480L Owner's Manual

V. 3.0 Update

This package contains a complete manual revision. To update your Owner's Manual, replace the entire contents of your 480L Owner's Manual Binder with the enclosed pages.

480L

Digital Effects System

lexicon

Lexicon Part No. 070-07296

Unpacking and Inspection

After unpacking the 480L and LARC, save all packing materials in case you ever need to ship the unit. Thoroughly inspect the 480L, LARC, and packing materials for signs of damage in shipment. Report any damage to the carrier at once.

Precautions

The Lexicon 480L is a rugged device with extensive electronic protection. However, reasonable precautions applicable to any piece of audio equipment should be observed.

- Always use the correct AC line voltage. Refer to Chapter 1 of this manual for power requirements.
- Do not install the 480L in an unventilated rack, or directly above heat-producing equipment. Maximum ambient operating temperature is 35°C (95°F).
- Never attach audio power amplifier outputs or other power sources directly to any of the 480L's connectors.
- To prevent fire or shock hazard, do not expose the 480L to rain or moisture.

Notices

In the interest of continued product development, Lexicon reserves the right to make improvements in this manual and the product it describes at any time and without notice or obligation.

Lexicon, Inc.
100 Beaver Street
Waltham, MA 02154 USA
(617) 891-6790
Telex 923 468

Printed in the United States of America

Warranty Notice

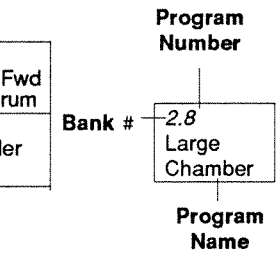
The Nonvolatile Memory Cartridge supplied with this unit carries a 30-day limited warranty.

Lexicon Part #070 - 04737 Rev.3.0
This manual accompanies Software Version 3.00

Table of Contents

Program Directory - Software Version 3.00

Bank	Program Name									
Bank 1 Halls	*1.1* Large Hall	*1.2* Large + Stage	*1.3* Medium Hall	*1.4* Medium + Stage	*1.5* Small Hall	*1.6* Small + Stage	*1.7* Large Church	*1.8* Small Church	*1.9* Jazz Hall	*1.0* Auto Park
Bank 2 Rooms	*2.1* Music Club	*2.2* Large Room	*2.3* Medium Room	*2.4* Small Room	*2.5* Very Small Room	*2.6* Large Wood Rm	*2.7* Small Wood Rm	*2.8* Large Chamber	*2.9* Small Chamber	*2.0* Small & Bright
Bank 3 Wild Spaces	*3.1* Brick Wall	*3.2* Buckram	*3.3* Big Bottom	*3.4* 10W-40	*3.5* 20W-50	*3.6* Metallica	*3.7* Silica Beads	*3.8* Inside Out	*3.9* Ricochet	*3.0* Varoom
Bank 4 Plates	*4.1* A Plate	*4.2* Snare Plate	*4.3* Small Plate	*4.4* Thin Plate	*4.5* Fat Plate					
Bank 5 Effects	*5.1* Illusion	*5.2* Surfin'	*5.3* Vocal Whispers	*5.4* Doubler	*5.5* Back Slap	*5.6* Rebound	*5.7* Elinar	*5.8* Sudden Stop	*5.9* In the Past	*5.0* Tremolo L & R
Bank 6 * SME Samplers	*6.1* Stereo 10s Rate chg	*6.2* Mono 20s Rate chg								
Bank 7 Samplers	*7.1* Stereo 3 Sec.	*7.2* Mono 6 Sec.	*7.3* Mono 3 Sec.	*7.4* Dual Rate Change	*7.5* Mono Fwd & Rev	*7.6* Stereo 3 S Drum	*7.7* Dual Rate Chg Drum	*7.8* Mono Fwd Rev Drum		
Bank 8 Pitch, Doppler	*8.1* Pitch Change	*8.2* Pitch Chorus	*8.3* 1% Up 1% Down	*8.4* Barber Pole	*8.5* Half Steps	*8.6* Stair Case	*8.7* Doppler 1	*8.8* Doppler 2		
Bank 9 So What Else	*9.1* The In-Out	*9.2* Twin Delays	*9.3* Stereo Adjust	*9.4* Stereo Param EQ	*9.5* Mono Param EQ	*9.6* Osc.				



Program Locations—Software Version 3.00

* The programs in bank 6 require the Sampling Memory Expansion option. See your Lexicon dealer for details.

Introduction

You are about to begin using the most advanced digital effects system available—the Lexicon 480L. The 480L is engineered for the emerging all-digital production environment. Digital audio places strict requirements on every link in the signal chain, and the 480L meets those requirements. With its unique 18 bit linear A/D and D/A converters, the 480L produces a dynamic range of 98 dB in the wet signal path. It is probably the only effects system available that doesn't raise the noise floor of a digital master. And the PCM 1610/1630 compatible digital I/O interface lets you add true stereo ambience and effects without leaving the digital domain.

The 480L doesn't just sound better—sheer computational power allows it to perform multiple audio tasks at the same time. And what tasks! In the current glut of throwaway digital devices with ever-cheaper versions of the same sounds, the 480L offers remarkable new effects and reverb sounds.

Its innovative reverb algorithms reflect a more accurate and natural model of the acoustic and psychoacoustic phenomena of reverb and ambience. Put the 480L up against any other reverberator—you'll be amazed at the difference.

Reverb is only part of the story. The 480L produces astonishing effects you haven't even begun to dream about yet. And its sampling programs offer a variety of useful and unique features.

The present software is powerful and comprehensive, a dramatic step forward in digital signal processing technology. Yet it hasn't explored the limit of the 480L's architecture, which is itself configured for future hardware expansion.

If you are familiar with the venerable 224XL, you'll feel right at home with the LARC used to control the 480L. However, there are enough differences in the way the two units operate that we strongly suggest that you read this manual as soon as possible. In it, you'll discover that the 480L's two high speed processors can operate in a variety of configurations. Samples can be processed with reverb or effects, all in the digital domain. Two 480Ls can be connected through their digital I/O ports for even wider creative horizons. The 480L can even be connected to a 224XL and both units operated from a single LARC. And that's just the beginning of what you'll discover--when you read this manual!

1

Installing the 480L

Installing the 480L involves six basic steps:

1. Familiarizing yourself with basic controls and functions.

2. Mounting.

3. Connecting the LARC(s) to the 480L mainframe.

4. Applying AC mains power.

5. Connecting the 480L to your console.

6. Setting audio levels.

Each of these subjects is discussed in this chapter.

About the Rear Panel

Main Inputs (L & R)
The left and right Inputs accept 3-pin male XLR connectors. They are electronically balanced and (optionally) transformer isolated. Either pin 2 or pin 3 can be used as high, but to maintain polarity when transferring data to the digital domain, pin 2 should be high. Pin 1 and either pin 2 or pin 3 of each input *must* be grounded for unbalanced operation. Input impedance is 30 kilohms in parallel with 100 pF. Inputs accept input levels from +6 to +24 dBm.

Main Outputs (L & R)
The left and right Main Outputs accept 3-pin female XLR connectors. They are electronically balanced and (optionally) transformer isolated. Either pin 2 or pin 3 can be used as high, but to maintain polarity when transferring data to the digital domain, pin 2 should be high. Pin 1 and either pin 2 or pin 3 of each output *must* be grounded for unbalanced operation. Output impedance is 33 ohms, and levels up to +24 dBm are possible.

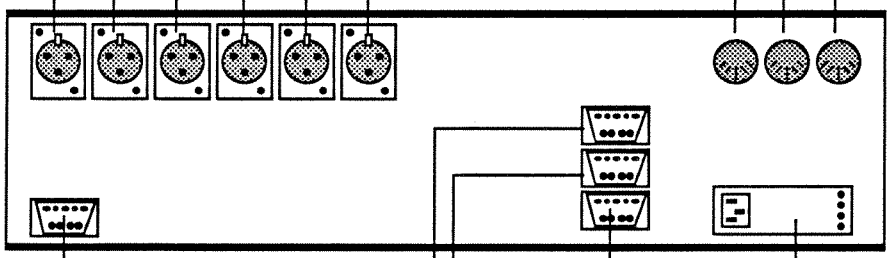
Aux Ouputs (L & R)
The left and right aux outputs are identical to the Main Outputs, except that they are used as secondary outputs when split or cascade modes are selected.

Important. Reversing polarity on either input or output connectors can produce audible phase inversion effects. Improper phasing in the stereo path can create a weak or thin mix. Ensure that inputs and outputs are wired consistently.

MIDI Connectors
MIDI IN receives MIDI information from other MIDI-equipped devices.

MIDI Thru retransmits MIDI information received at the MIDI In connector, without any change.

MIDI Out is currently not in use.



Lexicon Digital Audio I/O Connector
This DE9 connector provides PCM 1610-compatible digital I/O. It has 18-bit word length capability and can be slaved to a 48 kHz, 44.1 kHz or 44.056 kHz external word clock.

LARC 1 Connector
This DE9 connector connects the mainframe to the Lexicon Alphanumeric Remote Control (LARC) via a flexible 50-ft cable (supplied)

Automation Connector
The Automation Connector is provided for future computer control and automation features.

Important: Never connect a LARC to this connector.

LARC 2 (Thru) Connector
This DE9 connector allows connection of a second LARC to the mainframe. It also allows the 480L to be connected to a 224XL, with both units under control of a single LARC. A 10 ft cable is provided for this application.

Power Connector and Fuse Holder Cartridge
The Power Connector is a standard 3-pin IEC power connector. The Fuse Holder Cartridge contains the AC mains fuse(s). The voltage changeover card is also contained in this compartment. Read Appendix A for voltage changeover information.

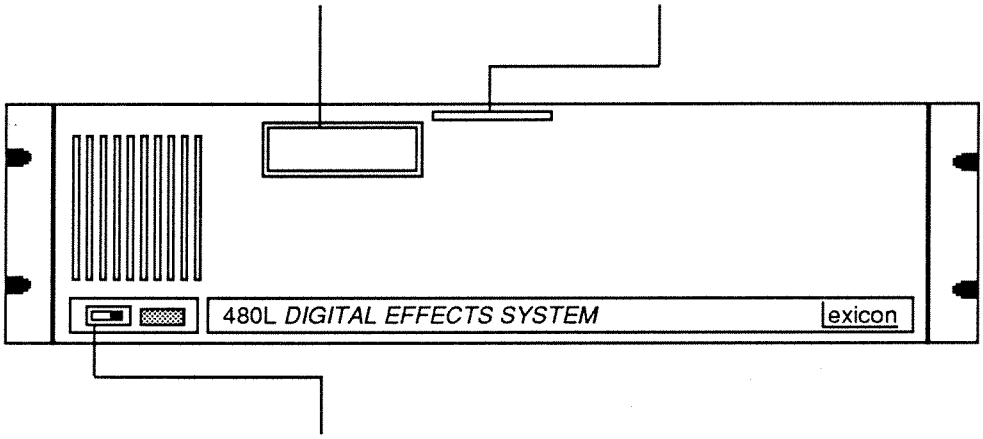
Figure 1.1. 480L Rear Panel.

About the Front Panel

Nonvolatile Memory Cartridge Slot
The 480L is shipped with one Nonvolatile Memory Cartridge, providing five banks of portable register storage. A write-protect switch prevents accidental erasure of contents.

Note: Cartridges may be shipped with the write-protect switch in the *ON* position.

Front Panel Latch
The front panel is hinged at the bottom; pull on the handle to open. Keep the front panel closed during normal operation to maintain dust filtration.



Power Switch and Indicator
The Power Switch turns the 480L on and off; the indicator lights when the unit is on. A lithium battery retains the data memory when power is off or disconnected.

Figure 1.2. 480L Front Panel.

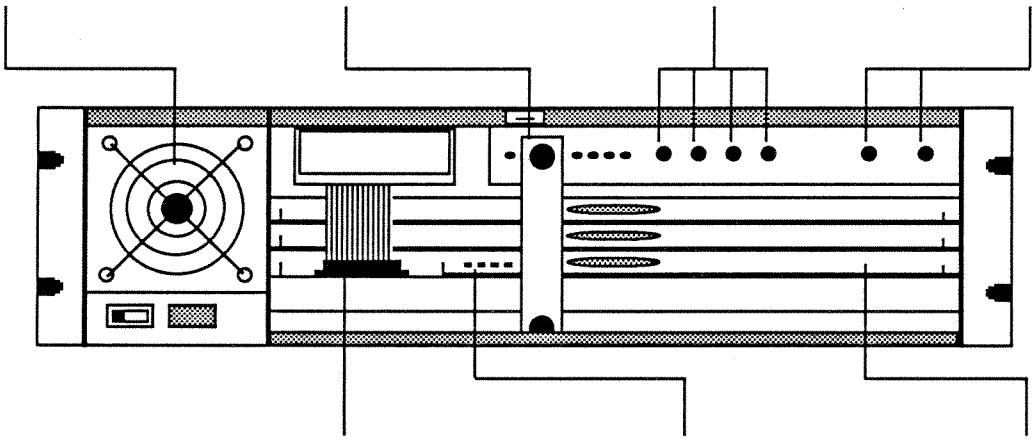
Behind the Front Panel

Cooling Fan
The cooling fan provides filtered forced air (the front panel vent is an air intake). The filter is removable and should be cleaned periodically with mild detergent and warm water.

Card Retainer
The card retainer ensures that the HSP and host processor cards remain firmly seated.

Output Level Controls
The output levels for the Main and Aux analog outputs may be adjusted independently over a range from +6 to +24 dBm (into 600 ohms) with these controls.

Input Level Controls
The input sensitivity for the left and right analog inputs may be adjusted independently to match inputs over a range of +8 to +28 dBm with these controls.



Nonvolatile Cartridge Cable
This ribbon cable connects the cartridge slot to the host processor card via a locking connector on the host processor card.

Caution: Use of excessive force when inserting cards into the 480L can result in serious damage. Always make sure that the connectors are lined up properly before applying seating force.

Diagnostic Indicators
The four diagnostic indicators on the host processor card flash briefly upon powerup.

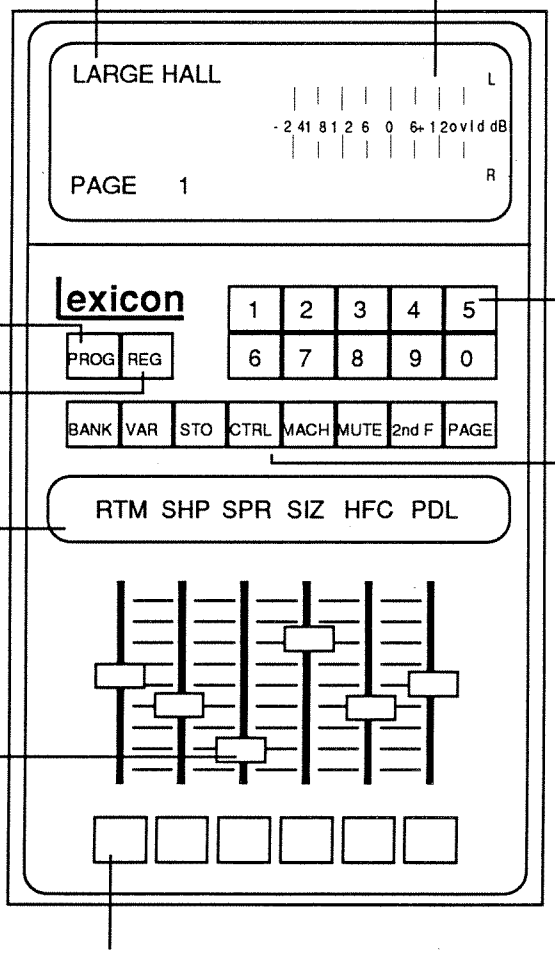
Removable Modules
The 480L is completely modular. Every subassembly in the mainframe can be unplugged and removed for service or exchange. The standard complement for a 480L is two HSP cards and a host processor card. The cards can be plugged into any slot in the mainframe, but for best noise performance, the HSP cards should be installed in the two top slots, and the host processor card directly beneath them. The empty bottom slot is provided for the optional SME card.

Figure 1.3. Behind the Front Panel.

About the LARC

Headroom Indicator
+12 dBm indicates analog or digital clipping. Proper input level is with +12 dB and ovld LEDs *unlit*.

Main Display
Shows names and values for all selections.



Numeric Keypad
Press one of these keys to load a program selected with PROG or REG. Also used to select pages.

Program-Select Key
Press repeatedly to scroll through programs in a bank.

Function Keys Bank
scrolls through groups of programs or registers.

Register-Select Key
Press repeatedly to scroll through registers in a bank.

VAR displays the running program or register name and the machine that the LARC is controlling.

Slider Display Line
Shows abbreviated names of the parameters currently under the control of the sliders. Full name appears in the Main Display.

STO stores edited parameter settings in registers (when REG is pressed at the same time.)

CTRL toggles in and out of the control mode.

Control Sliders
Adjust parameter values.

MACH toggles between machines when Split or Cascade modes are selected, and also between the 480L and 224XL when a 224XL is connected to the 480L.

MUTE removes processed audio from outputs (only while it is pressed).

2nd F is inactive.

PAGE steps through pages of parameters.

Slider Display Keys
Show parameter name and value in main display. Press twice to engage vernier (fine) adjustment mode.

Also used to trigger record and play events in Doppler and Sampler programs.

Figure 1.4. The LARC.

How to Mount the 480L

The 480L measures 19" wide x 5.25" high x 14.5" deep (483 x 133 x 368 mm). It can rest on any flat surface, or it can be mounted in a standard 19-in. (483 mm) relay rack. Do not install the 480L directly above equipment which produces significant amounts of heat (such as power amplifiers); maximum ambient operating temperature is 40°C (104°F). Do not obstruct the ventilation exhaust ports on the right side panel, or the air intake on the front panel.

If the 480L is mounted in a rack or road case, we recommend that you provide support for the rear of the chassis during transport to prevent possible damage from severe mechanical shock.

About the 480L's Power Requirements

The 480L is equipped with a three-pin IEC connector and detachable power cord, providing chassis grounding to the ac mains line. It can be operated at either 100/120 Vac or 220/240 Vac, depending on the fuses installed and the setting of the voltage changeover board.

Note: Voltage changeover is described in Appendix A.

The nominal operating voltage set at the Lexicon factory is indicated by a small protruding pin on the power connector/fuse holder (see Figure 1.5). Check this voltage setting before applying power to the unit! Power consumption is 70W typical, 180W maximum.

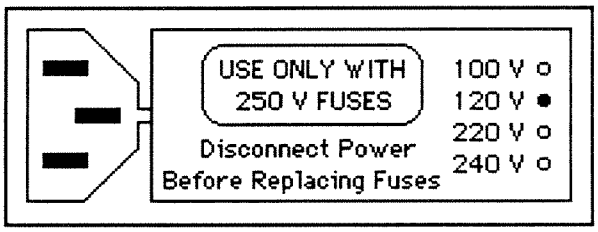


Figure 1.5. Voltage Selector Set for 120 V.

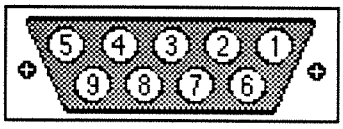
How to Interface the LARC

The LARC 1 connector interfaces the mainframe to the Lexicon Alphanumeric Remote Control (LARC) via a flexible 50-ft cable (supplied). If your system is equipped with a single LARC, this is the connector you should use.

The LARC 2 connector has two functions. It allows connection of a second LARC to the mainframe for applications where use of two LARCs is required (see Figure 1.8). It can also be used to connect the 480L to a 224XL (using the supplied 10' cable) with both units under the control of a single LARC (see Figure 1.9). The pin assignments for the LARC connectors are shown in Figure 1.7.

Important: Never connect a LARC to the automation connector. Doing so may blow the internal automation connector fuse.

Pin	Assignment
1	Chassis/shield ground
2	Receive data
3	Transmit data
4	Transmit common
5	Isolated power supply (+)
6	Receive common
7	Receive data
8	Transmit data
9	Isolated power supply gnd



LARC Connectors

Figure 1.7. Wiring diagram for the LARC mainframe connectors.

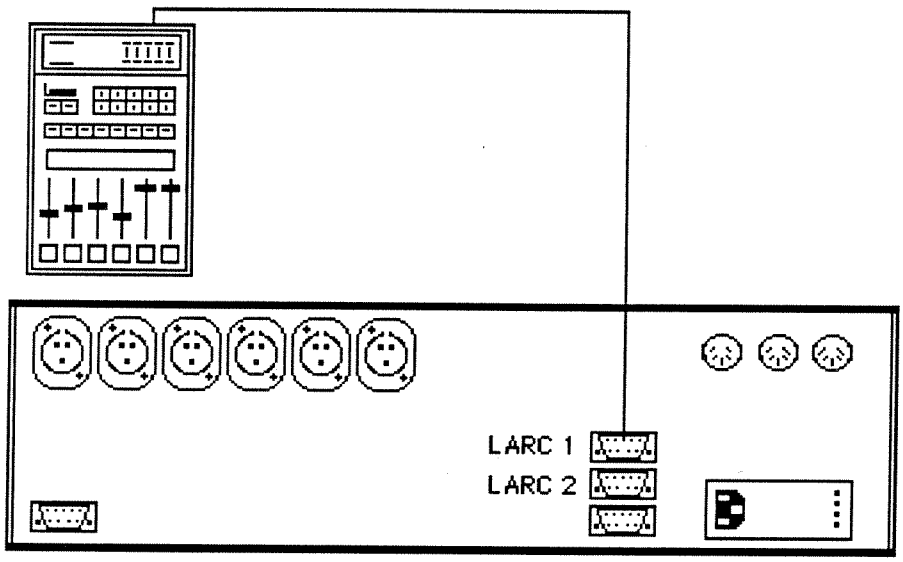


Figure 1.6. Connections for 480L with one LARC.

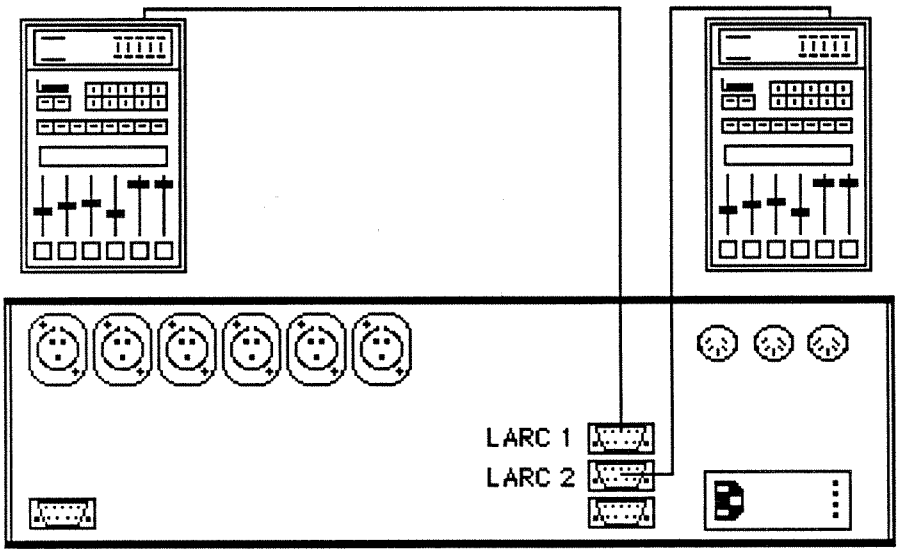


Figure 1.8. Connections for 480L with two LARCs.

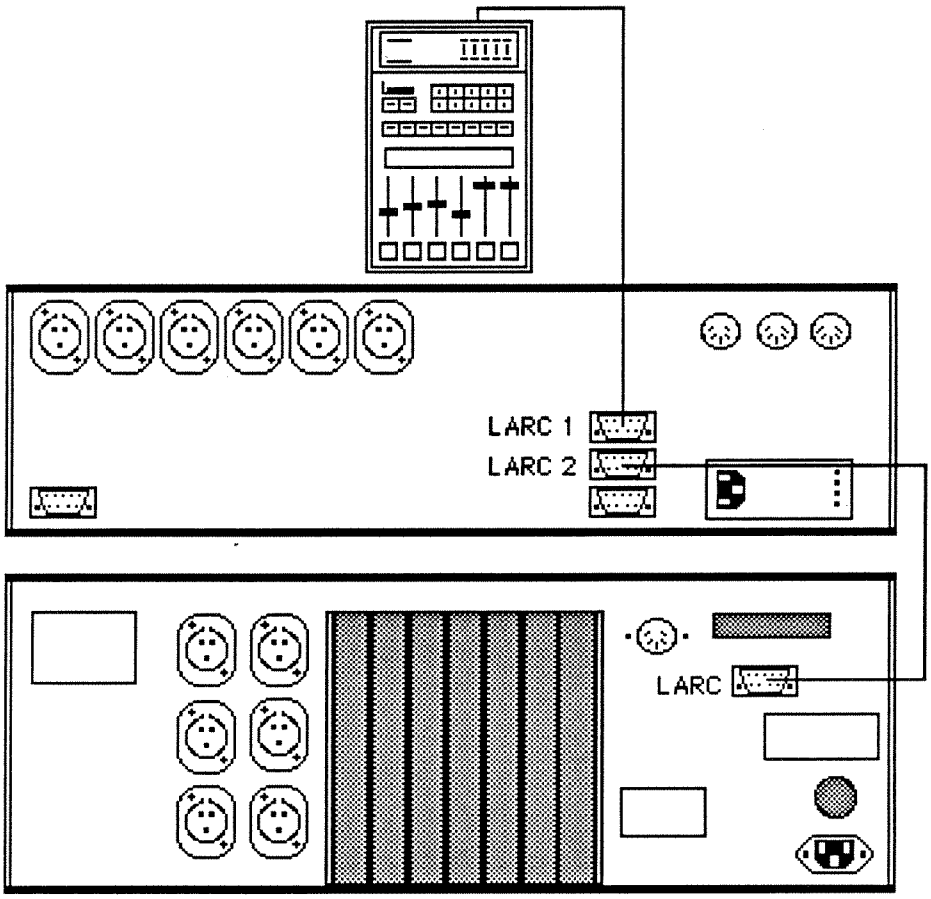


Figure 1.9. Connections for 480L and 224XL with one LARC.

Audio Connections

See page 1-2 for details about audio interfacing (pinouts, impedance, etc.)

The 480L is designed to take advantage of the flexibility of a mixing console. Figure 1.10 shows a typical configuration. For maximum utility, use independent sends that can be assigned as either prefader or postfader. You can use the console's effects returns if they are pannable or assignable, but for greater creative control, you may wish to connect the 480L outputs to regular input channels.

We recommend experimentation to arrive at the best configuration for your own system. Actual connections should always be checked carefully for proper impedance, polarity, and levels.

When using mono signal sources, either connect the left and right inputs in parallel, or use the mono split configuration (described in Chapter 2).

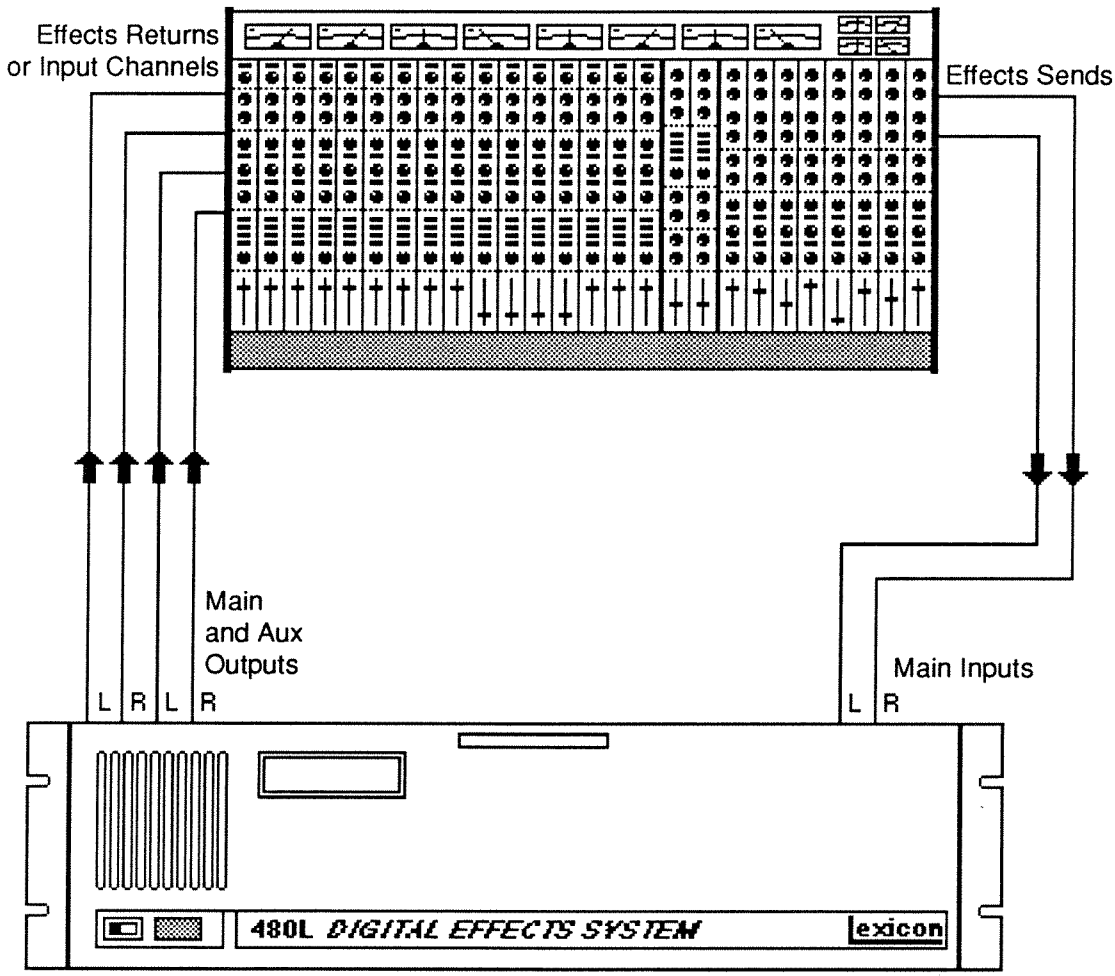


Figure 1.10. Typical Audio Connections.

How to Make Level Adjustments

To obtain the best possible performance from the 480L, input and output levels should be set with care. The factory settings give unity gain (0 dB) with a maximum output level of +18 dBm.

Setting the Input Levels

1. Put the 480L in the SINGLE configuration.

2. Load THE IN_OUT program located in Bank 9. This provides 0 dB gain through the 480L from the inputs through the outputs.

3. Feed a musical source or a 1-kHz test tone at the maximum peak level that you use in your system into the left and right audio inputs of the 480L.

4. While watching the Headroom display on the LARC, adjust the INPUT LEVEL controls (found behind the front panel) so that the peak input level comes just short of lighting the +12 dB LEDs (for both left and right inputs).

In CASCADE configuration the Headroom display only shows the input of Machine A. If the Machine A program increases the signal level too much, Machine B's headroom will be less than indicated.

Important: Do not overdrive the 480L. Its clipping characteristic, like that of other digital audio equipment, is very abrupt.

Setting the Output Levels

Set the four OUTPUT LEVEL controls (found behind the front panel) to provide output levels appropriate for the console's inputs.

We recommend running the 480L at +16 to +24 dB. If you must use lower levels (+6 or lower) some loss of dynamic range will be noticed. To rectify this problem, set the 480L output to a higher level (such as +18) and use a resistive pad or a step-down transformer (3:1 or 2:1) to reduce the level to match your equipment.

Floating the Analog Ground

In some applications it may be desirable to float the 480L's analog circuitry from the chassis ground. This can be accomplished by simply removing the blue jumper block located on the top side of the main circuit board near the two main input connectors. Store the jumper block on one of the posts in case you ever need to reinstall it.

When the jumper block is removed, the analog signal grounds are floated from the chassis at DC, but are tied to the chassis for protection through a 1000 pF bypass capacitor and a 180 V metal oxide varistor.

Using Digital I/O

In addition to its analog inputs and outputs, the 480L accepts digital audio I/O. Refer to Chapter 6, *The 480L*

2

Introducing the Controls

This chapter describes the controls and functions used to make the 480L do what you want it to do.

There are several terms to understand before we go any further.

• ***Algorithm***. The 480L contains several *algorithms*. An algorithm is a set of instructions that tells the 480L's microprocessors how to process the input signal. One algorithm produces effects, another reverberation, another sampling, etc. Algorithms are stored inside the 480L on ROM chips.

• ***Parameter***. Each algorithm has a set of *parameters* (controls) that uniquely characterize it. The settings of the parameters can be changed to create radically different sounds from a single algorithm.

• ***Program.*** A group of specific parameter settings permanently stored in the 480L is referred to as a *program*.

• ***Register***. New parameter settings you create by editing programs can be stored in *registers* for later recall. Registers can be stored within the 480L, or in a removable nonvolatile memory cartridge.

• ***Bank***. A *bank* is a collection of several similar programs or registers. For example, the Rooms bank contains reverberation programs that simulate real spaces, while the Effects bank contains programs which produce a variety of audio effects.

• ***Pages***. Because the programs have more than the six parameters which the LARC can display at one time, parameters are grouped into several *pages*. You move between pages by pressing PAGE.

• ***Control Mode***.. The *control mode* contains several pages of utility parameters and functions which are not directly related to a single algorithm, such as sampling rate, register transporter, program name function, etc. The control mode is entered and exited by pressing CTRL.

• ***Configuration.*** The 480L can run two programs simultaneously. How the two programs relate to each other is called the *configuration*. They can be used with independent inputs and outputs (mono split configuration), they can share the same stereo input signal (stereo split configuration), or the outputs of one program can be fed into the input of another (cascade configuration) The configuration is changed from the control mode. *The 480L is shipped in the stereo split configuration.*

• ***Machine***. *Machine* refers to two separate but related concepts. When two programs are operating simultaneously, they are referred to as Machine A and Machine B. When a 480L and a 224XL are under the control of a single LARC, these are referred to as Machine 1A and 1B, and Machine 2. You can toggle between programs and units by pressing the MACH key.

How to Set the 480L Configuration

The 480L can run two of its programs simultaneously. It can, for example, run a sampling program in one half of the machine while a reverb program is running in the other half. The two programs can be used entirely independently (with separate inputs and outputs) or they can be connected together internally in any of several flexible configurations. You select which program is currently under control of the LARC by pressing MACH.

Choosing a Configuration

Go into the control mode by pressing CTRL. Configurations are selected with Slider 2 on page 1 of the control mode. There are four internal configurations available:

- Cascade
- Stereo Split
- Mono Split
- Single

Because the Configuration slider redefines the internal architecture of the 480L, the display takes a bit longer to update after you move the slider than other parameters. Let's take a closer look at the four configurations.

The Cascade Configuration

The Cascade configuration feeds the output of one program (Machine A) directly into the input of the second program (Machine B). See Figure 2.1. This allows you to process a stereo signal with two entirely different effects--without ever leaving the digital domain. The Main outputs are connected to Machine B, and contain the processed signal from both Machine A and Machine B. The Aux outputs contain only the signal from Machine A.

In the Cascade configuration, the MIX control found in the reverb and effects programs becomes very important, because it is the only method you have of controlling the mix between the two programs.

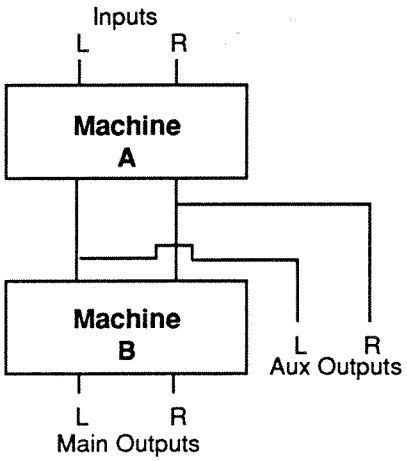


Figure 2.1. 480L in Cascade Configuration.

The Mono Split Configuration

The Mono Split configuration uses the 480L as two independent signal processors. See Figure 2.2. Each program has an independent mono input and an independent stereo output. The Left input always goes to the first program (Machine A), and the Right input always goes to the second program (Machine B). The Main Outputs produce stereo output from Machine A, and the Aux Outputs produce stereo output from Machine B.

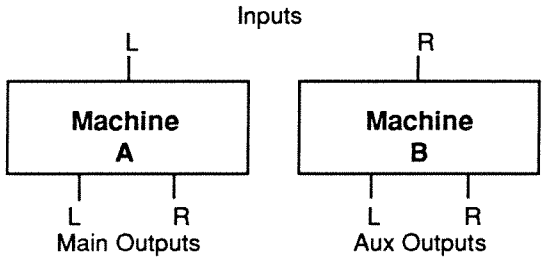


Figure 2.2. 480L in Mono Split Configuration.

The Single Configuration

A few programs (like Stereo Sampler) require all of the 480L's processing power, and cannot be run at the same time as other programs. The Single configuration is provided for these programs. In the Single configuration, the outputs of the program are available at both the Main and Aux Outputs.

The Stereo Split Configuration

The Stereo Split configuration also uses the 480L as two independent signal processors. See Figure 2.3. It differs from the Mono Split in that both inputs are sent to both programs; in other words, Machine A and Machine B receive the same stereo input signal. The Main outputs are used for Machine A, and the Aux outputs are used for Machine B.

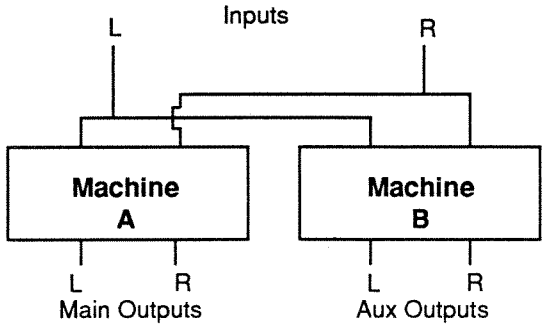


Figure 2.3. 480L in Stereo Split Configuration.

Checking Your System's Status

Move slider one on page one of the control program for a quick display of the following information:

- Configuration
- Sampling rate selected
- Clock source (internal or external)
- Input source (analog or digital)
- External Word Clock present/not present
- Register protection status
- Cartridge Status (formatted or unformatted, present or not present)

Using Two LARCs to Control a Single 480L

If you frequently use your 480L in the Split or Cascade modes, you may wish to consider purchasing a second LARC. Having two LARCs allows you to control two programs simultaneously, without switching back and forth with MACH. Two LARCs are also useful if the 480L is to be shared between two different rooms.

In addition to controlling two programs at once, the second LARC can be used to display two pages of parameters for a single program.

The second LARC should be connected to the LARC 2 (Thru) connector on the rear panel of the 480L. Refer to Chapter 1 for details.

Controlling a 224XL from a 480L and LARC

In facilities equipped with both a 480L and a 224XL, it may be useful to control both systems from a single LARC. To do this, connect the LARC 2 (Thru) connector to the 224XL LARC connector with the supplied cable, as shown in Chapter 1. Use the MACH key on the LARC to switch the LARC between the 224XL and the 480L. If you are running two programs on the 480L at the same time, there will be three choices to step through each time you press MACH.

Connecting a 480L and a 224XL together simply allows you to control the 224XL as you always have--none of the 480L's new capabilities are added to it. For example, the 224XL cannot access the register mover or other 480L control mode functions. Also, the 224XL cannot be accessed by the LARC while the 480L is in the control mode. If you press MACH while in the control mode, the 224XL will not appear in the display. As soon as you exit the control mode, the 224XL can be selected.

How to Load Programs

The 480L is shipped with over 60 programs installed (the exact number varies, depending on the version of the software supplied with your unit). This section describes selecting and loading programs. Detailed information about *using* the programs is found in later chapters.

The 480L's programs are stored in banks. A bank is a collection of several similar programs.

Select a Bank

Before selecting a program, you must first select the bank that the program is stored in. There are two ways to select banks:

1. Press BANK repeatedly. The 480L displays a bank name each time you press BANK. *Example*: BANK, BANK, BANK scrolls through three banks. This is a good method to use when you are just "sightseeing" to find out what programs are available.

2. Press BANK, and then one of the numeric keys. *Example:* press BANK, 2 to select the second bank of programs in the 480L. This is a good method to use once you are familiar with the 480L, and know exactly which bank you need.

While you are selecting a bank, the bank number on the LARC display flashes, and the number of the current bank is displayed:

BK2

Select a Program

After selecting a bank, you can scroll through the programs in that bank without loading them, by pressing PROGRAM repeatedly. While you are selecting a program, the program number on the LARC display flashes, and the number of the currently-selected program is displayed.

Load a Program

1. After finding a program you want to load, note its program number (the flashing number on the LARC display). For example:

PGM4

2. Load program 4 by pressing numeric-select key 4. The program that was running halts and the new program begins processing audio after a brief pause.

3. When you become familiar with the system of banks and programs, you'll find that you can move from program to program very quickly. For example, to go from bank 2, program 3 to bank 1, program 6, you just press BANK, 1, PROG, 6.

After you load a program, the first page of variable parameters appears.

Cue Up the Next Program

You can cue up the next program you will need by selecting it with the BANK and PROG or REG keys. Then, when you are ready for the new program, just press PROG or REG and the numeric-select key.

If the 480L is set up with a split or cascade configuration (see page 2-2), use the following procedure to load a program into machine B:

1. Press MACH to switch control to Machine B.

2. Load the program or register you want into Machine B. The same program or register can be loaded into both machines, or they can be entirely unrelated.

Toggling Between Machines

Once two programs have been loaded, they both process audio continuously and simultaneously. However, the LARC can only actively *control* one program at a time. Press MACH to select the machine you wish to control. Each time you press MACH, the LARC switches control to the other machine, and briefly indicates the machine it is controlling.

How to Edit Parameters

The sounds of the programs supplied with the 480L cover an astounding range of possibilities, but sooner or later you will want to alter the sounds of the programs to more perfectly fit your requirements. Each program in the 480L contains a set of parameters that can be edited to create a sound uniquely your own.

Just Move the LARC's Sliders

After loading a program, you can edit its parameters by moving the LARC's sliders. Most parameters can be edited in real time to alter an effect. However, a few parameters (like SIZE) have such a radical effect on the 480L's algorithms that the effects signal is muted briefly when they are edited.

To indicate the parameter that a slider controls, an abbreviated code appears in the display window above each active slider. You can display a more descriptive title and the current value for each parameter by pressing the keys directly below each slider. Moving a slider also displays this information.

In many cases, pressing a display key twice will engage a vernier (fine) adjustment mode that allows very precise adjustment. The display blinks to indicate that the vernier mode is active.

Change Pages to Access More Parameters

Because the programs in the 480L have more than the six parameters which the LARC can display at one time, parameters are grouped in several pages. Each page contains up to six parameters.

You can use either of two methods to move between pages:

1. Press PAGE repeatedly to step through the pages sequentially.

2. Press PAGE and then a numeric-select key to go directly to the page you want.

Important! When a new program is loaded or another page is selected, each slider is deactivated (i.e., the display does not change) until the slider is moved *through* its preset value.

When changes have been made on a page, and you move to a new page, the previous edits remain intact. However, when a new program is loaded, the edits you made disappear forever (unless you stored the edits in a register).

How to Use Registers

The ability to edit parameters would be of little value if there were no way for the 480L to store the edits. Not to worry--the 480L has 100 registers available to store edited versions of the preset programs. Registers are organized into banks, selected, and loaded exactly like the preset programs. You can also edit parameters in a register, and store the results in the same register or another register.

There are five banks of ten registers in internal memory. Another five banks of ten registers can be stored in a nonvolatile memory cartridge. One cartridge is supplied with the unit, and additional cartridges may be purchased.

Important! Cartridges are equipped with a write protect switch. When the switch is ON, it prevents the 480L from writing to the cartridge, regardless of the register protection selected in the 480L. Cartridges may be shipped with the write protect switch in the ON position. Figure 2.4 shows the location of this switch.

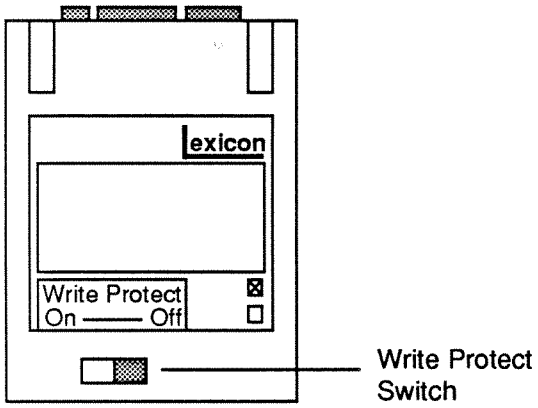


Figure 2.1. Location of Write Protect Switch.

Storing a Modified Program in a Register

After you have made the changes you want to a program's parameters, you can store the changed version in a register:

1. Press REG once to enter the register mode.

2. Press BANK repeatedly to locate the bank you wish to store the register in. Banks 1 through 5 are internal registers, and banks 6 through 10 are stored in the nonvolatile memory cartridge.

Note: If you have difficulty using a cartridge, it may not have been formatted. Also, cartridges formatted with earlier versions of software may not work with later versions until they are reformatted. See Chapter 11, *Solving Problems* for instructions on how to format the cartridge.

3. Press REG repeatedly to locate an "Unused" register, or a register you don't mind erasing.

4. With the register number that you want to use flashing on the display, hold down STO and press REG. The LARC display flashes

SETUP STORED

This lets you know that the register was stored correctly.

Loading Registers

Registers are organized into banks, selected and loaded in exactly the same manner as programs. However, you press REG to switch from program to register mode, and press REG instead of PROG when selecting, storing, and loading registers.

Naming Registers

When you store a register, the edited program still has the same name as the original program. To avoid confusion, you can assign names to registers. To rename a register:

1. Recall the register you want to rename and press CTRL to enter the control mode.

2. Press PAGE, 3 to go to page three.

3. Press the key under the slider marked SEL to activate the select function. The current name of the program appears in the lower display.

4. Move the SEL slider. Note that different characters within the name are selected by a pair of brackets < > as you move the slider. Select the first character in the program name.

5. Use the CHG slider to change the character. Note that a blank space is available at the bottom of the slider's range, as are several symbols.

6. Repeat steps 4 and 5 until all the characters in the new name have been entered successfully.

7. Press CTRL to exit the Control Mode.

8. The new name will be lost unless you store the register again. Press REG once. Then hold down STO and press REG to store the register with its new name.

Note: In this example, we asked you to first store an edited program, change its name, and then store it again. Actually, there is no reason not to change the name before storing the edited program for the first time.

Protecting Against Loss of Register Contents

Setting up a large number of registers to meet your personal requirements can represent a considerable investment of time and effort. To reduce the possibility of accidental loss of the contents of these registers, the 480L has a memory protection feature. When memory protection is on, the 480L does not allow anyone to erase the contents of a register by overwriting it.

However, unused registers can be written to. The 480L has four protection levels:

- PROTECT INT AND CART
- PROTECT CART
- PROTECT INT
- PROTECT OFF

PROTECT INT protects just the internal registers, but allows registers stored in the cartridge to be overwritten. PROTECT CART protects the cartridge, but allows internal registers to be overwritten. PROTECT INT AND CART protects both internal and cartridge registers. To activate memory protection:

1. Press CTRL to enter the control mode.

2. Press PAGE, 2 to go to page 2.

3. Move slider six to select one of the four protection modes.

4. Press CTRL to exit the control mode.

Once activated, memory protection remains in effect until it is turned off again.

Protecting Your Registers Against Another Kind of Loss

After creating a collection of registers, some users may not wish to let others access their "trademark" sounds. If this concerns you, copy any internal registers that you create to a nonvolatile memory cartridge at the end of each session (using the register transporter in the control mode). Then use the register clear function (also found in the control mode) to remove the registers from internal memory. Take the cartridge with you when you leave the facility.

Use of the register transporter and register clear functions are described below.

Moving Registers Around with the Register Transporter

The register transporter has four functions:

- Copy single registers from one location to another
- Move single registers from one location to another
- Copy all internal registers to a cartridge
- Copy all cartridge registers to internal memory

When registers are copied, the original register source remains intact. When registers are moved, the original register source is cleared.

Important! The register protect function found on page two of the control mode must be set to OFF if any moves or copies are to overwrite existing registers.

To copy entire register contents between internal and cartridge memory:

1. Press CTRL to enter the control mode.

2. Press PAGE, 2 to go to page 2.

3. Use slider one to select CPY CART TO INTERNAL or CPY INTERNAL TO CART.

4. Hold down STO and press REG to complete the copy.

Note: When either of these two modes are selected, the SRC and DST sliders are inactive.

To move or copy single registers:

1. Press CTRL to enter the control mode.

2. Press PAGE, 2 to go to page 2.

3. Use slider one to select MOVE or COPY.

4. Use slider two to select the source.

5. Use slider three to select the destination.

6. Hold down STO and press REG to complete the copy or move.

Clearing Register Contents

Page two of the control mode has a CLEAR control that allows complete removal of register contents. CLEAR has three functions:

- Clear a single register
- Clear all internal registers
- Clear all cartridge registers

To clear a single register:

1. Press CTRL to enter the control mode.

2. Press PAGE, 2 to go to page two.

3. Use slider one to select CLR SETUP.

4. Use slider two to select the register that you wish to clear.

5. Hold down STO and press REG to clear the selected register.

To clear all cartridge or internal registers:

1. Press CTRL to enter the control mode.

2. Press PAGE, 2 to go to page two.

3. Use slider two to select CLR ALL INT or CLR ALL CART.

4. Hold down STO and press REG to clear the selected registers.

> **Note**: When either CLR ALL INT or CLR ALL CART are selected, the BANK and REG sliders are inactive.

Control Mode - Reference Section

The following list contains a brief description of every parameter in the control mode, listed in order by page number.

Page One

STA (Status)
Moving the STA slider displays the current status of a variety of different controls on the 480L. This control doesn't permit you to change any settings—it simply allows you to quickly check out the status of several 480L controls.

CFG (Configuration)
The 480L can run any two of its programs simultaneously. The two programs can be used independently, or they can be connected together internally in any of several configurations. The CFG control is used to choose one of these configurations.

SMP (Sampling Rate)
SMP selects between 44.1 kHz and 48 kHz sampling rate. Use the higher 48 kHz sampling rate for maximum audio performance. However, when using digital I/O, the 44.1 kHz rate may be required to match an external device.

CLK (Clock Source)
The 480L can generate its own word clock, or it can be slaved to 48 kHz, 44.1 kHz, and 44.056 kHz external word clocks (through the digital I/O connector). For most applications using the 480L's analog inputs, CLK should be set to INTERNAL. For most digital I/O applications, CLK should be set to EXTERNAL. If EXTERNAL is selected, but an external word clock is not present at the digital I/O connector, the 480L will continue to use its internal word clock.

To determine if the 480L is correctly receiving an external word clock, move the STATUS slider (slider one, page one) to display External Word Clock Status.

Important! Do not send external word clock to the 480L until *after* it is powered up.

INP (Input Source)
INP chooses between analog audio input via the main inputs and digital audio input via the digital I/O port.

Page Two

Page 2 contains controls related to copying and moving registers. It is sometimes referred to as the register transporter page.

FUN (Function Setup)
The FUN slider has eight functions:

- COPY SETUP
- INT TO CART
- CART TO INT
- MOVE SETUP
- CLR SETUP
- CLR ALL INT
- CLR ALL CART
- FORMAT CART

COPY SETUP copies a program or register to a specified register location

INT TO CART copies all the registers in internal memory to the cartridge

CART TO INT copies all the registers in the cartridge to internal memory

MOVE SETUP copies a register to a specified register location, and deletes the original.

CLR SETUP deletes the specified register

CLR ALL INT clears all internal registers

CLR ALL CART clears all registers in the cartridge

FORMAT CART formats the cartridge

To perform any of these functions, hold down STO and press REG.

SRC (Source)
SRC selects the source register or program for clearing, moves or copies.

DST (Destination)
DST selects the destination register for copies or moves.

PRO (Register Protect)
PRO has four options:

- OFF (no protection)
- INTERNAL (internal registers are protected)
- CARTRIDGE (cartridge registers are protected)
- INT & CART (both internal and cartridge registers are protected)

When registers are protected, they cannot be copied to, moved to, cleared, or otherwise erased. Blank registers can still be copied or moved to.

Page Three

This page is used to change the name of the current program.

SEL (Character Select)
SEL selects the character to change.

CHG (Character Change)
CHG changes the selected character. Symbols are at the bottom of the range, numerals in the middle, and characters at the top. To enter the name change, hold down STO and press REG.

Page Four

Page four contains controls which allow you to set up 10 MIDI patches. Each register can have a unique set of 10 patches.

SEL (Patch Select)
SEL chooses which of the 10 patches will be edited.

SRC (Source)
SRC selects the MIDI controller or event that will be patched to the 480L parameter or event.

DST (Destination)
DST chooses the 480L parameter or event to be controlled by the MIDI controller or event selected with SRC.

SCL/LOW (Scaling Factor/Low Note)
When SRC is set to a MIDI controller, last note, or last velocity, this slider sets the scaling. Scaling determines the relationship between settings of the MIDI controller and the parameter which is under its control. Scaling ranges from -200% through +200%.

In the sampler and doppler programs, when SRC is set to NOTE EVENT, this control sets the LOW NOTE.

PRM/HIGH (Parameter/High Note)
When SRC is set to a MIDI controller, last note, or last velocity, this slider allows control of the parameter selected with DST. This is particularly useful when trying to set the correct SCL value.

In the sampler and doppler programs, when SRC is set to NOTE EVENT, this control sets the HIGH NOTE.

Page Five

Page Five contains the corresponding register table and the MIDI channel selection control.

PGM (MIDI Program Change Number)
PGM has a range of 0 - 127, and sets the MIDI program change number for the corresponding register table.

TBL (Corresponding Register Table)
TBL chooses the 480L program or register to link to the MIDI program change number selected with PGM.

PGM (Program Change Mode)
Pgm determines what the 480L will do with incoming MIDI program changes. PGM has three options:

- IGNORE (Ignore incoming program changes)
- FIXED (incoming program changes 0 to 99 are mapped directly to register numbers; 100 to 127 are mapped to the first 28 programs)
- TABLE (Uses the corresponding register table created with PGM and TBL)

CHL (MIDI Channel)
CHL sets the MIDI channel for program changes and patches.

Note: Remember that the MIDI channel and corresponding register table are set separately for each machine when the 480L is in Split or Cascade modes.

3

Using the Reverb Programs

In this chapter we'll discuss the Reverb programs and parameters.

Note: There are now two different reverb/room simulation algorithms available. The primary difference between the two is the density of the reverberation. This is most noticable at large sizes and with long reverb times. The denser algorithm has two pre-echo voices, while the other algorithm has six.

The presets are not organized by algorithm. One bank may contain programs made with both algorithms. To discover which algorithm is used by a particular program, go to page three to see how many pre-echo voices are available. If there are two voices, the program uses the dense algorithm. If there are six, it uses the other one. When creating a new reverb sound, make sure you start with a program that uses the algorithm that you want.

Before we jump into detailed descriptions of the programs and parameters, let's take a look at the philosophy behind the reverberation algorithm's radical new structure.

About the Reverberation Algorithm

The 480L incorporates the results of a great deal of research into acoustics and reverberation. It produces four general classes of sounds: ambience, room simulations, plates, and gated sounds.

In Search of Ambience

Ambience is the use of reverberation or reflected sound energy to give recorded music a sense of being performed in a real acoustic location. Ideally, ambience gives warmth, spaciousness and depth to a performance without coloring the direct sound at all.

Recent research into ambience has shown that this phenomenon depends most critically on the shape of the initial reverberation build-up and decay. Ambience is perceived and has benefit while the music is running (which is most of the time). But once the reverberation has decayed 15 dB it is no longer audible in the presence of the direct sound. So the time it takes for the sound to build up and decay 15 dB determines the perceived reverb time, regardless of what the decay time to -60 dB is. Some very good halls for recording have a rather uneven initial build-up and decay, giving a much longer effective reverb time than their -60 dB reverb time might suggest.

It has become common practice to use predelay in an attempt to emulate the sound of these halls. Adding delay to the reverb sends definitely increases the effective audible reverb time and the apparent size of the hall, but the result sounds unnatural.

If we make echograms of real halls, we find that there is usually a gradual buildup of energy between the arrival of the direct sound and the time at which the reverberation reaches maximum loudness. The sharp attack of added predelay in most reverberation devices sounds entirely different.

In the 480L, the SIZE, SPREAD and SHAPE controls allow adjustment of the buildup and decay of the initial part of the reverberation envelope. SHAPE controls the shape of the envelope, while SPREAD and SIZE set the time over which this shape is active.

In the hall and room programs, SIZE acts as a master control for the apparent size of the space being created by the 480L. Both SPREAD and RT MID vary *linearly* with the setting of SIZE. Thus maximum reverb time and spread require high settings of SIZE. To find an appropriate reverb sound, start with a preset with a similar sound to what you want to end up with. Simply varying SIZE is often sufficient to arrive at the exact sound you are seeking.

Once a size has been selected, SPREAD and SHAPE are used to adjust the shape and duration of the initial reverb envelope, which together provide the major sonic impression of room size.

When SHAPE is at minimum, the reverberation envelope builds up very quickly to a maximum amplitude, and then dies away quickly at a smooth rate. This envelope is characteristic of small reverberation chambers and reverberation plates. There are few (if any) size cues in this envelope, so it is ineffective in creating ambience. With this SHAPE setting, SPREAD has no effect. The density is set by the size control, and the rate of decay is set by RTMID. This reverberation envelope is typical of many of the popular digital reverberators of the last few years.

As SHAPE is raised to 32 (about 1/8th of the way up) the initial sharp attack of the reverberation is reduced, and reverberation builds more slowly. The envelope then sustains briefly before it begins to die away at the rate set by RTMID. SPREAD has little or no effect on this shape.

When SHAPE is at 64 (1/4 of the way up) buildup is even slower and the sustain is longer. Now SPREAD affects the length of both the buildup and the sustain. As a rough estimate, the sustain will be approximately the time value indicated by the SPREAD display (in milliseconds).

As SHAPE is raised further, the buildup and sustain remain similar, but now a secondary sustain appears in the envelope, at a lower level than the first. This secondary plateau simulates a very diffused reflection off the back wall of a hall, and is effective in creating a sense of size and space. This reflection becomes stronger and stronger, reaching an optimal loudness at a SHAPE value of about 128 (1/2 way up).

The highest SHAPE settings are typically used for effects. Near the top of the scale the back wall reflection

becomes stronger than the earlier part of the envelope, resulting in a inverse sound.

Note that none of these shape effects are audible unless RTMID is set short enough. Generally, RTMID should be set to a value of about 1.2 seconds for small rooms, and up to 2.4 seconds or so for halls. SIZE should also be set to a value appropriate to the desired hall size (note, however, that small sizes color the reverberation).15 meters makes a very small room, and 38 meters is useful for a large hall.

Used with care SHAPE and SPREAD allow the 480L to produce superior ambience—a sound which is spacious and has great depth—without the long RT60 of a church.

Creating a Realistic Ambient Sound

When you set out to create an ambient sound, the first and most important decision is how big a space you want. The best way to start is to listen to several presets and choose the one which sounds closest to what you have in mind. If necessary, use SIZE to make a slightly larger or smaller sound, as needed.

Next use RTMID to fine-tune the amount of time the reverberation takes to die away at the end of musical phrases. Actual halls vary a great deal in their actual RT MID values. The setting of the BASS MULTIPLY is also critical in matching the sound of an existing hall. An ideal concert hall would have a BASS MULTIPLY setting of 1.2. It is rare when actual physical spaces exceed 1.5. Many (if not most) good recording environments have values of BASS MULTIPLY of 1.0 or less, and a value of 0.8 should be tried when attempting to match an existing hall.

There are two additional controls to deal with. SHAPE and SPREAD adjust the effective reverb time when the music is running. Higher values of SHAPE and SPREAD produce a longer effective reverb time. Longer effective reverb times give greater spaciousness to the sound.

The Early Reflection Myth

The importance of early reflections in reverberation has become accepted as indisputable fact. We call it a myth. Much of the myth of early reflections is a result of attempts to emulate the sound of discrete reflections from the floor, stage area, and ceiling of a real hall. This sounds reasonable in theory, but it has been our experience that the resulting preechoes are much different from the early reflections present in real halls, and recorded music is often better off without them.

The reason for the difference is not difficult to discover. Early reflections in artificial reverberation are usually discrete--simply a delayed version of the original sound. Transients such as clicks or drums are clearly heard as discrete reflections, resulting in a coarse, grainy sound. But the reflective surfaces of real halls are complicated in shape, and the reflections they produce are smoothed or diffused. Their time and frequency responses are altered, making them much more interesting. In a very good hall, discrete reflections are hard to identify as such.

Another major disadvantage of discrete early reflections is that the same reflection pattern is applied to every instrument which is fed into the reverberation unit, and each instrument has its timbre altered in exactly the same way. In a real hall, every instrument has a different set of early reflections, and each instrument will have its timbre altered in a different way.

Some engineers find any type of early reflection undesireable. In classical music, many recordings are now made with the orchestra in the middle of the hall, with the specific intention of avoiding early reflections. Too much early reflected energy makes the sound muddy, and does not add to richness or spaciousness. This is in part because reflections and reverberation also exist in the playback room.

The 480L reverberation algorithm still offers the option of adding early reflections (preechoes) but we have made them diffused clusters of preechoes. The density of the cluster is set by the DIFFUSION control. We recommend that these preechoes be used with caution, unless you are trying to match the sound of the reverberation to a particular location where such reflections are strong.

When creating new reverberation sounds of your own, don't forget that an Effects program can be put in series with the reverberation (using the Cascade configuration described in Chapter 2). The result can be extremely interesting. Also, try using the Effects program to give high frequencies a different envelope from low frequencies.

Page One						Page Two					
RT Mid	Shape	Spread	Size	HF Cutoff	Pre-Delay	Bass Mult.	Cross-over	RT HF Cut	Dif-fusion	Decay Opt.	Mix

Page Three	Page Four
Preecho Levels	Preecho Delays

Figure 3.1. Reverberation Parameters.

About the Reverberation Parameters

Page One

RT MID (Mid-Frequency Reverb Time)
RT MID sets the reverb time for mid-frequency signals *when the signal stops*. Because low-frequency reverb time (BASS MULT) is a multiplier of RT MID, RT MID acts as a master control for the stopped reverb time. When DECAY OPT is set to Reverb mode, the actual value set for RT MID varies with the setting of SIZE. SIZE should be adjusted before RTMID. This interaction is deactivated when DECAY OPT is set to EFFECTS mode.

SHAPE
SHAPE and SPREAD work together to control the overall ambience of the reverberation created by the 480L. SHAPE determines the contour of the reverberation envelope. With SHAPE all the way down, reverberation builds explosively, and decays quickly.

> **Note**: SPREAD only functions when SHAPE is set higher than eight.

As SHAPE is advanced, reverberation builds up more slowly and sustains for the time set by SPREAD. With SHAPE in the middle, the buildup and sustain of the reverberation envelope emulates a large concert hall (assuming that SPREAD is at least halfway up, and that SIZE is suitably large—30 meters or larger.)

SPREAD
SPREAD works together with SHAPE to control the contour of the overall ambience of the sound created by the 480L. SPREAD controls the duration of the initial contour of the reverberation envelope (SHAPE controls the envelope). Low SPREAD settings result in a rapid onset of reverberation at the beginning of the envelope, with little or no sustain. Higher settings spread out both the buildup and sustain.

SPREAD and SHAPE control the rate at which reverberation builds up, and how the reverberation sustains as it begins to decay. When DECAY OPT is in Reverb mode, SPREAD is linked to SIZE, and the actual value for SPREAD depends on the selected SIZE.

SIZE
SIZE sets the rate of buildup of diffusion after the initial period (which is controlled by DIFFUSION). It also acts as a master control for RT MID and SPREAD. For this reason, the SIZE control can be used to vary a reverb sound from very large to very small. Generally, you should set the SIZE control to approximate the size of the acoustic space you are trying to create. The size in meters is roughly equal to the longest dimension of the space. Moving SIZE while a signal is present momentarily mutes the reverb signal.

The apparent size of the space created is actually a combination of the settings of the SIZE, SHAPE, and SPREAD controls. Small acoustic spaces are characterized by a rapid buildup of diffusion. However, both small and large spaces frequently have an uneven buildup of initial reverberation. This uneven buildup is what is controlled by the SPREAD and SHAPE controls.

HF CUTOFF
HF CUTOFF sets the frequency above which a 6 dB/octave low-pass filter attenuates the processed signal. It attenuates both preechoes and reverberant sound. High frequencies are often rolled off with this parameter, resulting in more natural sounding reverberation.

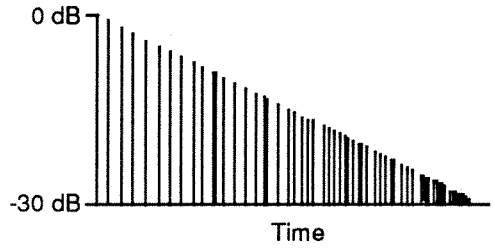


Figure 3.2. SHAPE Set All the Way Down.

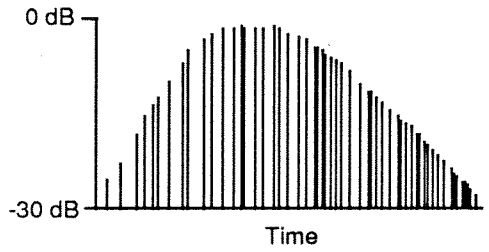


Figure 3.3. SHAPE at 64 - 1/4 of the Way Up.

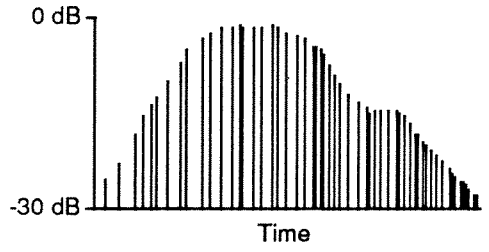


Figure 3.4. SHAPE at 128 - 1/2 of the Way Up.

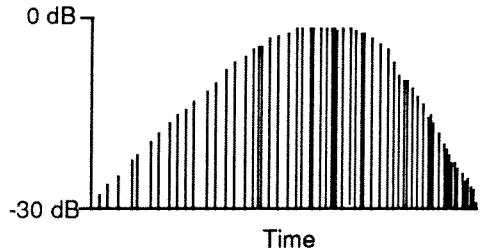


Figure 3.5. SHAPE at 255 - All the Way Up. Short RT MID Setting.

PREDELAY
PREDELAY sets the amount of time which elapses between input of signal and the onset of reverberation. Under natural conditions, the amount of predelay depends on the size and construction of the acoustic space and the relative position of the sound source and the listener(s). PREDELAY attempts to duplicate this phenomenon and is used to create a sense of distance and volume within an acoustic space. Relatively long PREDELAY settings place the reverberant field behind rather than on top of the input material. Extremely long PREDELAY settings produce unnatural sounds that often prove interesting.

A sense of continuity between source and reverb is maintained up to around 40 ms of predelay, after which the sound begins to separate into distinct patterns; however, large values of PREDELAY can effectively give the impression of large size if early reflections are used to fill in the spaces between input and the delayed reverberation.

Much of the effect of PREDELAY can be better achieved by using medium values of SHAPE, and setting the desired apparent predelay with SPREAD. Setting these parameters should be done by ear, since the values don't relate directly to ms.

Note: Very high values of PREDELAY limit the amount of SPREAD available. The display does not reflect this, however.

Page Two

BASS MULTIPLY
BASS MULTIPLY sets the reverb time for low-frequency signals, as a multiplier of the RT MID parameter. For example, if BASS MULTIPLY is set to 2X, and RT MID is set to two seconds, the low frequency reverb time will be four seconds. For a natural-sounding hall ambience, we recommend values of 1.5X or less.

CROSSOVER
CROSSOVER sets the frequency at which the transition from LF RT to RT MID takes place. CROSSOVER should be set at least two octaves higher than the low frequency you want to boost. For example, to boost a signal at 100 Hz, set the CROSSOVER to 400 Hz (This setting works well for classical music). CROSSOVER works best around 500 for boosting low frequencies, and around 1.5 kHz for cutting low frequencies.

RT HF CUT
RT HF CUT sets the frequency above which sounds decay at a progressively faster rate. It filters all the sound except the preechoes. When set relatively low, it gives a darker tone to the reverberation, simulating the effect of air absorption in a real hall. This also helps keep the ambience generated by the program from muddying the direct sound.

DIFFUSION
DIFFUSION controls the degree to which initial echo density increases over time. High settings of DIFFUSION result in high initial buildup of echo density, and low settings cause low initial buildup. After the initial period (in which echo buildup is controlled by DIFFUSION) density continues to change at a rate determined by SIZE. To enhance percussion, use high settings of diffusion. For clearer and more natural vocals, mixes, and piano music, use low or moderate settings of diffusion. The plate presets and some of the room presets use an algorithm with higher inherent diffusion. If high diffusion is desired, start with one of these presets. They are easily identifiable because they have only two preechoes.

DECAY OPT (Decay Optimization)
DECAY OPT alters program characteristics in response to changes in input level, to make reverberation decay sound more natural. DECAY OPT should normally be set to REVERB 7.

To make it easy to create "wild spaces" DECAY OPT has a second mode--EFFECTS. In the EFFECTS mode, the numbers 0 - 9 have the same effect as they do in the REVERB mode. However, in the EFFECTS mode the SPREAD control is not linked to the SIZE control, making it possible to use high values of SPREAD with low values of SIZE. These settings can result in some interesting, but unnatural sounds.

Note: On certain types of program material (such as soft low-frequency tones from a synthesizer) side effects may be audible during level changes. If these are heard, set DECAY OPT to REVERB 0 or EFFECTS 0.

WET/DRY MIX
WET/DRY MIX controls the ratio of direct vs. effect signal in the output from a program. When the 480L is patched into a console, this control should almost always be set to 100% wet. When an instrument is plugged directly into a 480L, or when the Cascade configuration is in use, a setting between 45 and 60% is a good starting point for experimentation with this parameter.

WET/DRY MIX is a sine/cosine fade. Practically speaking, this means that MIX can be adjusted over its range with little or no change in output level. When you control mix at the console, adding effect to the dry signal increases overall level.

Page Three

PREECHO LEVEL
Preechoes can best be understood by visualizing a stage where the early reflections are the sounds emanating from the rear and side stage walls directly after the sound from the stage. Usually the rear stage wall reflection is earlier and louder than those from the two side walls. The preechoes are actually clusters of echoes, with the density of the cluster set by DIFFUSION.

The preecho reflection parameters change the perceived locations of reflecting surfaces surrounding the source. PREECHO LEVEL adjusts the loudness of the reflection.

Note: Some of the presets use an algorithm with six preechoes, and others only have two. If you need more than two when creating a sound, be sure to start with a preset that has six.

Page Four

PREECHO DELAY TIME
For each of the PREECHO LEVEL parameters, there is a corresponding PREECHO DELAY TIME parameter. PREECHO DELAY TIME sets the delay time in ms for one of the preechoes. PREECHO DELAY TIME is not affected by PREDELAY, so preechoes can be placed to occur before the reverberation starts.

Notes

Bank 1 - Halls

		Page One						Page Two				
Program #	Name	RT Mid	Shape	Spread	Size	HF Cutoff	Pre-Delay	Bass Mult.	Cross-Over	RT HF Cut	Dif-fusion	Decay Opt. Mix
1	Large Hall	2.19 s	126	179	37 m	2.862	24 ms	1.2 x	752 Hz	4.186	99	R 7 All Fx
2	Large+Stage	2.19 s	126	179	37 m	2.862	24 ms	1.2 x	752 Hz	4.186	99	R 7 All Fx
3	Medium Hall	1.74 s	126	128	25 m	4.395	24 ms	1.2 x	752 Hz	3.982	99	R 7 All Fx
4	Medium+Stage	1.74 s	126	128	25 m	4.395	24 ms	1.2 x	752 Hz	3.982	99	R 7 All Fx
5	Small Hall	1.13 s	96	50	25 m	4.395	24 ms	1.0 x	752 Hz	3.784	99	R 7 All Fx
6	Small+Stage	1.13 s	96	50	25 m	4.395	24 ms	1.0 x	752 Hz	3.784	99	R 7 All Fx
7	Large Church	4.04 s	85	247	38 m	2.523	30 ms	1.5 x	1.02 Hz	2.691	80	R 7 All Fx
8	Small Church	2.42 s	65	106	31 m	3.402	0 ms	1.0 x	752 Hz	3.591	70	R 7 All Fx
9	Jazz Hall	1.26 s	34	98	23 m	12.177	0 ms	1.2 x	752 Hz	5.538	80	R 7 All Fx
0	Auto Park	5.29 s	149	247	38 m	7.818	24 ms	1.0 x	752 Hz	5.538	99	R 0 All Fx

Figure 3.6. Halls Bank - Programs and Parameters.

General Description

The programs in the Halls bank are reverberation programs designed to emulate real concert halls.

While the Halls are useful for a wide variety of tasks, they are especially good with traditional and classical music. For popular music, they can be used to give multitrack recordings the sense of belonging to the same performance, by putting the whole mix in the context of a real-sounding acoustic space.

Large Hall - Program 1

Large Hall provides the sense of space and ambience of a large concert hall to music which has already been mixed.

Acoustically, the sound of this program resembles a large, relatively square concert hall. The musicians are not placed in a stage area at one end, but in the middle of the hall, away from nearby walls and other surfaces that produce reflections. The reverberant pickups are located between the sound source and the walls, and are directed away from the musicians, so they pick up little or no direct energy.

The resulting reverberation has the space and ambience of a large hall, but does not color or muddy the direct sound of the recording. Because of the large SPREAD value used, the sound of the Large Hall is most effective when relatively small amounts of it are mixed with the direct signal. If the reverberation sounds obtrusive or tends to reduce clarity, you are using too much of it!

BASS MULT, RT HF CUT, and HF CUTOFF have been set to values typical of good concert halls. SIZE is set at maximum to provide reverberation with medium density and low color. If higher density is required (for material such as closely-miked percussion) try reducing SIZE to about 25.

Large + Stage - Program 2

Large + Stage is similar to Large Hall, except that the musicians are located at one end of the hall, and several preechoes simulate the effects of a procenium arch.

Page Three **Page Four**

Preecho Levels						Preecho Delays							
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Large Hall	1
-12 dB	-10 dB	-8 dB	-8 dB	-9 dB	-9 dB	16 ms	22 ms	64 ms	56 ms	112 ms	102	Large+Stage	2
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Medium Hall	3
-14 dB	-12 dB	-10 dB	-10 dB	-12 dB	-12 dB	16 ms	22 ms	44 ms	38 ms	80 ms	76	Medium+Stage	4
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Small Hall	5
-12 dB	-12 dB	-10 dB	-10 dB	-14 dB	-14 dB	12 ms	18 ms	44 ms	36 ms	72 ms	52	Small+Stage	6
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Large Church	7
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Small Church	8
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Jazz Hall	9
-6 dB	-6 dB	-9 dB	-9 dB	-12 dB	-12 dB	22 ms	12 ms	44 ms	66 ms	164 ms	136	Auto Park	0

Medium Hall - Program 3

Medium Hall is very similar to Large Hall, but smaller.

Medium + Stage - Program 4

Medium + Stage is very similar to Large + Stage, but smaller.

Small Hall - Program 5

Small Hall is a smaller version of Medium Hall.

Small + Stage - Program 6

Small +Stage is a smaller version of Medium + Stage..

Large Church - Program 7

Large Church is a big space with the musicians centrally located, and a comparatively long RT MID.

Small Church - Program 8

Small Church is a smaller version of program 7.

Jazz Hall - Program 9

Jazz Hall is a relatively small space with hard bright walls and a short RT MID. It emulates a hall full of people, without the noise they make. It has high diffusion, and sounds good with jazz or pop material.

Auto Park - Program 0

Auto Park reproduces the sound of an underground parking garage.

Bank 2 - Rooms

		Page One						Page Two				
Program #	Name	RT Mid	Shape	Spread	Size	HF Cutoff	Pre-Delay	Bass Mult.	Cross-Over	RT HF Cut	Dif-fusion	Decay Opt. Mix
1	Music Club	1.03 s	40	55	25 m	7.181	0 ms	1.0 x	752 Hz	3.784	78	R 7 All Fx
2	Large Room	0.70 s	52	82	19 m	6.593	0 ms	1.0x	752 Hz	3.784	65	R 7 All Fx
3	Medium Room	0.50 s	22	10	19 m	7.181	0 ms	1.0 x	752 Hz	3.784	65	R 7 All Fx
4	Small Room	0.31 s	16	0	10 m	7.181	0 ms	1.0 x	752 Hz	3.784	60	R 6 All Fx
5	Very Small	0.13 s	8	0	4 m	7.181	0 ms	1.0 x	752 Hz	3.784	55	R 0 All Fx
6	Lg Wood Rm	1.33 s	73	34	23 m	8.513	0 ms	0.8 x	1.158 Hz	5.538	82	R 7 All Fx
7	Sm Wood Rm	0.71 s	45	19	13 m	8.513	0 ms	0.8 x	1.158 Hz	2.691	80	R 7 All Fx
8	Lg Chamber	0.88 s	3	0	20 m	7.181	10 ms	1.0 x	752 Hz	6.047	99	R 6 All Fx
9	Sm Chamber	0.36 s	16	0	10 m	7.181	0 ms	1.0 x	752 Hz	3.784	70	R 6 All Fx
0	Small & Bright	0.65 s	40	39	9 m	10.591	6 ms	0.8 x	621 Hz	7.493	81	R 7 All Fx

Figure 3.7. Rooms Bank - Programs and Parameters.

General Description

The room programs are similar to the Hall programs, but the spaces they emulate are smaller and somewhat more colored. The rooms are useful for film and video production, as well as classical and popular music recording.

Music Club - Program 1

Music Club is similar to Jazz Hall, but is smaller and less reverberant--especially at high frequencies.

Large Room - Program 2

Large Room resembles a good-sized lecture room. It is smaller than Music Club, and more colored, with comb filtering and slap echoes.

Medium Room - Program 3

Medium Room is a smaller version of Large Room.

Small Room - Program 4

Small Room is much smaller and less reverberant than the Large and Medium Rooms. It resembles a typical American living room.

Very Small Room - Program 5

Very Small Room has the intimate, close feel of a bedroom or den.

Page Three						Page Four						
Preecho Levels						Preecho Delays						
Off	Off					0 ms	0 ms					Music Club 1
Off	Off					0 ms	0 ms					Large Room 2
Off	Off					0 ms	0 ms					Medium Room 3
Off	Off					0 ms	0 ms					Small Room 4
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Very Small 5
Off	Off					0 ms	0 ms					Lg Wood Rm 6
Off	Off					0 ms	0 ms					Sm Wood Rm 7
Off	Off					0 ms	0 ms					Lg Chamber 8
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Sm Chamber 9
-14 dB	-14 dB	-14 dB	-14 dB	Off	Off	14 ms	10 ms	28 ms	44 ms	0 ms	0 ms	Small & Bright 0

Large Wood Room - Program 6

Large Wood Room is similar to Large Room, but has a lower BASS MULT, simulating a room with thin wooden paneling, or a cheaply made warehouse or auditorium.

Small Wood Room - Program 7

Small Wood Room is a smaller version of program 6.

Large Chamber - Program 8

Large Chamber has few size cues. It produces a sound similar to a good live chamber with nonparallel walls and hard surfaces. Large Chamber can be used wherever a plate would normally be used, but with a more subtle acoustic sound.

Small Chamber - Program 9

Small Chamber is a smaller version of program 8.

Small and Bright - Program 0

Small and Bright adds presence to a sound without adding a lot of obvious reverberation.

Bank 3- Wild Spaces

		Page One						Page Two				
Program #	Name	RT Mid	Shape	Spread	Size	HF Cutoff	Pre-Delay	Bass Mult.	Cross-Over	RT HF Cut	Dif-fusion	Decay Opt. Mix
1	Brick Wall	0.24 s	0	254	26 m	10.591	0 ms	1.5 x	1.886 Hz	Full R.	88	E 7 All Fx
2	Buckram	0.24 s	94	61	24 m	6.882	0 ms	1.5 x	1.886 Hz	Full R.	98	E 7 All Fx
3	Big Bottom	0.89 s	66	210	31 m	11.084	0 ms	4.0 x	243 Hz	Full R.	88	E 7 All Fx
4	10W-40	0.78 s	10	88	19 m	Full R.	4 ms	4.0 x	885 Hz	1.886	99	E 7 All Fx
5	20W-50	1.01 s	152	94	23 m	11.084	4 ms	4.0 x	621 Hz	621	99	E 7 All Fx
6	Metallica	0.97 s	57	187	28 m	14.986	14 ms	1.5 x	1.020 Hz	7.493	90	E 7 All Fx
7	Silica Beads	5.46 s	126	252	37m	9.278	24 ms	0.2 x	4.395 Hz	Full R.	80	E7 All Fx
8	Inside Out	1.36 s	243	112	20 m	10.591	22 ms	1.2 x	752 Hz	4.611	99	E 7 All Fx
9	Ricochet	1.56 s	0	0	34m	14.986	18 ms	0.6 x	1.735 Hz	10.127	90	E 7 All Fx
0	Varoom	0.78 s	255	216	28m	12.177	0 ms	2.0 x	621 Hz	12.177	98	E7 All Fx

Figure 3.8. Wild Spaces Bank - Programs and Parameters.

General Description

The programs in the Wild Spaces bank can best be described as reverberation effects. They produce reverberation, but their sounds bear little resemblance to anything found in nature. These programs are specifically intended for use in popular music production, and have no known applications in traditional or classical music.

Brick Wall - Program 1

Brick Wall, as in running into, rather than sounding similar to. This program can best be described as a subtle gated inverse room, but it's really much more. Unlike most gated reverb effects, this one's usefulness extends well beyond drum sounds. Try it on a wide variety of material.

Buckram - Program 2

Buckram is a variation of Brick Wall. The difference is that Buckram doesn't sound as dense as the Brick Wall, and has a longer reverb tail.

Big Bottom - Program 3

Big Bottom has a relatively short RT MID and a much longer bass reverb time. This produces a big boom from low-frequency material, while leaving the high end more or less untouched. This is useful for adding a big bass and tom drum sound to an existing mix, or to a drum machine with premixed stereo outputs.

10W-40 - Program 4

10W-40 emulates the sound of an oil drum. If your facility lacks an oil drum wired for sound, you will be pleased to discover that Lexicon has supplied one—before you even knew you needed it.

20W-50 - Program 5

A more aggressive oil drum.

Page Three **Page Four**

Preecho Levels						Preecho Delays							
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Brick Wall	1
-6 dB	-6 dB					64 ms	40 ms					Buckram	2
Off	Off	Off	Off	Off	Off	0 ms	0 ms	0 ms	0 ms	0 ms	0 ms	Big Bottom	3
Full Up	Full Up	-5 dB	-3 dB	Off	Off	0 ms	0 ms	26 ms	46 ms	0 ms	0 ms	10W-40	4
Full Up	Full Up	-5 dB	-3 dB	Off	Off	0 ms	0 ms	50 ms	64 ms	0 ms	0 ms	20W-50	5
-7 dB	-7 dB	-18 dB	-12 dB	-18 dB	-20 dB	70 ms	88 ms	136 ms	156 ms	284 ms	276	Metallica	6
Off	Off					64 ms	40 ms					Silica Beads	7
-14 dB	-14 dB					20 ms	22 ms					Inside Out	8
-12 dB	-10 dB					378 ms	322 ms					Ricochet	9
Off	Off					14 ms	18 ms					Varoom	0

Metallica - Program 6

Metallica produces dense, metallic reverberation with lots of hard echoes. Designed for heavy metal.

Silica Beads - Program 7

Put a small monitor upside down on top of a snare drum, pour a few thousand beads on top of the drum, and hit the monitor with a couple hundred watts. The result? Not nearly as interesting as the Silica Beads program.

Inside Out - Program 8

Inside Out produces a big echo with a big difference—it's turned inside out. Listen closely to percussive material.

Ricochet - Program 9

Ricochet emulates a fairly large space with a dangerous slapback echo.

Varoom - Program 0

Varoom is a room with no resemblance to any known acoustic space; the sound accelerates as it goes by.

Bank 4- Plates

		Page One						Page Two				
Program #	Name	RT Mid	Shape	Spread	Size	HF Cutoff	Pre-Delay	Bass Mult.	Cross-Over	RT HF Cut	Dif-fusion	Decay Opt. Mix
1	A Plate	2.00 s	0	0	20 m	8.513	0 ms	0.6 x	752 Hz	Full R.	97	R 0 All Fx
2	Snare Plate	1.84 s	1	0	16 m	Full R.	60 ms	0.6 x	120 Hz	Full R.	95	R 0 All Fx
3	Small Plate	1.65 s	0	6	18 m	15.886	2 ms	1.0 x	885 Hz	10.127	99	R 0 All Fx
4	Thin Plate	1.59 s	0	0	15 m	Full R.	0 ms	0.6 x	752 Hz	15.886	85	R 0 All Fx
5	Fat Plate	1.98 s	97	130	34 m	9.278	2 ms	1.0 x	1.586 Hz	21.181	75	R 0 All Fx

Figure 3.9. Plates Bank - Programs and Parameters.

General Description

The Plate programs mimic the sounds of metal plates, with high initial diffusion and a relatively bright, colored sound. For this reason, they are good choices for percussion. They are designed to be heard as part of the music, mellowing and thickening the initial sound itself. The Plate sound is what most people associate with the word reverb, and it is useful for all popular music.

A Plate - Program 1

A Plate is a basic plate program with a very clear sound; you'll find it useful for everything from vocals to percussion.

Snare Plate - Program 2

Snare Plate has its HFC and RT HFC parameters set to full range, resulting in a rapid buildup in high-frequency information. As its name implies, it has been tuned for optimal results with snare drum.

Page Three		Page Four		
Preecho Levels		Preecho Delays		
-8 dB	-9 dB	14 ms	18 ms	A Plate 1
-9 dB	-12 dB	110 ms	152ms	Snare Plate 2
-2 dB	-4 dB	10 ms	6 ms	Small Plate 3
-6 dB	-6 dB	14 ms	18 ms	Thin Plate 4
-6 dB	-9 dB	30 ms	30 ms	Fat Plate 5

Small Plate - Program 3

Another plate variation. As its name implies, this program produces the sound of a smaller plate.

Thin Plate - Program 4

Another variation on the plate theme.

Fat Plate - Program 5

Fat Plate produces the sound of a very large, highly-colored plate.