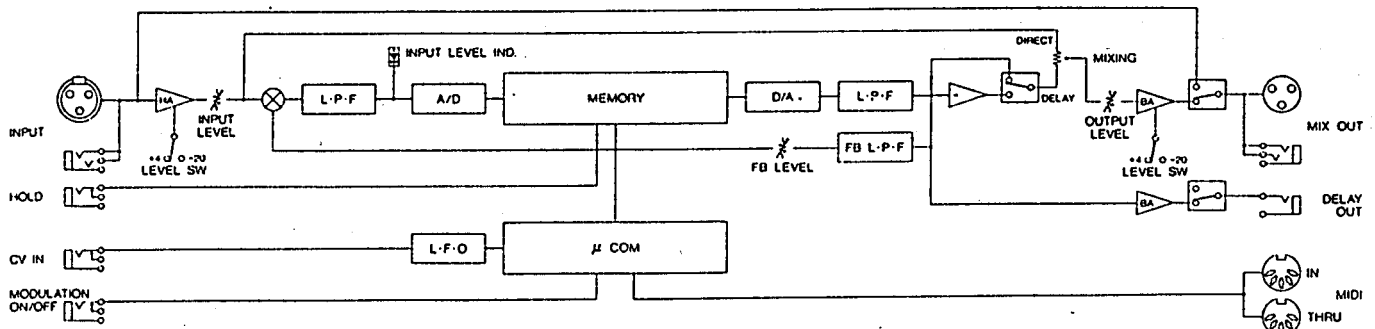
0 dB is referenced to 0.775 volts RMS.

Specifications subject to change without notice.

DIMENSIONS



BLOCK DIAGRAM



FCC CERTIFICATION (USA)

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict 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 computer with respect to the receiver.

Move the computer away from the receiver. Plug the computer into a different outlet so that computer 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 U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

SINCE 1887



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