Lexicon 224

OWNER'S MANUAL

MODEL 224 OWNER'S MANUAL OUTLINE

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2.0 BRIEF OPERATING INSTRUCTIONS - VERSION 3 (AND HIGHER)

POWER-ON DIAGNOSTICS:

Digital systems diagnostics are performed at power-on or "RESET". The test begins by illuminating all remote panel LEDS for a few seconds, while displaying a "P" and the software version number. Errors display with an "E" and an error code.

If no errors are found the 224 starts reverberation with program #1 in the "CALL" mode. Recommended parameter settings are automatically loaded and the 224 can be used for reverberation without further adjustment. Notice that program buttons #7 and #8 are normally illuminated. See "Mode Enhancement" and "Decay Optimization".

TO "CALL" A REVERBERATION PROGRAM:

Press the "CALL" button to enter "CALL" mode, and then press the desired program button. Recommended slider settings will load automatically.

Example: "CALL" + "PROGRAM #3" = "Large Concert Hall - B" with recommended slider settings

TO MODIFY INITIAL SLIDER SETTINGS ("CALL" or "SET" modes)

Move the desired slider to or through the preset position. The slider will become active. The preset or active position can be viewed on the digital display by pushing the button below each slider.

TO ACTIVATE ALL SLIDERS - (bypassing the recommended settings)

Press "IMMEDIATE"

TO "CALL" A MAIN REGISTER:

Press "CALL" to enter the "CALL" mode, and then the desired register button. The previously stored program and slider positions will be loaded. Sliders can be activated to modify the presets.

Example: "CALL" + "REGISTER A" = setup previously stored in register "A"

TO STORE A MAIN REGISTER:

Press "SET" to enter the "SET" mode. Then push the desired register button.

SLIDERS:

"BASS" Reverb Time below the crossover frequency
display reads in seconds

"MID" Reverb Time above the crossover frequency
display reads in seconds

"CROSSOVER" Sets the Crossover frequency between "BASS" and "MID"
display reads in Hertz and kiloHertz

"TREBLE DECAY" Sets a FREQUENCY above which decay is very rapid
display reads in Hertz and kiloHertz

"DEPTH" Sets the effective distance between the source and the reve
display reads in arbitrary units from 0 to 71

"PRE-DELAY" Sets the delay before the onset of reverb
display reads in milliseconds

INPUTS:

Stereo feed to the "LEFT" and "RIGHT" inputs as marked. Reduced separation may be useful.

Mono feed should be bridged to both inputs.

OUTPUTS:

The main stereo outputs are outputs "A" and "C", the jacks just below the input jacks. Outputs "B" and "D" are chiefly used for mixing with the front channels in Quad operation. They are not recommended for stereo.

For mono use, it is best to mix "A" and "C", but either can be used alone.

PHASE:

Be sure there is no phase reversal between any of the inputs or the outputs of the 224.

2.1 DETAILED OPERATING INSTRUCTIONS

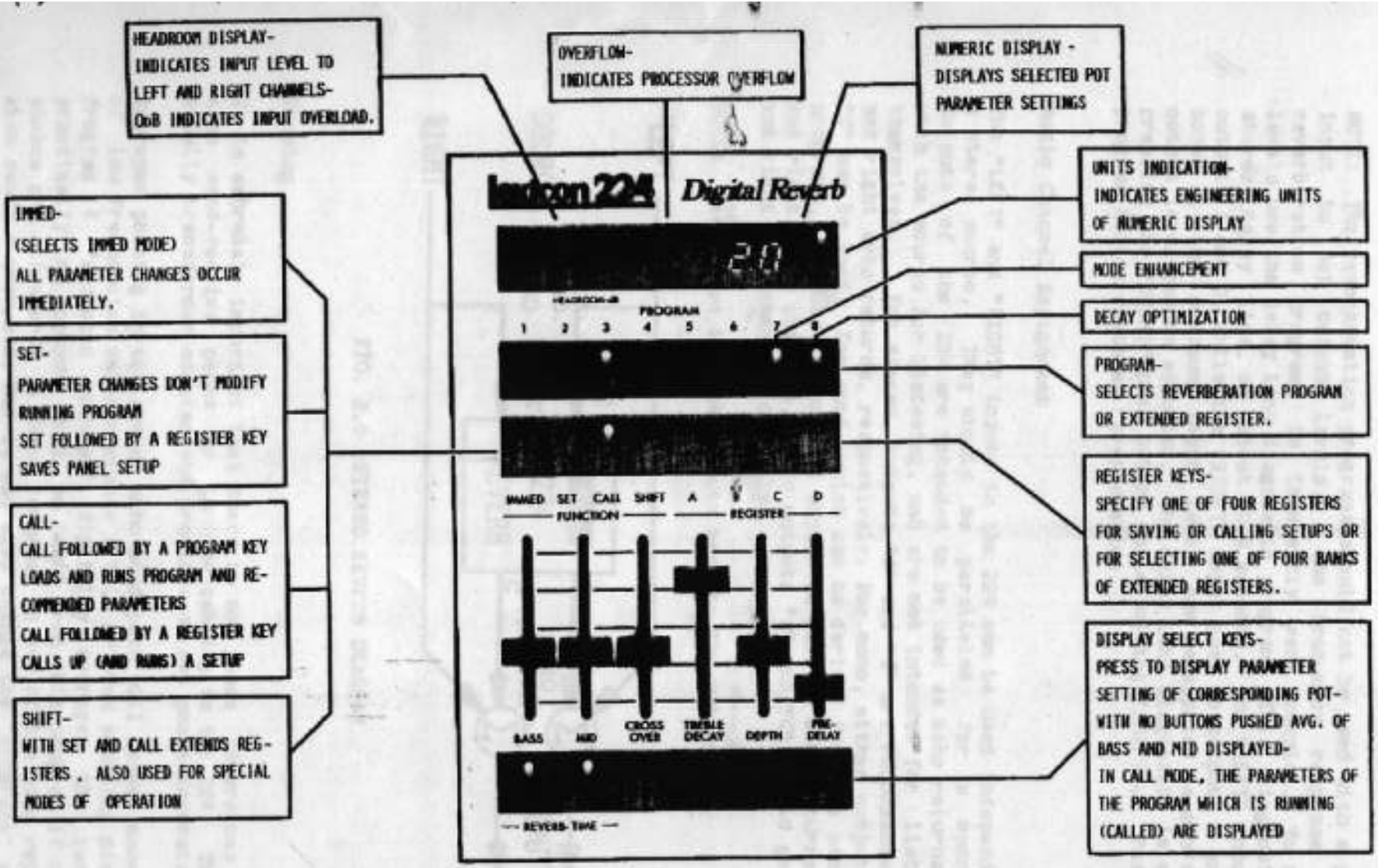
After the Model 224 is installed (section 1), power up at the mainframe. The on/off button applies power to the entire system, lighting the power-on indicator immediately. The remote control panel will take a few seconds to activate while built-in diagnostic procedures verify proper machine operation. As part of the built-in digital diagnostics all LED displays on the front panel are illuminated, while the numeric display shows a triple dash (Version 2) or a capital P (Version 3 and higher) followed by the software version number. The display will then go blank for a few seconds as diagnostics are completed. Machines with Version 2 software activate program 1 in the immediate mode after diagnostics. Machines with Version 3 (or higher) software activate program 1 in the "call" mode. With Version 3 (or higher) software the slider settings Lexicon recommends as a starting point for that program are automatically entered, and the Model 224 can be used without further adjustment. If a different program is desired, simply push the appropriate program button. Again the proper parameters will be loaded. If the optional memory board is installed, the program and slider settings last used in the 224 will be loaded after diagnostics.

If after several seconds the remote panel display fails to log on, or if the display comes on but makes no sense, check the remote cable connections or try pushing the "RESET" button on the mainframe. The reset button should be pushed whenever displays or output signals appear to be garbled. In normal operation this problem should rarely, if ever, be encountered.

Should the diagnostics routine locate a problem, the remote panel display will indicate an error by displaying an "E" followed by a two digit code number. The code can be read by consulting the diagnostics table in section 6. Pushing "PROGRAM 1" will continue diagnostics to the next test. If the 224 must be used despite the indicated malfunction, it is possible to defeat the diagnostics by pressing the "PROGRAM 2" button while powering up the unit at the mainframe or while pushing reset.

LEVEL ADJUSTMENT

Input and output level adjustments can be made with a small screwdriver through access holes in the mainframe front panel. The input levels should be set so that the peak input amplitude falls just short of illuminating the 0dB indicator on the remote control unit headroom display (see section 2.2). The maximum input levels can be adjusted from less than +8dBm to greater than +18dBm. The output levels should be set for the convenience of the user. Maximum output levels range from less than +8dBm to greater than +18dBm peak output depending upon the setting of the output level pots. The input and output adjustments come factory set for unity gain at a level of +12dBm.



BASS — SETS REVERB DECAY TIME FOR LOW FREQUENCIES

MID — SETS REVERB DECAY TIME FOR HIGH FREQUENCIES

CROSS — SETS BASS-MID CROSSOVER FREQUENCY

TREBLE DECAY — SETS FREQUENCY ABOVE WHICH THE REVERBERENT SOUND OUTPUT WILL QUICKLY DECAY AWAY

DEPTH — SETS APPARENT REVERB PICK UP POINT
0 = CLOSE --- 71 = DISTANT

PRE-DELAY — SETS DELAY BEFORE ONSET OF REVERBERATION
(TYPICALLY 0 TO 100 ms IN 1 ms STEPS)

FROM :

PHONE NO. :

NOTE: The reverberation programs should not be used with a pure tone input to set output levels. The frequency response of the reverberation programs is inherently very complex. To set output levels use the delay line diagnostic program. This diagnostic is a stereo delay line of about 0.4 seconds. The "LEFT" input goes to outputs A and D, while the "RIGHT" input goes to outputs B and C. A tone at the maximum input level can be applied as above, and the output level can be adjusted. The delay line diagnostic is entered by pressing the "DELAY" push button while holding "SHIFT". Pushing any program button restores reverberation.

Audio Channel Assignment

The "LEFT" and "RIGHT" inputs to the 224 can be used independently for a stereo source. They should be paralleled for a mono source. Outputs of the 224 are intended to be used as echo returns combined with the source for listening, and are not intended for listening by themselves. For stereo, outputs "A" and "C" are recommended as left and right echo returns, respectively. For mono, either output "A" or "C" can be used. For quad, which can be derived from the concert hall programs, outputs "B" and "D" should be used as echo returns for left and right front channels, while outputs "A" and "C" should go to left and right rear channels directly.

NOTE: Never feed the 224 outputs back to the 224 inputs.

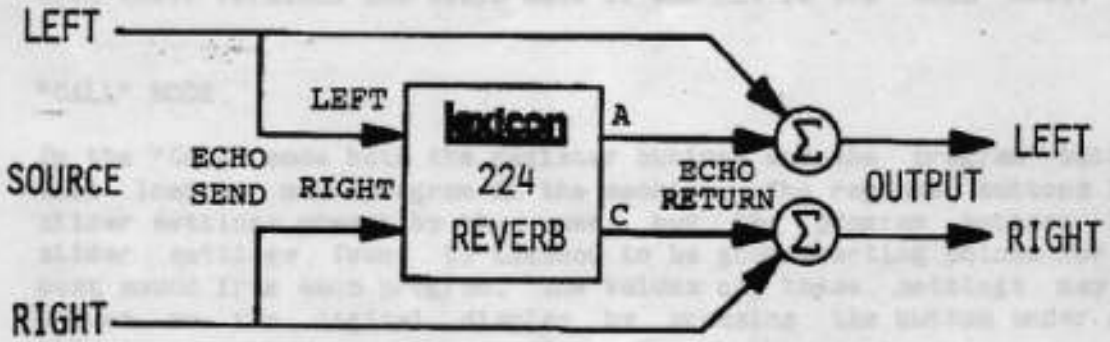


FIG. 2.0 STEREO REVERB DIAGRAM

Phasing

It is extremely important that there be no phase inversions in the echo send-receive paths or in the cabling to the 224. The 224 is totally transformer coupled and provides no net phase inversion.

Improper phasing in the stereo echo send path will cause cancellation of low frequencies and can create a thin or weak sounding mix. Since Program 4 "acoustic chamber" digitally averages the two inputs practically no output will be heard from this program if the input phases are different. A phase reversal in one of the echo returns can also cause a weak mix, but it may also change the apparent width of the reverb on some material. On percussive material an overall phase

inversion between the inputs and the outputs of the 224 can be easily heard - experimentation with these effects is encouraged.

Mix Ratio

The mix ratio of the reverberant returned to the dry feed is basically up to the user to decide. It is recommended that the returns from the chamber and plate programs be used with restraint, but some material can benefit from a large amount of the concert hall programs.

Bridging of Inputs

It is usually recommended that mono sources be bridged to both "Left" and "Right" inputs - refer to individual program descriptions in Section 3 for specific recommendations.

Program Selection and Use

The 224 allows the user great flexibility in program selection and parameter setting. Software versions beginning with Version C have been designed to make obtaining a natural sound as easy as possible. With these versions the basic mode of the 224 is the "CALL" mode.

"CALL" MODE

In the "CALL" mode both the register buttons and the program buttons will load a new program in the machine. The register buttons load slider settings preset by the user, but the program buttons load slider settings found by Lexicon to be good starting points for the best sound from each program. The values of these settings may be viewed on the digital display by pressing the button under each slider.

Once a program has been called the sliders on the panel are initially inactive. The sliders can be individually activated by pushing them to or through the preset position. To change the reverb time for example, one need only push the BASS and MID sliders up or down until the display indicates they have become active, and then set them for the desired sound. "CROSSOVER", "TREBLE DECAY", "DEPTH", and "PRE-DELAY" will all remain at their preset values. The preset values may be restored by simply pushing the program button again. In practice a flick of a control is sufficient to activate it. Modified programs can be saved in the registers for later use or modification by pressing the "SET" button and a register button. A loaded register button in the call mode behaves identically to a program button, except that the preset parameters have been set by the user. Calls to unloaded registers are ignored.

"IMMEDIATE" MODE

The "IMMEDIATE" mode activates all sliders. If a program button is pushed in the immediate mode the actual parameter settings given by the slider positions will be loaded into the machine with the new program.

"SET" MODE

The "SET" function allows the user to store programs and parameter settings for later use. It also allows the user to modify parameters or call new programs without affecting the audio. If a new program button is pushed while in the "SET" mode the recommended parameters for that program will be displayed. This new program can be modified and run, or it can be stored in a register without affecting the running program. The new program can be run in the 224 by pushing either "CALL", which will run the displayed parameters, or "IMMEDIATE", which will set all the parameters to the actual slider positions.

To store a new set-up in a main register, simply push one of the four "REGISTER" buttons while in the "SET" mode. The program and settings which are currently being displayed will be stored in that register. Once stored, the set-up can be recalled from the "CALL" mode by simply pushing the register button.

All the set-ups stored in the registers, as well as the current operating state of the machine are retained when the power is off if the optional memory board is installed.

EXTENDED REGISTER STORAGE:

Version 3 allows 32 extra program settings to be stored in four banks. The "REGISTER" buttons select the bank, and the "PROGRAM" buttons select the register within the bank. These registers are reached by adding "SHIFT" to either "CALL" or "SET". To store a setting in an extended register, for example register "A1", enter "SET" mode and push "SHIFT". Both "SET" and "SHIFT" should be illuminated. If you now push register "A" AND HOLD IT, followed by program button #1 the current setting will be stored in extended register "A1". The contents of register "A" will be undisturbed. In the "SET" - "SHIFT" mode the program buttons and the register buttons are inactive unless one of each is down at the same time. The display will blink when the settings are correctly stored.

To call an extra register, push "CALL", "SHIFT", and the desired register bank button. All three LEDS should be illuminated. The program buttons will now call any register in that bank with a single keystroke. The display will blink when registers which have been previously loaded with programs and settings are called. Program buttons corresponding to empty registers will be ignored. The "CALL" - "SHIFT" mode allows complicated scene or mood changes to be made quickly. Pushing any "FUNCTION" button restores normal operation.

"MODE ENHANCEMENT" and "DECAY OPTIMIZATION" (SUBPROGRAMS #7 AND #8)

"MODE ENHANCEMENT" is a subprogram which increases the effective density of modes in the 224. It greatly improves the naturalness of the sound of the 224, both in the decay and as the music is running. The improvement is similar to the effect of "DECAY OPTIMIZATION", but the two work by entirely different techniques, and complement each other. If the two subprograms are tried separately, "MODE ENHANCEMENT" is more effective at controlling the coloration at the end of the 224 decay, and it also produces a noticeably warmer sound in speech or continuous music.

"MODE ENHANCEMENT" works by altering some of the internal parameters in the 224 continuously. Since the coefficients must change in discrete steps, an increase in the background noise of the 224 may be noticeable with pure test tones of very low or very high frequency when "MODE ENHANCEMENT" is running. "MODE ENHANCEMENT" is not necessary with such inputs, and it can be turned off by pushing button #7. This change can be stored in the registers. The amount the internal parameters are changed by "MODE ENHANCEMENT" is adjusted differently for each program, and for certain specialized applications it may be useful for the user to use more or less than the preset value. See "ADVANCED FEATURES OF VERSION 3".

"DECAY OPTIMIZATION" improves the naturalness of the decay from the 224. It alters internal parameters in response to changes in level at the input. This subprogram was first introduced with Version 2 software, and has been very successful with users. With version 3 (and higher) software the level detection algorithm has been made much more sophisticated. The 224 can now tell the difference between drums and vocals and adjusts "DECAY OPTIMIZATION" correctly for each. The amount of "DECAY OPTIMIZATION" used is set by each program when it is called and can be adjusted by the user for certain specialized applications. See "ADVANCED FEATURES OF VERSION 3". "DECAY OPTIMIZATION" increases the clarity and reduces the coloration of the decay from the 224. However, it can also make the decay more uneven on some material. If the decay is noticeably uneven, "DECAY OPTIMIZATION" can be turned off with button #8, and this change can be stored in the registers. "DECAY OPTIMIZATION" can cause an increase in noise with low frequency pure tones which vary in amplitude. You may want to turn it off when using the 224 with this material.

2.2 REMOTE CONTROL PANEL DISPLAY

Numeric Display

The Model 224 control panel displays three digits which indicate a variety of parameters depending upon the function chosen. Quantities from 0 to 999 can be displayed as well as decimals such as 2.8 with the use of a decimal point. In addition, some letters can be displayed such as "E" which indicates an error.

Units

Displayed units are seconds ("sec"), milliseconds ("ms"), Hertz ("Hz"), and kilohertz ("kHz") which are indicated by an LED lamp lighting adjacent to the appropriate symbol. Units are determined automatically depending upon which parameter is selected. For example, "2.8 sec" is a typical value for a reverberation time parameter.

Overflow

Under certain conditions of high input signal levels and/or program parameter settings, the arithmetic processor can overflow much as a calculator that attempts to produce a sum or product that exceeds the range of the instrument. When this happens, the "ovfl" indicator will light indicating the need to reduce one or more of the following: input signal amplitudes, reverberation time settings, "CROSSOVER" setting, or the "TREBLE DECAY" setting.

Headroom

Headroom indicators are provided for both left ("L") and right ("R") input channels; Peak signal levels are displayed on sequential arrays of LED's indicating from 24dB below limit to 0dB (limit) in 6dB intervals. When the 12dB LED first comes on, for example, there is 12dB of dynamic range left before limit, i.e., 12dB of headroom. Proper setting is with both the zero db and overflow LEDs off.

Parameters

The reverberation parameters were chosen primarily to emulate those characteristics of real rooms and halls which most effectively determine the acoustics. For instance, the complex frequency characteristics and the "liveness" of real halls can be approximated with the "CROSSOVER" and "TREBLE DECAY" controls. The size of a hall can be approximated with the "REVERB-TIME" controls. And one's apparent position in a hall can be altered with the "DEPTH" control.

The "PRE-DELAY" control is provided for the common studio practice of inserting some delay time before going to chambers and plates. But because the reverb programs were written with some pre-delay already

in them, the "PRE-DELAY" control will not be required in many situations.

In order to display a given slide pot parameter, the corresponding control button must be held down. The parameter control pots will be active, however, even if they are not being displayed. When none of the parameter buttons are being held down, the display will indicate an average of the "BASS" and "MID" reverb time parameters.

REVERB TIME

The reverberation time refers to the time it takes for the programmed reverberation to die away following a momentary excitation. The reverberation time is broken down into two bands, the "BASS" and "MID" bands, which are separated at a frequency determined by the "CROSSOVER" control.

BASS

Holding down the "BASS" button causes the bass reverb time to be displayed in seconds as long as the button remains pressed. The reverb time ranges to 70 seconds in coarse increments.

MID

Similarly, holding down the "MID" button causes the mid frequency reverb time to be displayed to a maximum of 70 seconds.

CROSSOVER

The frequency which divides the "BASS" band from the "MID" band is controlled by moving the "CROSSOVER" slide control. When the corresponding button is held down, the crossover frequency is displayed ranging from 100Hz to 10.9kHz.

TREBLE DECAY

The "TREBLE DECAY" refers to the frequency above which reverberation falls off. It is controlled by the "TREBLE DECAY" slide pot, displayed when the button is held down, and ranges from 100Hz to 10.9kHz.

DEPTH

"DEPTH" is a non-dimensional parameter and is displayed (when holding the "DEPTH" button down) on an arbitrary scale from 0 to 7 (software versions 1 and 2) or from 0 to 71 (software versions greater than version 3). In concert hall programs the function of the "DEPTH" control is to simulate reverberation at varying distances from the sound source in a hall. As the control is moved up, the displayed number increases, and the apparent distance from the source increases.

PRE-DELAY

The "PRE-DELAY" parameter produces a delay between the sound source