Moore

THE URSA MAJOR 8X32 - Mk II

OWNER'S MANUAL

JULY 1984

URSA MAJOR, Inc.

Box 18, Belmont, MA 02178 • Telephone (617) 489-0303
Telex: 921405 URSAMAJOR BELM

WARRANTY REGISTRATION
MODEL 8X32-Mk II

We are pleased and grateful that you have chosen an URSA MAJOR product for your use. We stand behind each of our products, and hope they serve you well. Please fill out this form completely to register your Model 8X32 for its one year warranty (refer to the Owner's Manual for warranty details). We must receive the completed Warranty Registration form promptly in order for your warranty to be valid. The information you provide is confidential, and will help us serve you better.

Serial Number of Your Unit: _____ Date Received: _____

Name: _____ Dealer Name: _____
Company Name: _____ Street Address: _____
Street Address: _____ City/State/Zip: _____
City/State/Zip: _____ Country: _____
Country: _____

How did you first hear about the Model 8X32? _____
_____
_____

What's your application? Recording? ____ Broadcast ____ Live Performance _____
Sound reinforcement ____ Home ____ Other _____
Describe in a few words how you use the 8X32. _____
_____
_____

With what sources? _____
_____
_____

What do you like about the Model 8X32? _____
_____
_____

Any suggestions for other products? _____
_____
_____

T - SHIRT OFFER

When we receive this completed form from you, we will send you a complimentary URSA MAJOR T-shirt. They're 100% cotton, beige, and have our sleeping bear logo and name on the front.

Specify T-Shirt Size: Small ____ Medium ____ Large ____ X-Large ____

You may purchase additional T-shirts for $5.00 each, plus $1.00 shipping (U.S. and Canada) or $3.00 shipping (other countries).

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OWNER'S MANUAL

MODEL 8X32-Mk II

DIGITAL REVERBERATOR

TABLE OF CONTENTS

INTRODUCTION

This revision of the 8X32 owners manual incorporates the four additional programs that make your machine the 8X32-MK II. Details on these programs may be found in appendix 5 at the end of this manual.

All servicing is currently performed at the factory. If you have any problems with the Model 8X32-MK II, please contact your dealer or the Service Manager at URSA MAJOR immediately (P.O. Box 18, Belmont, MA 02178 USA
Telephone: (617) 489-0303, Telex 921405 URSAMAJOR BELM). For applications support, you may consult with Christopher Moore, the designer of the 8X32-MK II.

A Warrenty Registration form has been included in the front of this manual. Please fill it out and return it as soon as possible. The warrenty is only valid if the factory recieves the completed form promptly. In addition, the information on the form will ensure that we can provide you with program revisions as they become available.

URSA MAJOR MODEL 8X32

SPECIFICATIONS

FOUR BASIC PROGRAMS: Plate I, Plate II, Hall, and Space

EARLY REFLECTION and INITIAL REVERBERATION TIMES: approximately 6 to 98mS in 16 steps for each

EARLY REFLECTION AND INITIAL REVERBERATION LEVELS: 8 steps each

DECAY TIME: 15 values per Program, ranging from 0.0 to 20.0 seconds, depending upon Program selected

LF DECAY and HF DECAY: 4 values of LF Decay, 4 values of HF Decay

NON-VOLATILE STORAGE REGISTERS: 64

BANDWIDTH: 8kHz

DYNAMIC RANGE: 80dB

SAMPLING RATE: 20kHz

SIZE: 3.5" high, 19" rack mount, 15½" deep

OPTIONAL REMOTE CONTROL

SETTING THE UNIT UP FOR OPERATION

UNPACKING: As soon as you receive the carton containing your Model 8X32, inspect it carefully for signs of shipping damage. Then, open the carton and check the unit for damage. Report any shipping damage to the carrier immediately, and file a claim. Although, in most cases, we insure our shipments, it is the consignee's responsibility to initiate a claim for shipping damage. Save the carton and all packing material, in case return to the factory is ever necessary.

POWER: The Model 8X32 operates on 115/230VAC, 50/60Hz. A sticker on the rear panel indicates how your unit was set at the factory. The 3-wire plug furnished with the U.S. units is an important safety feature: do not cheat the ground pin. There is an internal line fuse, and a spare fuse is packed with each exported unit.

INSTALLATION: The Model 8X32 should be rack mounted (height is 3½", depth is 15½" without connectors). Be sure to maintain adequate clearance for air flow at the sides, top and bottom of the unit (an inch all around is recommended). It is not recommended that you mount the Model 8X32 above high-power, hot components, such as power amplifiers. DO NOT OPERATE THE 8X32 WHILE IT IS RESTING ON A TABLE OR BENCH as the unit will not receive adequate ventilation.

If the Model 8X32 is installed in a mobile van, it must be supported in the rear as well as the front, in a manner that won't block off ventilation.

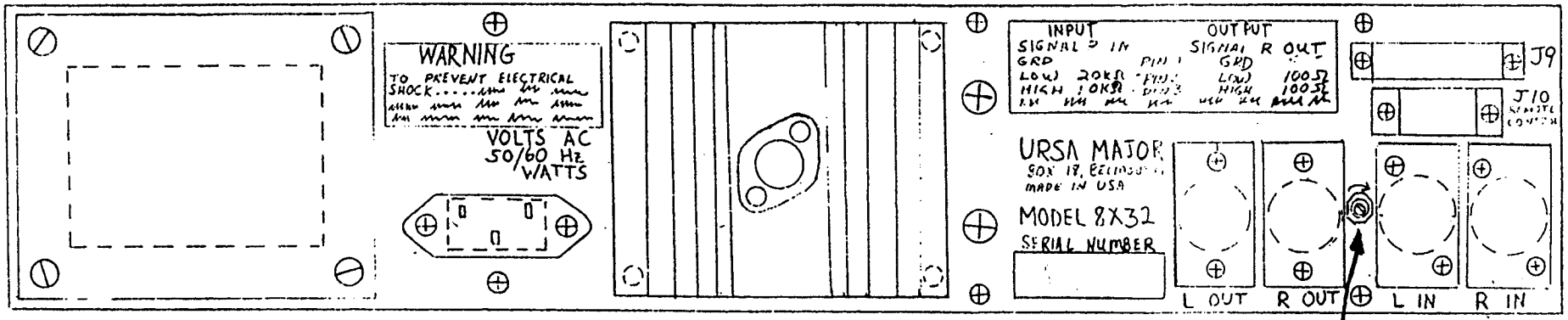
INTERFACING TECHNIQUES: The input of the Model 8X32 is a 3-pin female XLR connector, with pin 1 grounded, pin 3 high, and pin 2 low. The input is balanced, into a differential op amp with 10K resistance for pin 2, and 20K resistance for pin 3. The maximum input signal is 7Vrms, while the source impedance should be 600 ohms or less. Input wiring options are:

Unbalanced - Signal to pin 3, pin 1 and pin 2 grounded.
Balanced - Signal to pin 3 high, pin 2 low, pin 1 grounded.
Sensitivity: -10dBm to +4dBm by adjusting the Input Sensitivity Control.

The output is two 3-pin male XLR's, with pin 1 grounded, pin 2 low, and pin 3 high. It will drive at least +18dBm into a 600 ohm load (minimum recommended). For a single-ended output, pin 3 is high and pins 1 and 2 are grounded. For reversed phase, pin 2 is high and pins 1 and 3 are grounded.

*Important: Refer to Appendix 2 for interfacing details.

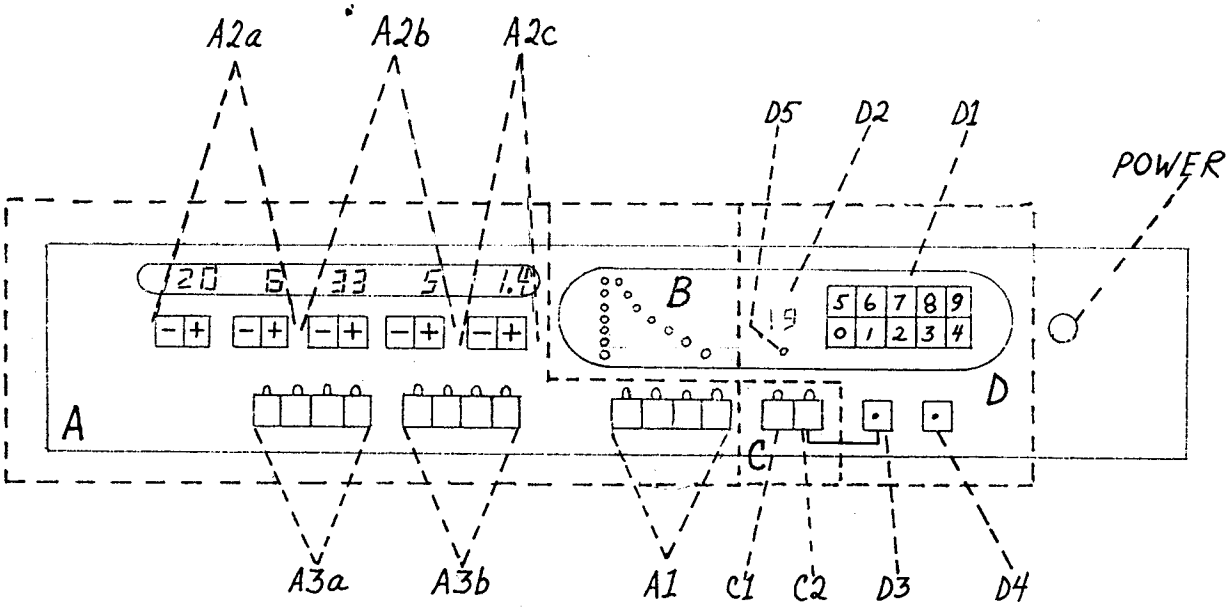
ADDENDUM: NOTE ON INPUT LEVEL CONTROL



BACK PANEL OF THE MODEL 8X32

INPUT LEVEL CONTROL SCREW. TURN THIS SCREW CLOCKWISE TO INCREASE THE LEVEL OF THE INPUT SIGNAL INTO THE 8X32.

FRONT PANEL DIAGRAM (FPD)



A - ASPECTS OF REVERBERATION
A1- Programs
A2a-Early Reflections
A2b-Initial Reverberation
A2c-Decay Time
A3a-LF Decay
A3b-HF Decay

B - INPUT LEVEL AND REVERBERATION LEVEL LED DISPLAYS

C - SPECIAL FEATURES
C1- Input Mute
C2- Reverb Clear

D - MEMORY
D1- Pushbuttons to Control Register Numbers
D2- LED Register Number Display
D3- Store
D4- Recall
D5- "Recall Only" LED

CONTROLS AND FEATURES

A. ASPECTS OF REVERBERATION: The characteristics of the reverberation produced by the Model 8X32 are controlled by the buttons located on the left half and lower center of the front panel (the portion labelled "A" on the Front Panel Diagram). Additional delay values and levels for Early Reflections and Initial Reverberation, as well as Decay Time, are indicated by the LED displays in the window across the upper left of the panel. Red LED indicators above the Program and Low and High Frequency Decay push-buttons show which are in use.

A.1. Programs: The Model 8X32 has four basic reverberation Programs, whose selection buttons are located at A1 on the Front Panel Diagram (FPD), each with preset delay values for Early Reflections and Initial Reverberation, and with a limit imposed on the Decay Time within the Program. Brief descriptions of the reverberation simulated by each Program follow:

Plate I - The Plate I Program simulates the reverberation produced by a plate reverberator with a small, fast-diffusing surface area. The sound of Plate I is bright; the Program adds "body" to the source material.

Plate II - Plate II maintains the smooth reverberation characteristics of the plate reverberator, but simulates a larger plate than Plate I, whose reverberation is diffused more slowly.

Hall - The Hall Program gives you the reverberant characteristics of the concert hall. The sound is rich and complex. The high frequencies decay much more rapidly than the low or middle frequencies.

Space - The Space Program takes reverberation to its outer limits. The reverberation produced is "unnatural" in that it doesn't occur very often in a natural acoustic space. Long delay times are set into both Early Reflections and Initial Reverberation. The Decay Time can be set up to an extraordinary 20 seconds.

A.2. Reverberation Parameters: Each reverberation parameter can be adjusted within the context of the basic Program chosen.

A.2.a. Early Reflections: The design of the 8X32 incorporates two (three in original programs, E4-0) delay taps which are dedicated to producing the sound of Early Reflections. These might be most easily understood if you think of them as the first reflections heard in an acoustic space, between the direct sound and the dense, omni-directional pattern of reverberation.

Each basic Program has a delay value for Early Reflections designed into it. You may use the down (-) and up (+) nudge buttons on the upper left of the front panel (A2 on FPD) to add 0-98mS more delay

*Refer to Appendix 2 for further information on the on the new Edition E4-1 Programs.

A.2.a. continued
to that value. The LED display above these buttons indicates the amount of incremental delay, beyond the value set into the Program. The additional delay value will automatically recycle back to 0, if the "+" button is pushed at 98 seconds.

The Level of the Early Reflections can be independently adjusted, in 8 steps, by the nudge buttons directly to the right of the Early Reflections mS buttons. A reading of 1 is the minimum level and 8 is the maximum. The Level will recycle back to 1 if the up (+) button is pressed when the LED display indicates 8.

A.2.b. Initial Reverberation: Initial Reverberation is the last phase of the reverberation process before reflections are distinguishable because of the density of the sound. In the 8X32, Initial Reverberation comprises a cluster of 10 delays just prior to the onset of actual reverberation, which makes for a smooth transition into the reverberant field.

What is referred to as "pre-delay" is set by the Initial Reverberation controls of the 8X32.

As with Early Reflections, the basic Program selected determines a base delay value for the Initial Reverberation. The nudge buttons for Initial Reverberation (A.2.b. on FPD) allow you to add 0-98mS more delay. Again, the LED display shows the amount of incremental delay. The delay value of the Initial Reverberation will not recycle itself. Flashing decimal points will appear at either side of the mS display if the "+" control button is pressed at 98 or the "-" button at 0. These remind the user that he must press the "-" button at 98 and descend through the delay values to the one he wants. The "+" button is the only one that operates at 0.

The Level control for Initial Reverberation is adjustable from 1-8, with 1 as the minimum. Again, as with the Early Reflections, the Level automatically recycles from 8 back to 1.

A.2.c. Decay Time: The time, in seconds, which appears at the extreme right of the smaller, left-hand window of the front panel (A.2.c. on FPD) shows how long the reverberation would take to die out after the input signal ceases (the RT60, or the decay time to -60dB). The Program in operation places a limit on the Decay Time (6 seconds in Plate I, 8 in Plate II, 10 in Hall, and 20 in Space). Flashing decimal points will appear on either side of the LED display if you press the "+" button at the longest permissible Decay Time for whatever Program you are using. The Decay Time will not automatically recycle from the 20 second limit of the machine and the Space Program, or from the limit of any of the other Programs. The user must press the "-" button

A.2.c. continued
to descend through the Decay Time value possible in each Program. A table of those values follows.

TABLE OF DECAY TIMES BY PROGRAM

PLATE I	PLATE II	HALL	SPACE
.0	.0	.0	.0
.2	.2	.2	.2
.4	.6	.6	1.0
.6	1.0	1.0	1.7
.8	1.4	1.4	2.1
1.0	1.7	1.7	2.5
1.4	2.1	2.1	3.0
1.7	2.5	2.5	4.0
2.1	3.0	3.0	5.0
2.5	3.5	3.5	6.0
3.0	4.0	4.0	8.0
3.5	5.0	5.0	10.0
4.0	6.0	6.0	12.0
5.0	7.0	8.0	15.0
6.0	8.0	10.0	20.0

It is possible to set a 0.0 or 0.2 Decay Time into the 8X32. In these modes the machine isn't, strictly speaking, producing reverberation. However, with the Decay Time at 0.0, the Early Reflection and Initial Reverberation controls can be used just for delay effects, for fattening vocals, etc. Another, later group of delays becomes active at 0.2; and reverberant decay begins at the next highest setting.

A.3. Low and High Frequency Decay: The Low and High Frequency Decay buttons at the lower left of the front panel (at A.3. on the FPD) allow you to trim both ends of the frequency spectrum of the decaying reverberation. The Model 8X32 provides 4 values, which essentially represent filters, (20Hz, 50Hz, 100Hz, and 200 Hz) for LF Decay (at A.3.a. on FPD), and 4 values (1kHz, 2kHz, 5kHz, and 8kHz) for HF Decay (at A.3.b. on FPD). LED's above the buttons indicate which value has been chosen.

The LF and HF Decay controls only effect reverberant decay. They do not effect the total quality of sound as it is processed through the Early Reflections and Initial Reverberation portions of the 8X32. If, for example, you have chosen 100Hz LF Decay and 5kHz HF Decay, the Early Reflections and Initial Reverberation would be unchanged, but all frequencies below 100Hz and above 5kHz would be progressively attenuated from the reverberation as it decays.

B. INPUT LEVEL AND REVERBERATION LEVEL LED DISPLAY:
At the center of the front panel (B on FPD), in the left side of the large window, the Model 8X32 presents an LED display of the levels of both the input signal and the reverberation. The -36dB through 0dB demarcations apply to both displays.

B. continued
The Input Level is shown by the vertical column of LED's on the left. This indicates the level of the sound coming into the processor, before any time delay or reverberation. The Input Level should respond to the volume or gain control of the input source. The uppermost, red LED is a peak indicator and should only light up very infrequently.

The descending arc of LED's, to the right of the vertical column, displays the signal level inside the reverberator. It gives a relative indication of sound decay inside the processor. The red LED at "Overflow" should never be lit.

The red LED's in these displays indicate that signal levels are reaching the limit of the digital processor--much like clipping in an op amp. And though small amounts of this clipping may go unnoticed, prolonged operation in this mode can lead to severe audio distortion that will be reverberated like any other sound coming into the unit.

C. INPUT MUTE/REVERB CLEAR: Two special features of the Model 8X32 enhance the ability of musicians and engineers to "play" with the reverberation process during performance or recording, and are especially useful with longer Decay Times in which reverberant decay can be used as an accompaniment. Input Mute and Reverb Clear (C on FPD) are located in the lower center protion of the front panel, to the right of the Program buttons.

C.1. Input Mute: Pressing the Input Mute button silences the input signal path so that no new sound enters the reverberator. This leaves the prior contents of the reverberation processor to decay naturally, isolated from new input. The Input Mute function continues to operate, with its red LED on, until the user presses the button a second time.

None of the LED's on the Input Level display (B on FPD) should be lit up when Input Mute is operating.

C.2. Reverb Clear: Pressing the Reverb Clear button momentarily forces a 0.2 decay time into the reverberator, regardless of the programmed Decay Time. This effectively empties the reverberator of its prior contents and then opens it up again to build new reverberation. The Reverb Clear function does not remain in effect when pressure is removed from the button. The red indicator LED should be on only while the user is pressing the Reverb Clear button, and there is no need to press the button again to return the 8X32 to normal function.

Reverb Clear does not black out the LED's in the descending arc of the Reverberation Level display because there is still a 0.2 second decay time being produced by the processor.

The Reverb Clear button has a secondary function as a check in the storage procedure for the memory registers. In order for a rever-

C.2. continued
beration set-up to enter a register, the Reverb Clear button must be pressed simultaneously with the Store button. This is to prevent accidental editing of the registers.

D. MEMORY: The Model 8X32 has a memory with 64 non-volatile storage registers, allowing you to maintain a "library" of favorite or most useful reverberation set-ups. The controls and displays for memory storage and recall are located on the right side of the front panel (D on FPD).

It should be noted that when you receive your 8X32 from the factory, the numerical LED displays (A2a and A2c on FPD) will show "E"s if you try to recall a register which is not yet filled. This will stop as soon as you have stored a reverberation set-up in that register.

D.1. Storage: After you have decided that you want to store a particular set of reverberation characteristics, use the 10 numbered push-buttons (D1 on FPD) in the large window. Punch in the number of a storage register that is not in use (you can, of course, edit any register already filled--that will be explained in section D4). Register numbers 00 to 63 are valid. The green LED Register display will indicate which register you are filling. To insert the reverberation set-up into the memory register, press the Store (D3 on FPD) and Reverb Clear (C2 on FPD) buttons simultaneously. The values you have chosen are now permanently registered until you choose to alter them. The non-volatile memory of the 8X32 retains its contents even when power to the unit is shut off.

D.2. Recall: To recall any reverberation set-up already stored, again use the numbered push-buttons (D1 on FPD) to choose the register you want accessed, then just tap the Recall (D4 on FPD) button. The values of all the reverberation parameters will change immediately, and you will note the changes as they are indicated by the LED numerical displays and the red indicator LED's over the Program and LF and HF Decay buttons.

D.2.a. Attempting to Store or Recall into an illegal register number (greater than 63) will cause "ER" to be displayed in the register window.

D.3.a. A-B Comparisons: At any given time, the 8X32 is processing the input signal according to the values indicated by the red LED displays for Program, Early Reflections, Initial Reverberation, Decay Time, and LF and HF Decay. If the register displayed (at D2 in FPD) has different values than those being produced by the machine, two decimal points, one on each side of the register number, will flash on and off.

To make a direct comparison between the contents of the register whose number is displayed and the set-up indicated by the individual displays, hold the Recall button down (for more than a second). The 8X32 will temporarily switch to the reverberation characteristics stored in the register. When the Recall button is released, the unit will return to the previous values. Remember that for permanent recall, you merely tap the Recall button briefly.

*See Appendix 3 for further information on front panel operational changes in later units.

D.4. Editing: In order to edit the contents of any register, recall that register, make any changes you wish, and then press the Store and Reverb Clear buttons simultaneously.

D.5. Locking the Memory Registers: The memory registers of the 8X32 may be locked, putting the machine in the "Recall Only" mode, indicated by a red LED (D5 on FPD) beneath the Register number display. The locking procedure is described on page 13a, which is located directly after the Warranty Information and is intended to be removed from the manual. If you misplace the locking instructions, please contact the factory for assistance.

CAUTION - GENERAL NOTE ON THE USE OF CONTROL BUTTONS: Do not press more than 2 control buttons of the 8X32 at one time. The microprocessor is designed to arbitrate between any 2 messages. There will be uncertain results if it is called upon to simultaneously arbitrate among more.

IMPORTANT NOTE ON MASTER CLEAR AND RESET OF MICROPROCESSOR

In the case of suspected latch-up, you may clear and reset the microprocessor of the 8X32 using the following procedure:

1. Shut the power to the unit off.

2. Depress the down (-) button which usually controls Early Reflections Level and the up (+) button which usually controls Initial Reverberation Level.

3. Hold both buttons down while turning the power to the unit back on.

4. Keep both buttons depressed for 3 seconds.

This procedure is an extreme measure and should only be performed after problems with the unit have been thoroughly evaluated. All memory registers will be erased by this procedure.

OPTIONS, ADDITIONS, AND ENHANCEMENTS

A. Remote Unit: The 8X32 Remote Unit must be used with a revised version of the 8X32 CPU board. Owners of 8X32's shipped before the new CPU design was phased in, and who purchase a Remote Unit, will be provided with a new CPU board at the same time, on a swap-in basis. The original CPU board must then be returned to URSA MAJOR.

B. Program Updates: URSA MAJOR will provide updated audio software PROM's at no charge.

OPTIONS, ADDITIONS, AND ENHANCEMENTS continued

C. Auto Mixdown Interface: In the near future, URSA MAJOR hopes to provide as an option automated mixdown or remote computer control software (using Serial Interface RS232C). This will allow a remote computer, connected at position J9 on the back panel, to read and write into the 64 user registers, and to operate all front panel controls.

WARRANTY INFORMATION

LIMITED WARRANTY: URSA MAJOR, INC. warrants each Model 8X32 to be free from defects in materials and workmanship, under normal use and service, for one year. This warranty begins on the date of delivery to the purchaser or his authorized agent or carrier. During the warranty period, we will repair, or, at our option, replace at no charge, components that prove to be defective, provided the equipment is returned, shipping prepaid, to the factory or a designated service facility.

This warranty is null and void under any of the following conditions:

a. Abuse, neglect, alteration, or repair by unauthorized personnel.

b. Damage caused by improper use, or operation from an incorrect power source.

c. Damage caused by accident, act of God, war or civil insurrection.

URSA MAJOR, INC. shall not be responsible for any loss or damage, direct or consequential, resulting from machine failure or the inability of the product to perform. URSA MAJOR, INC. shall not be responsible for any damage or loss during shipment to or from the factory or its designated service facility.

This warranty is in lieu of all other warranties, express or implied, and URSA MAJOR, INC. does not assume nor authorize anyone to make any warranty or assume any responsibility not strictly in accordance with the above.

URSA MAJOR, INC. reserves the right to make changes or improvements in the design of the machine without obligation to make such changes or improvements in purchaser's machine.

No equipment may be returned under this warranty without the prior written authorization of URSA MAJOR, INC. Authorized return of shipments must be prepaid and should be insured. The machine should be returned carefully packed in the original carton and packing material. If these are not available, new ones may be procured from URSA MAJOR, INC.

For your protection and our information, please return the Warranty Registration to URSA MAJOR, INC. when you receive your Model 8X32. The warranty for your unit may be invalid if we do not receive the returned Warranty Registration form promptly. If there is no copy of the Warranty Registration in your unit's shipping carton, please ask your dealer for one.

MEMORY LOCKING PROCEDURE -- "RECALL ONLY"**

In order to lock the memory registers of the Model 8X32, follow this procedure:

1) Use the 10 numbered push-buttons in the large window to punch "88" in the Register display.

2) Simultaneously push the (-) button which usually refers to Early Reflections mS and the (+) button which usually refers to Decay Time.

The memory of the Model 8X32 is now in the "Recall Only" mode. Any attempt to fill or edit a register will elicit a "no" on the unit's Register display.

To unlock the memory:

1) Use the 10 numbered push-buttons in the large window to punch "89" in the Register display.

2) Simultaneously push the (-) button which usually refers to Early Reflections mS and the (+) button which usually refers to Decay Time.

The memory registers are now available for storage and editing.

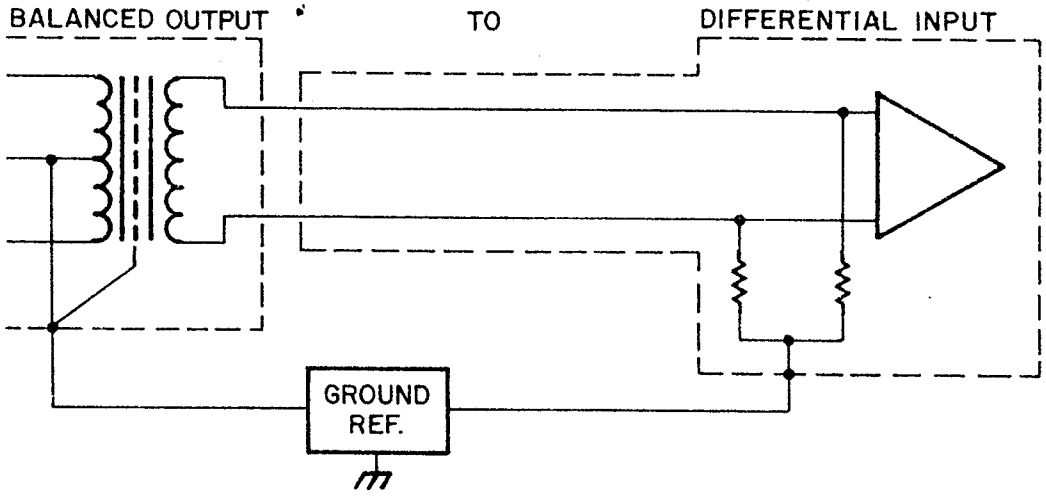
**You may want to remove this page and store it separately from the Owner's Manual.

INTERFACING TECHNIQUES (page 3, PRELIMINARY OWNER'S MANUAL)- SUPPLEMENTARY DIAGRAM - PLEASE CONSULT THE DIAGRAM WHICH MATCHES YOUR SITUATION.

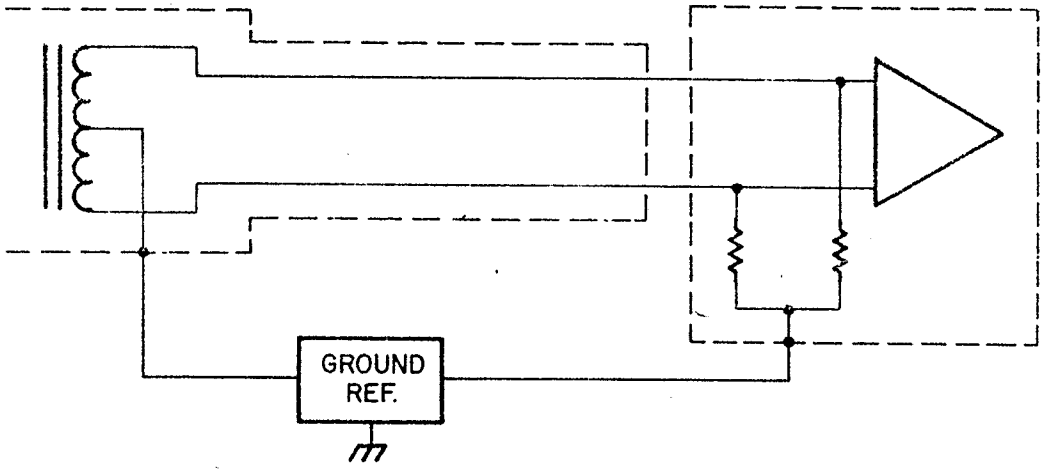
I. DIAGRAMS A-D: FROM EXTERNAL SOURCE TO 8X32 INPUT

BALANCED OUTPUT TO DIFFERENTIAL INPUT

A.



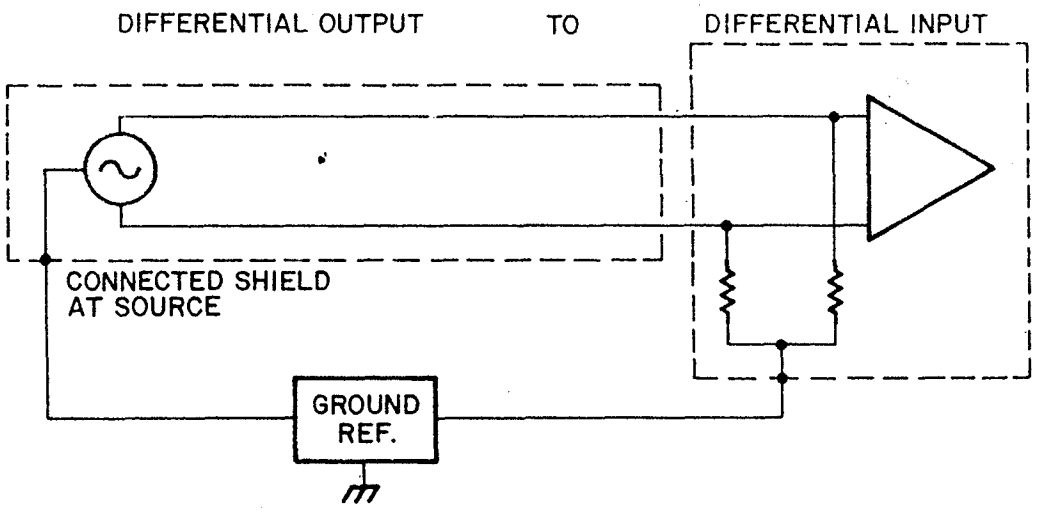
B.



NOTE: OUTPUT TRANSFORMER A IS FLOATING SO LINES ARE REFERENCED TO DIFFERENTIAL INPUT – TIE SHIELD TO DIFFERENTIAL INPUT GROUND.

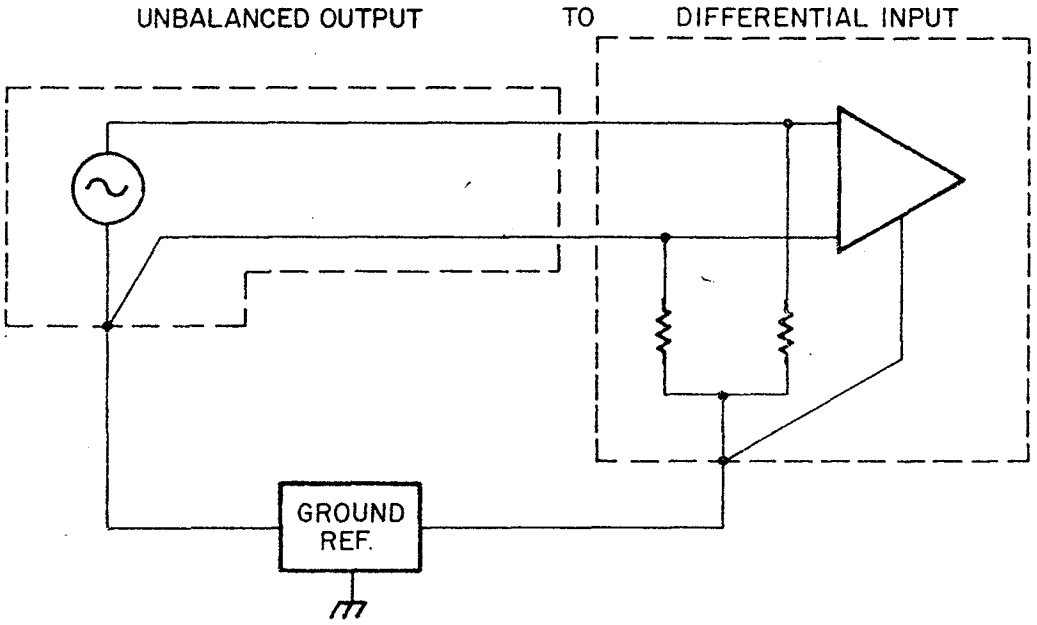
C.

DIFFERENTIAL OUTPUT TO DIFFERENTIAL INPUT



D.

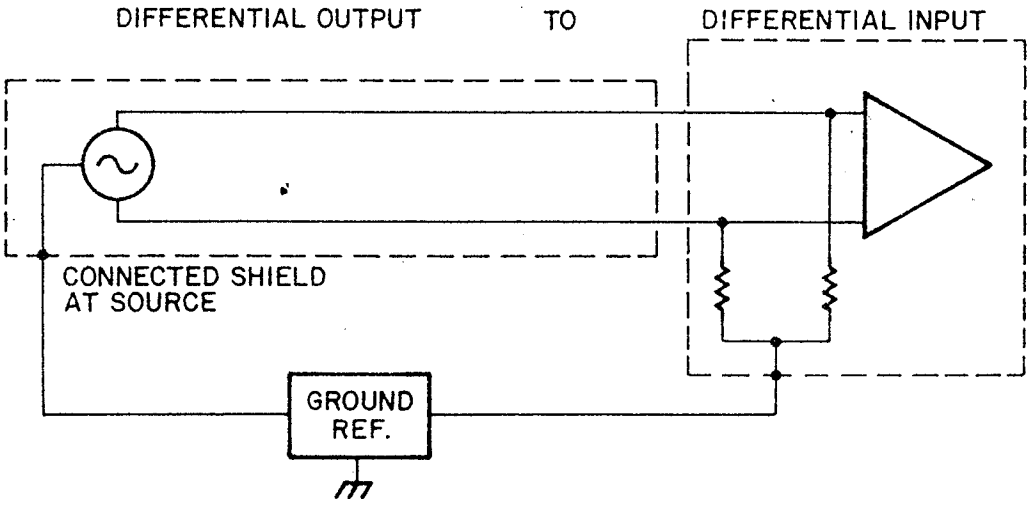
UNBALANCED OUTPUT TO DIFFERENTIAL INPUT



II. DIAGRAMS E-G: FROM 8X32 OUTPUT TO EXTERNAL LOAD

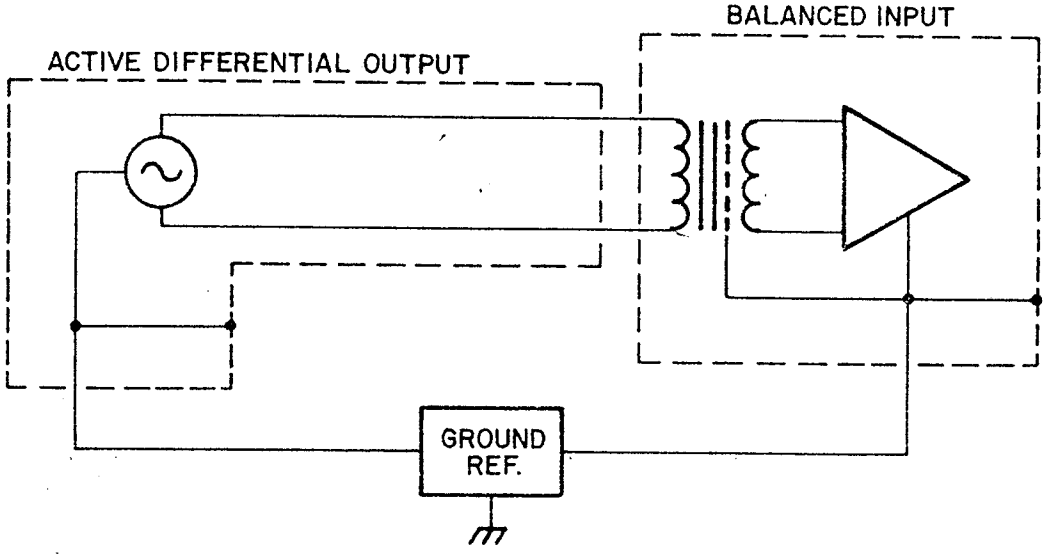
E.

DIFFERENTIAL OUTPUT TO DIFFERENTIAL INPUT



F.

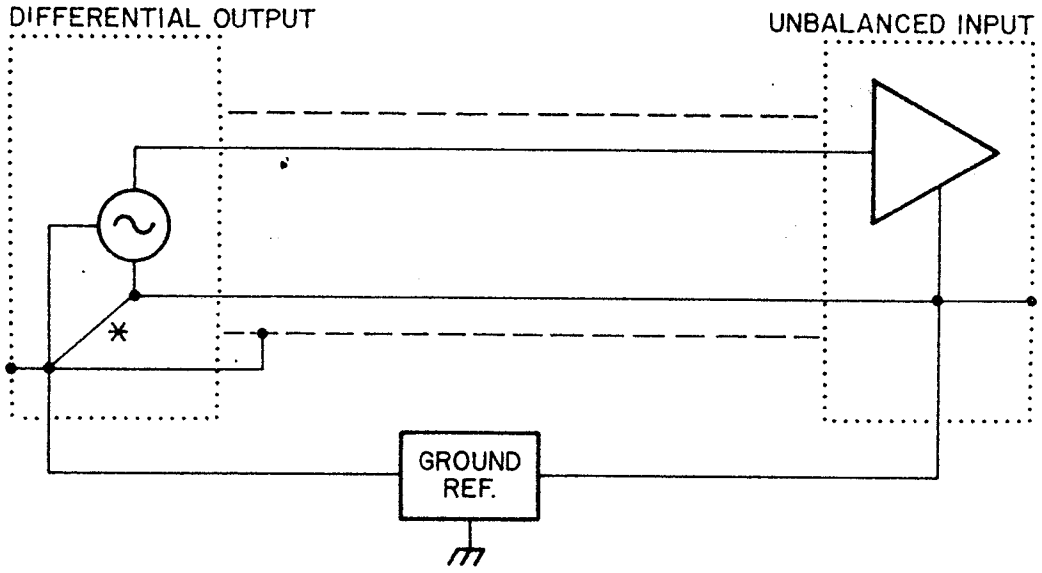
DIFFERENTIAL OUTPUT TO BALANCED INPUT



II. (continued): FROM 8X32 OUTPUT TO EXTERNAL LOAD

G.

DIFFERENTIAL OUTPUT TO UNBALANCED INPUT

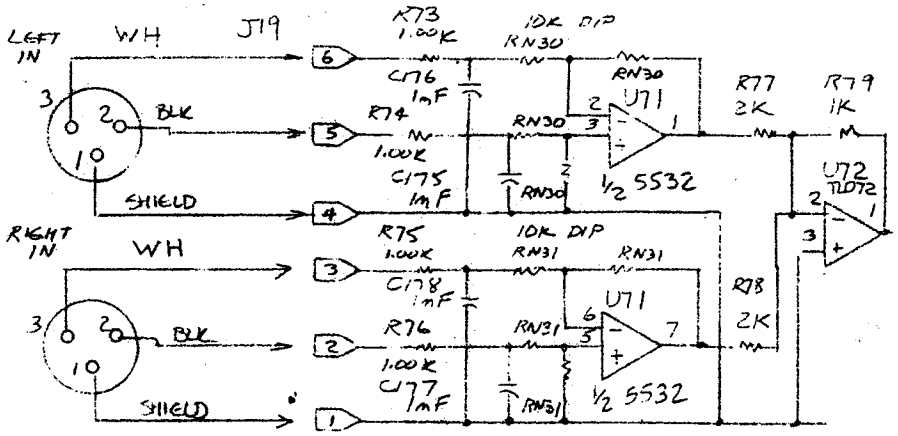


1. NOTE * GROUND - THIS IS IMPORTANT TO ACTIVE DIFFERENTIAL OUTPUTS. WHEN ONE OUTPUT SIDE IS SHORTED THE OUTPUT CURRENT NEEDS TO RETURN TO GROUND VIA THE SHORTEST, LEAST INDUCTIVE/CAPACITIVE ROUTE.

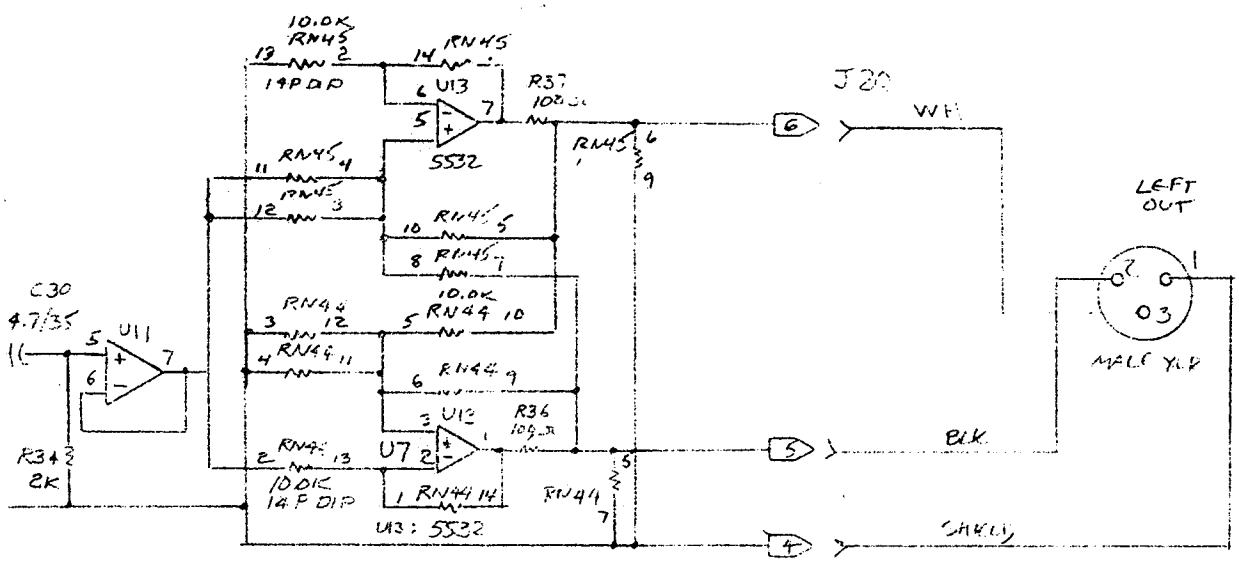
2. THIS IS NOT A DESIRABLE INTERCONNECT - WATCH FOR GROUND LOOPS AND OSCILLATIONS OF DIFFERENTIAL OUTPUT.

DIAGRAMS A-G ARE USED WITH THE KIND PERMISSION OF THOMAS M. HAY (MCI, Inc.). THEY FIRST APPEARED IN HIS PAPER, "DIFFERENTIAL TECHNOLOGY IN RECORDING CONSOLES AND THE IMPACT OF TRANSFORMERLESS CIRCUITRY ON GROUNDING TECHNIQUE", PRESENTED AT THE 68th AES CONVENTION IN HAMBURG (MARCH, 1981).

III. DETAILED SCHEMATIC OF 8X32 INPUT STAGE



IV. DETAILED SCHEMATIC OF 8X32 OUTPUT STAGE



APPENDIX 2: PROGRAM E4-1 DESCRIPTIONS

8X32 PROGRAM DESCRIPTION --- EDITION E4-1

Program Edition E4-1 is the second set of programs to be produced for the 8X32. The first, used in all production units shipped up to 20 June 1982, was Edition E4-0. It is our intention that E4-1 completely supersedes the original program set, E4-0, which is no longer available.

This new edition provides the same basic programs, with roughly the same intended characteristics, but is improved in many respects. Coloration (the tendency to emphasize certain parts of the spectrum) is greatly reduced in all programs. Diffusion (the density of echoes) is increased, resulting in smoother, denser reverberation. The two Plate programs are tighter, especially Plate I, so that percussive sounds are very quickly reverberated, reducing the tendency to reveal discrete clicking. The decay envelope is now smoother, with less undulation in the energy density during long decays. All programs are now used with no out-of-phase information, with the result that the reverberation is more open, spacious and harder to localize.

Edition E4-1 is implemented in two PROM's, so that updating is virtually as simple as changing two PROM IC's. Eliminating the out-of-phase information, however, calls for a simple hardware change (removing two resistors on the ANA-2 PC Board) which is described in detail in Engineering Field Service Bulletin #9 provided with the PROM set.

Edition E4-1 consists of :

Delay PROM Part Number: 0527-6
Gain PROM Part Number: 0525-6

It contains these four Programs:

Plate I, revision I	Part number: P0620A
Plate II, revision I	Part number: Q0620A
Hall, revision I	Part number: H0620A
Space, revision I	Part number: S0620A

8X32 PROGRAM DESCRIPTION	Edition E4-1 PLATE I, Rev. 1 (P0620A)
Build-Up:	Explosive--achieves high density within 30-50ms.
Decay:	Quite uniform, smooth, highest density of E4-1 programs.
Coloration:	Moderate--short delays result in "small", slightly colored sound.
Early Echo Density:	Very high--no clicking or discrete reflections audible even with very short test impulses.
Available Decay Times:	0, .2, .4, .6, .8, 1, 1.4, 1.7, 2.1, 2.5, 3, 3.5, 4, 5, 6 (sec).
Early Reflection Delay:	23ms left, 5ms right (base delay).
Initial Reverberation Delay:	10ms (approximate base delay to cluster mid-point).

Plate I is intended to roughly simulate the best plate reverberators and their capacity to produce bright, highly diffuse reverberation. Of the four programs in E4-1, this is the best for percussive material, music with sudden short transients that need to be spread quickly into dense, "fattening" reverberation. If front panel "ms" controls are kept at or near zero, it will be virtually impossible to detect discrete reflections even with the most trying signals (such as a lab impulse generator). Due to the short delays, coloration (a tendency to sound small or "boxy") is the greatest in Plate I, but it is nevertheless quite under control.

Studios have found this program nice for drums, staccato brass sections, vocals, and other instruments that call for explosive reverberation fully fused with the original sound. Its fast attack and very high diffusion are not necessary, however, with a great many instruments, any one of the other programs might be a better choice due to their reduced coloration. Instruments or musical passages with less rapid signal variations don't require such great diffusion, and the other programs will give reduced coloration and greater spaciousness.

8X32 PROGRAM DESCRIPTION Edition E4-1 PLATE II, Rev.1 (Q0620A)

Build-Up:	Moderately explosive--achieves high density within 50-100ms.
Decay:	Quite uniform; smooth, high density.
Coloration:	Moderate--less than Plate I, but greater than Hall or Space.
Early Echo Density:	Low in first 50ms, increasing rapidly thereafter.
Available Decay Times:	0, .2, .6, 1, 1.4, 1.7, 2.1, 2.5, 3, 3.5, 4, 5, 6, 7, 8.
Early Reflection Delay:	31ms left, 14ms right (base delay).
Initial Reverberation Delay:	22ms (approximate base delay to cluster mid-point).

Plate II is a compromise between Plate I and Hall, with reduced coloration and greater openness, but still with a fast enough attack to be quite free of discrete clicks with sharp transient material. The slower build-up leaves a longer gap to open up the sound when used with instruments or vocals that might otherwise in Plate I be somewhat muddled. Even if the difference in Initial Reverberation Delay between Plate I and Plate II is adjusted out with the Initial Delay-ms controls, Plate II will still sound less colored and more open due to the reduced density of the Initial Reverberation cluster and ensuing reverberation. Plate II is capable also of slightly longer maximum decay time than Plate I—8 seconds.

This is a good choice with fast-changing pop vocals, choruses and "busy" instrumentals whose rapidly-changing waveforms call for fast, dense reverberation, but which still need a little breathing room to retain clarity.

8X32 PROGRAM DESCRIPTION	Edition E4-1 HALL, Rev. 1 (H0620A)
Build-Up:	Uneven, gradual, softer attack beginning after 70-100ms.
Decay:	Overall uniform, but with more variation in fine structure and local echo density. Lower ultimate density than the Plates.
Coloration:	Very slight.
Early Echo Density:	Low in first 80ms--possible to hear clicking with sharp transients.
Available Decay Times:	0, .2, .6, 1, 1.4, 1.7, 2.1, 2.5, 3, 3.5, 4, 5, 6, 8, 10.
Early Reflection Delay:	25ms left, 10ms right (base delay).
Initial Reverberation Delay:	65ms (approximate base delay to cluster mid-point).

Hall is scaled and balanced to behave like a good medium-sized concert hall, with low coloration and a substantial open period with a few discrete reflections before the reverberation really begins to spread into a high echo density. This open early reverberation period will permit clicking to be heard with sharp transients, particularly if high Initial Reverberation level settings are used. But this same openness helps the program achieve its great utility in giving more lesiurely vocals and slower-changing instruments a very full, spacious, open sounding reverberation. This is the most natural, most pleasing program for classical music and much pop material because it most closely imitates the reverberation many of us know instinctively from years of hearing live music. Unless HF Decay is adjusted downward from 8kHz, Hall will be unnaturally bright and sibilant, although this may be desirable, as when a pop vocal is to be enhanced with a spacious reverberation with an audibly separated high frequency bloom. Increasing Initial Reverberation-ms above the base values will give the sense of a larger space, to the point where the reverberation is actually heard with an echo. Adjusting the level and delay of both the Early Reflections and the Initial Reverberation will allow a great variety of concert hall effects, from very distant incoherent reverb fields, to warm chamber music environments with quite an intimate character.

Build-Up:	Very slow, open and unveven for first 100-150ms.
Decay:	Lowest echo density of four programs--clicks with short transients. Some undulation may be audible.
Coloration:	Very slight.
Early Echo Density:	Low, although increased levels of Early Reflection and Initial Reverberation controls will fill in the first 150ms with un-colored discrete reflections.
Available Decay Times:	0, .2, 1, 1.7, 2.1, 2.5, 3, 4, 5, 6, 8, 10, 12, 15, 20.
Early Reflection Delay:	10ms left, 25ms right (base delay).
Initial Reverberation Delay:	125ms (approximate base delay to cluster mid-point).

Space is all the stops pulled out to allow the largest, most echoing, longest decaying, sound field. It's obviously not good for fast, sharp percussive material, unless the discrete echos are desired for effect. But with more legato sounds--a lush string section, organ, synthesizer, or even a vocal set against a shimmering background--it's just the thing. You'll never hear the reduced density with material like this, so that the open, airy, uncolored sound of Space will be achieved with no compromise. Space offers such a long maximum decay time (20s) that it can capture several seconds of the preceding sound and hold it suspended as a kind of "spectral plasma" against which succeeding notes stand out in harmony with the gradually decaying reverberant floor. If you're into "space music" this is the one for you. The very open early period of Space's reverberation lets the active, rapidly-varying character of an instrument stand out with great clarity--if the reverb is not returned to the mix at too high a level! Use Space with even more delay from the front panel controls and transient wavefronts can be heard to move left and right in the Initial Reverberation period, and to echo and richochet well into the period of dense decay. With short decay times, Space has some uses in providing slap echo for special effects with percussion.

This is a good program to try the unique 8X32 functions "Input Mute" and "Reverb Clear". Just after a few clear notes have built up in the reverberator with a very long decay time (10-20s), tap Input Mute on, and the notes will hang suspended for long enough to use a harmonic background for a short vocal passage. Tap Reverb Clear to dump out this "spectral plasma", release Input Mute, and start over again. Reverb Clear is very useful with these long decay times as a way of terminating an otherwise long decay time in those moments where the accumulated "mud" would be undesirable.

Figure 1
Impulse response of four programs, showing first .5s of reverberation, 50ms/division. Decay time 2.5s, ER & IR Levels set to 1, delays set to 0ms.

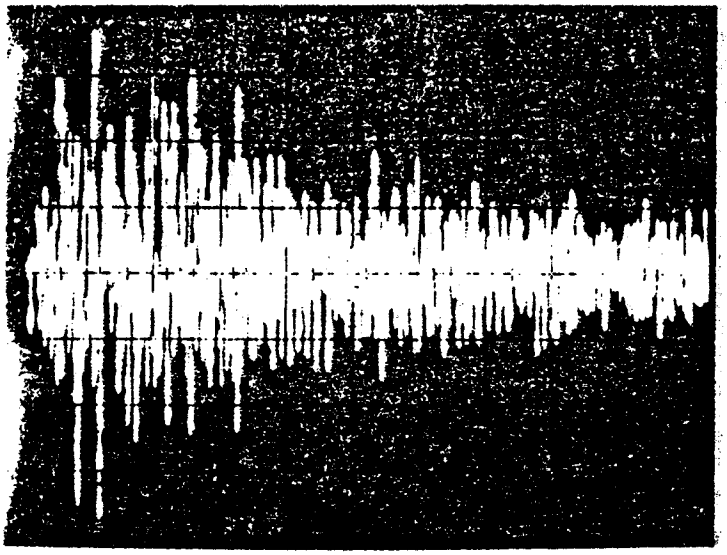


Plate I: Explosive attack in first 50ms. Increasing ER & IR Levels will increase explosiveness further.

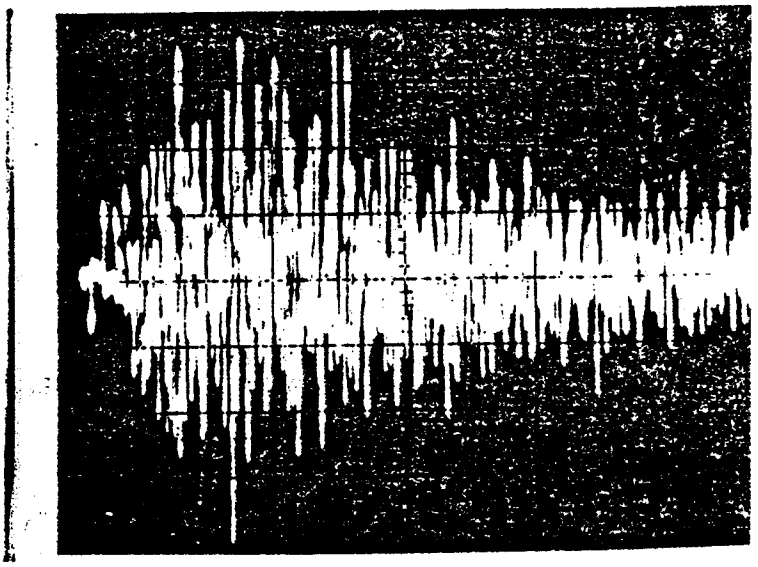
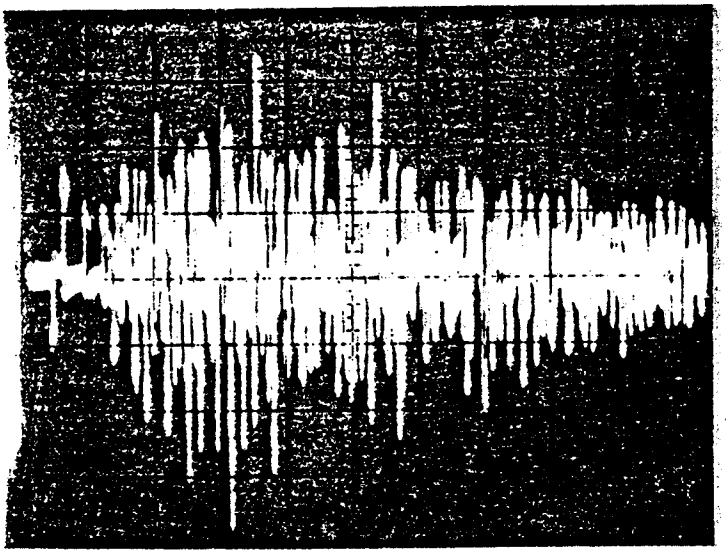
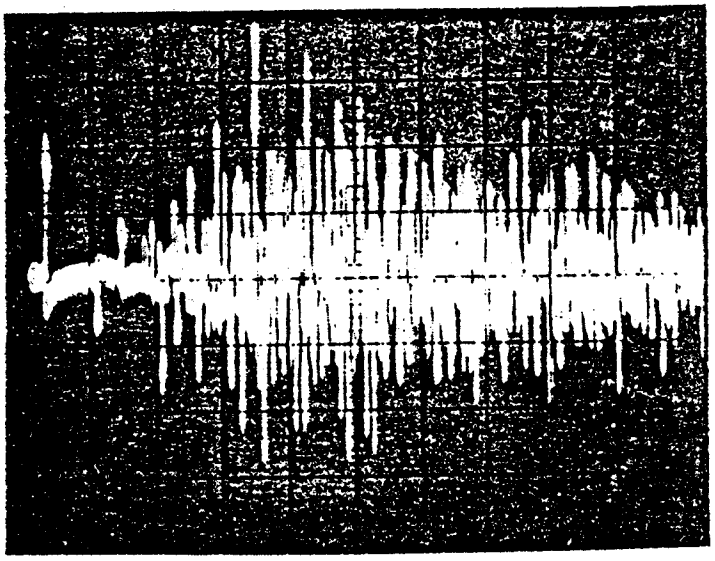


Plate II: More open first 50ms, more gradual build-up than Plate I.



Hall: Scattered reflections in otherwise open first 70ms, followed by soft build-up into dense reverberation. Increase ER & IR Levels for more intimate sound (less depth).



Space: Sparse reflections in first 100ms, followed by slowly building reverberation gives feeling of large acoustic enclosure.

APPENDIX 3: REVISED CPU BOARD SOFTWARE CHANGES

In July 1982, a revised version of the 8X32's CPU PC board, and its uP operating software, was released. This was done to allow full simultaneous support of serial communications to the 8X32 Remote Control Unit and to an automated mixdown unit. To use a Remote Control, the mainframe must have this revised CPU.

At the same time as the serial communications feature of the remote were enhanced, some software changes in front panel protocol were carried out. Owners of 8X32's with Remotes will, therefore, need to read on.

Recall Only Feature: The Recall Only feature is designed to protect the contents of any registers you have already used to store a set-up. Whenever the CPU is reset, whether initially at the factory, or deliberately in the field with the Master Clear procedures, all registers are initialized to a Hall program, and a flag bit is set in each register. When storing or recalling a register, this bit is checked.

If, during recall, the bit is set, the displays show all "E"s to indicate that you have never used this register.

During store, if the "Recall Only" LED is on, this bit is checked, and if it is set (ie: the register has never been used), a store operation is permitted, the store button LED goes on, and the flashing register decimal points go out, confirming the store operation. If, on the other hand, the bit is clear, then no store is allowed, and the register number display shows "no". In this way, new registers may still be used even in the "Recall Only" mode, while previously used ones are protected.

Non-Volatile Memory Management: The new software handles possible errors in user-register memory in a different way. Anytime a store operation is done, the uP computes a new "checksum" of all the user registers and stores it in non-volatile memory. Whenever the unit is powered up, the checksum is re-computed and compared to the checksum previously stored. If they disagree, then something in memory has been altered, but there is no way to say how much or where. In this case, the register display shows ".bd.", advising the user of the error condition, essentially saying, "don't trust the registers". You may, at this point, proceed to check a few registers to see if they are ok, or you can use the Master Clear procedure to clear all user registers. The checksum error message will be put back up whenever the power is turned off-on. The error message will be cleared and not reappear after a Recall or Store operation is performed. Ie, you are warned once of the suspect memory error condition, but not again.

APPENDIX 3 continued

In the original CPU, one location in user memory was used to store a reference code, which was checked whenever power was turned on. If an error was found, all user registers were automatically cleared (display "E"s when recalled). Since only one memory location is checked, it isn't quite as comprehensive as the new version. Furthermore, the remedy - clearing all user registers - is somewhat drastic, considering that some of them may still be ok, the new version gives the user a chance to check registers against his own memory and possibly salvage some.

N.B. Despite all the discussion about user register error messages, the design is such that these problems should never occur. In the event of bizarre brown-out power fluctuations, or static discharge to the 8X32, some disturbances to memory could occur - that's why all the precautions.

APPENDIX 4
8X32 ALGORITHM & PROGRAMS

An algorithm is the definition of a process, the set of rules or sequence of operations that must be carried out to accomplish a desired result. In our case, the desired result is to synthesize reverberation from the source input signal ("dry" or "direct" sound). Shortly we will discuss how this is accomplished in the 8X32 and, in the process, learn something about its algorithm. But first let's investigate the "algorithm" for natural reverberation. How can we describe the process whereby an acoustic space transforms the source sound into reverberation?

To begin, there are some rules. Sound is a wave motion phenomenon in air, so all the laws of acoustical physics describing sound propagation and absorption in an enclosure apply. The following five principles are relevant to our description of natural reverberation:

1. Sound is radiated from its source as a wave, extending in a straight line in every direction from the source (subject, of course, to its directivity pattern).

2. As sound travels through the air, some of its energy is lost to collisions with air molecules, resulting in attenuation of the sound with increasing distance, especially at high frequencies.

3. Sound travels relatively slowly--about one foot per millisecond (1/1000th second). This results in a sequence of closely-spaced echoes that unfolds in time.

4. By the very nature of an enclosure, the travelling sound wave will eventually reach a boundary. When it does, the angle at which the sound is reflected from the wall will equal the angle at which the sound hit the wall.

5. When the sound wave encounters a boundary and is reflected, it loses some energy: only a portion of the sound is reflected. Sound will be attenuated every time it reflects off a boundary.

Armed with these basic principles, we can outline the algorithm for reverberation in an enclosure. The source emits sound which radiates in straight lines, getting weaker because of air absorption, until it eventually encounters boundaries. The sound is reflected, losing further energy, and travels again through the air, again encounters another boundary, etc. It is a pretty simple process to conceptualize this way.

Though the process can be described simply, the result is complex. In a concert hall the sound wave emitted by an instrument on stage travels in many directions and encounters various boundaries many

different times. The sound reflects off each boundary that it encounters, so that the process results in an increasingly dense pattern of reflections, which eventually approach the listener from all angles, and at the rate of thousands of echoes per second.

The three-dimensional nature of the reverberation situation in an enclosure makes it extremely hard to duplicate with a simple piece of electronic equipment-- or even with a complex piece of equipment, for that matter. In fact, it has been observed that it is theoretically impossible to exactly synthesize reverberation with an electronic system . A natural acoustic environment is three-dimensional, whereas a piece of electronic equipment can never exceed one dimension-- but that is an issue too complex for us to explore here.,

What we need to do in our reverberator is to come up with a convincing replica of natural reverberation. The listener automatically, and largely unconsciously, subjects any synthetic reverberation to psychoacoustic tests, comparing it to a deep memory of natural reverberation. The output of our digital reverberator needs to pass these tests: not exactly duplicate the real thing.

THE 8X32 REVERBERATION ALGORITHM

For clarity's sake, the 8X32's algorithm can be simplified to three main stages:
1) First the algorithm synthesizes two discrete early reflections which simulate the first two significant reflections that inevitably occur in a concert hall or other reverberant situation.
2) Next the algorithm provides a group of reflections, somewhat larger in number than those in (1), to simulate the intermediary phase of the reverberation process, in which the echoes begin to get quite dense in time, but have not yet achieved the maximum diffusion that will eventually occur.
3) The final stage is the production of the very dense reverberation decay tail that dies out approximately exponentially over a longer period of time.

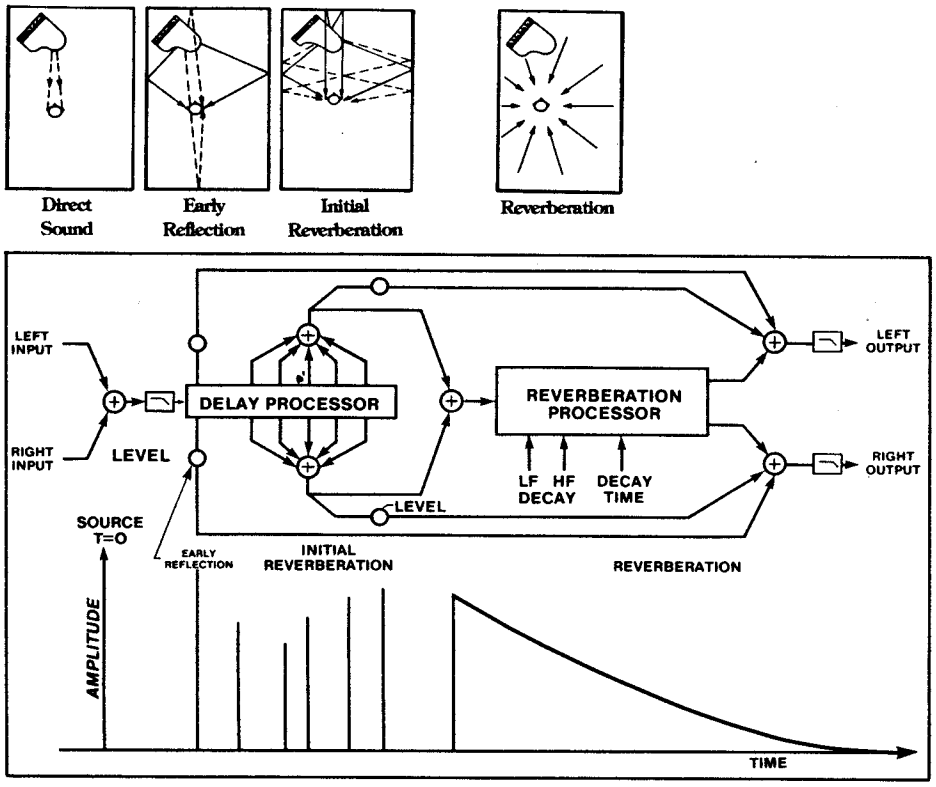


FIG.1 8X32 ALGORITHM & IMPULSE RESPONSE

By breaking the synthesis of reverberation into these three stages, the 8X32 can provide a very accurate simulation of natural reverberation. Moreover, this allows great flexibility in tailoring the reverberant pattern, in all its phases and detail, to exactly suit the program material.

Now that we have the general outline of the algorithm, we can look in more detail at how the 8X32 carries out the process. The incoming sound is routed into a large segment of the 8X32's memory. From that segment, there are many taps at which the sound can be extracted, with exact time delay, and brought to the output.

Two of these taps are called the Early Reflections. They comprise a stereo output signal, whose level in the final mix of the 8X32's output is controlled by the front panel Early Reflection Level control. The algorithm assigns a basic delay to each of these two taps, but the Early Reflection Milliseconds control allows for the addition of up to 98ms of delay to both base delays. In order to simulate the reverberation in a larger room with its longer sound paths and greater delays, the user will want to add more delay to the occurrence of the Early Reflections.

Next, for the second stage, a larger group of delay taps (from the same portion of memory as the Early Reflections) is mixed into the output in stereo. The level of these Initial Reverberation taps, and any additional delay of their occurrence, are controlled by the Level and ms buttons. Again, each of these taps has been assigned a base delay value to which additional delay (up to 98ms) can be added. These taps, unlike the Early Reflections, are also carried forward into the next part of the 8X32 reverberation algorithm, the reverberator. Since they drive the reverberator, giving them extra delay will also give additional delay to the reverberation itself--the so-called "pre-delay" so often used in studio reverb applications.

Signals directed into the reverberator first pass through a processor that greatly increases the echo density. Afterwards, they drive the final part of the reverberation processor, where recirculation is used to obtain very long decay times.

To accomplish a variable decay time, the 8X32's algorithm permits the adjustment of the gain of some signals that are fed back into the reverberator, and adjustment of their high and low frequency response so that the decay time can be modified at high and low frequencies. These characteristics are adjusted on the front panel by the Decay Time, HF Decay, and LF Decay buttons. If the Decay Time is set to 0.0 seconds, the reverberator (3rd stage of the algorithm) is completely silenced, leaving only the delay taps of the Early Reflection and Initial Reverberation available to reach the output. In the next setting, 0.2 seconds, a portion of the reverberator is enabled, allowing other taps to reach the output and increasing the echo density, but still not allowing recirculation and sustained reverberation.

As the Decay Time is increased, the gain of the feedback signals is increased, causing the reverberation to linger for a longer period of time. The algorithm couples the sound of the reverberator into the stereo output of the 8X32 via many taps, yielding a broad, incoherent stereo ambience. Unlike the Early Reflection and Initial Reverberation, there is no level control for this portion of the algorithm: it is coupled into the output at a fixed level. The two level controls for the earlier stages of the algorithm allow the user great versatility in balancing early, middle, and late reverberant levels. This gives a lot of control over the apparent "depth" or listener position in the hall (front or back).

THE FOUR PROGRAMS OF THE 8X32

The 8X32 has one basic algorithm, very flexible and broadly conceived, that can simulate a wide variety of reverberant spaces or devices. Changing the time delays and the gains used throughout the algorithm results in dramatically different

programs ranging from small, fast-diffusing plates appropriate for percussion, to large echoing spaces.

Once you become accustomed to the controls, and understand how each of them adjusts parameters in one of the three stages of the algorithm, it is easy to appreciate the uses and distintive qualities of each of the programs. The most basic difference from program to program is the increasing time delays used (moving from Plate I to Space). This is, of course, true to nature, where small spaces have short sound paths and large halls quite long paths. Each of the four programs has a distinctively different character, useful for a variety of program material, different instruments, different creative effects. The following chart will give some idea of the differences between the four programs.

CHARACTERISTIC	PLATE I	PLATE II	HALL	SPACE
DIFFUSION	Fastest			Slowest
COLORATION	Greatest			Least
SPACIOUSNESS	Least			Greatest
INTELLIGIBILITY	Greatest			Least
MAX DECAY TIME	6 sec	8 sec	10 sec	20 sec
PERCUSSIVE MATERIAL	Optimum			Poor

TABLE I: Program Characteristics

GLOSSARY OF REVERBERATION TERMS

DIFFUSION describes the ability of a reverberator to build up a high echo density, and how quickly it builds this density. The greater the diffusion of a reverberator, the more quickly it takes an input sound and produces a large number of echoes. Good reverberation calls for an eventual diffusion to at least 1000 echoes per second.
In the studio world, a plate has very high diffusion, an echo chamber somewhat less, and a hall or large space the least. Diffusion is an important parameter to consider with percussive material. A percussive sound, such as a wood block, can be close to an impulse (an engineering term for a loud, extremely short duration sound, like a gun shot or electrical spark discharge). Such impulsive sounds easily reveal the diffusion of the particular reverberator in use. In order not to hear a succession of discrete echoes after the impulse, a reverberator needs high

diffusion. But with less impulsive material, such as a string section or pipe organ, or even vocals, we do not care so much about high diffusion because it simply will not be revealed due to the slowly changing nature of the program material.

COLORATION describes the tendency of any reverberant situation to emphasize some parts of the frequency spectrum over others. All reverberators have wildly varying frequency responses with countless peaks and valleys. The broader and higher these resonant peaks are, the more we would hear coloration.

Coloration can distort the balance of different tones in the input signal; for example, as a flute rises and falls in pitch, some notes may leap out while others vanish. Coloration tends to increase in small acoustic spaces (like your favorite tiled shower) where diffusion is the greatest. If you seek the lowest coloration, choose the Hall or Space programs. Of course, in all the 8X32 programs, coloration has been reduced to the minimum regardless of the diffusion; nevertheless, it is the least in Hall or Space.

SPACIOUSNESS describes the ability of a reverberator to psychoacoustically convey the listener into another space. The reverberation algorithm is crucial to establishing a feeling for the space and its size by setting time delays, reflection patterns, decay time, decay frequency response, etc.

INTELLIGIBILITY involves our ability to still hear temporal detail of a sound in a reverberant environment. Our ability to understand speech depends upon maintaining enough temporal clarity--intelligibility--to separate syllables. Of course, we never listen just to the reverberation by itself, but if we were to do so, we would find that intelligibility is greatest in the Plate I program, where delays are short and fuse closely with the source. In Space, on the other hand, the long delays and gaps between delays allow confusing repetitions of sounds that muddy it up. Intelligibility can be related to diffusion: fast diffusion tends to keep the temporal detail of the source fused with the reverberation, retaining clarity. This is why we would prefer a fast diffusing program for percussion, but would not care about diffusion with legato, slow-changing sound sources. In Space, the delays and gaps are long enough so that we can actually hear the discrete echoes if we excite the 8X32 with short impulses.

APPENDIX 5
8X32-MK II PROGRAM DESCRIPTIONS

The 8X32-MK II is an enhanced version of the origional 8X32 digital reverberator. The following pages detail these enhancements. This appendix supercedes the information on page 19. The program descriptions for CASK, PERC, CHAMB, and R REV are in addition to those on pages 20 thru 24.

8X32 MK II PROGRAM DESCRIPTION Edition E8-0

Program edition E8-0 is the third set of programs produced for the 8X32. This program edition adds 4 new programs to the PLATE I, PLATE II, HALL and SPACE programs in Edition E4-1. The PLATE I, PLATE II, HALL and SPACE programs in E8-0 are identical to those in E4-1.

The 4 new programs, Cask, Percussion Plate (PERC), Chamber (CHAMB) and Reverse Reverb (R REV) are new and the result of extensive tuning and feedback from users. They are accessed through pressing the reverb clear button and one of the four program buttons simultaneously. A flashing program LED indicates that a "shifted" program has been selected.

Edition E8-0 is implemented in 4 PROMs: two new CPU PROMs to handle the new front panel protocol, and two new program PROMs incorporating the 8 programs.

Edition E8-0 consists of:

CPU Low PROM	Part Number: 0883-0
CPU High PROM	Part Number: 0884-0
Delay PROM	Part Number: 0886-0
Gain PROM	Part Number: 0887-0

It consists of these eight programs:

PLATE I, Revision 1	Part Number: P0620A
PLATE II, Revision 1	Part Number: Q0620A
HALL, Revision 1	Part Number: H0620A
SPACE, Revision 1	Part Number: S0620A
CASK, Revision 0	Part Number: CA507A
PERC, Revision 0	Part Number: PP507A
CHAMB, Revision 0	Part Number: CH507A
R REV, Revision 0	Part Number: RR507A

8X32 MK II PROGRAM DESCRIPTION Edition E8-0 CASK, Rev. 0 (CA507A)

Build-Up:	Explosive--achieves high echo density within 15-25ms.
Decay:	Quite uniform, smooth, highest density of E8-0 programs.
Coloration:	Strong--very short delays result in a very small, highly colored sound.
Early Echo Density:	Very high--no clicking or discrete reflections audible even with very short test impulses.
Available Decay Times:	0, .1, .2, .3, .4, .5, .6, .7, .8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0 (sec).
Early Reflection Delay:	8ms left, 3ms right (base delay).
Initial Reverberation Delay:	4ms (approximate base delay to cluster mid-point).

Cask was designed out of the desire to simulate a very small enclosed space. Very short delays were chosen to achieve the extremely high echo density and rapid early reflections that characterize such a space. The result is a highly colored, "hollow" sound. Sources processed by the cask program have been variously described as sounding like they are coming from an oil drum, metal pipe, or wine cask...hence its name.

The cask program may be used with virtually any source. It is possible to put a narrator, instrument or even an entire band in a 55 gallon drum! If the mix is smoothly changed from dry to wet it sounds like the source is being lowered into the cask. A more realistic effect is often achieved by cutting the high frequency decay to 1 or 2 kHz. This program is also useful for percussion. If one can live with the coloration, cask has the highest echo density and most rapid build-up of all the 8X32 programs.

8X32 PROGRAM DESCRIPTION Edition E8-0 PERCUSSION PLATE, Rev. 0 (PP507A)

Build-Up:	Very explosive--build-up starts in less than 1ms and achieves high density in 25-40ms.
Decay:	Quite uniform, smooth, second in density only to cask.
Coloration:	Moderate--short delays result in slightly colored sound.
Early Echo Density:	Very high--no clicking or descrete reflections audible even with very short test impulses.
Available Decay Times:	0, .2, .4, .6, .8, 1.0, 1.2, 1.4, 1.6, 2.0, 2.4, 2.8, 3.2, 3.6, 4.0
Early Reflection Delay:	9ms left, 5ms right (base delay).
Initial Reverberation Delay:	8ms (approximate base delay to cluster mid-point).

This program is a response to requests for a higher echo density and more rapid build-up than Plate I, for a truly explosive percussion sound. Less than 1ms after a snare crack enters the reverberator it is already being heard at the output. The initial reverberation cluster is so tight that it instantly fuses into the reverb. The sound is also quite free from coloration.

Use the percussion plate program with percussive instruments, vocals, any source requiring instant, dense reverberation. Sources requiring decay times longer than 4 seconds or less coloration should probably be processed by one of the other plate programs.

8X32 MK II PROGRAM DESCRIPTION Edition E8-0 CHAMBER, Rev. 0 (CH507A)

Build-Up:	Moderately gradual--achieves high density within 65-130ms.
Decay:	Quite uniform, smooth, moderate density.
Coloration:	Very slight.
Early Echo Density:	Low in the first 100ms, possible to hear discrete reflections with sharp transients.
Available Decay Times:	0, .2, .6, 1, 1.4, 1.7, 2.1, 2.5, 3, 3.5, 4, 5, 6, 7, 8.
Early Reflection Delay:	31ms left, 13ms right (base delay).
Initial Reverberation Delay:	44ms (approximate base delay to cluster mid-point).

Vocals, strings, and other "pure" sounds need an uncolored, smooth and clear reverberation. The chamber program is especially suited to fill these requirements. Chamber is scaled to be larger than Plate II but smaller than Hall. In addition the reverberent decay has been tuned to be especially diffuse and free from coloration.

8X32 MKII PROGRAM DESCRIPTION Edition E8-0 REVERSE REVERB, Rev. 0 (RR507A)

Build-Up:	Very slow, open and uneven for the first 100-250ms.
Decay:	Low echo density, comparable to SPACE program. Discrete reflections audible with short transients.
Coloration:	Very slight.
Early Echo Density:	Low, but very even.
Available Decay Times:	0, .2, 1, 1.2, 2.1, 2.5, 3, 4, 5, 6, 8, 10, 12, 15, 20.
Early Reflection Delay:	168ms left, 186ms right (base delay).
Initial Reverberation Delay:	75ms (approximate base delay to cluster mid-point).

Unlike the other seven programs, reverse is a special effect. Reverse reverb is a common studio effect. Reverb is added to a tape being played in reverse. The result is that when the tape is played forward one hears reverberation growing in volume, ending abruptly with the dry signal. Reverse is an attempt to simulate such an effect in real time. The technique is as follows: the initial reverb is heard first as an increasingly loud series of reflections. Next, the two early reflections are heard (note that even when the early reflection delay displays 00, the early reflections are still set to 168 and 186ms delay by the software). Meanwhile, the reverberation has been building up to and peaks shortly after the "early" reflections are heard. For the most pronounced effect, set the early reflection delay=0, level=0, and initial reverberation delay=0, level=8. Increase the decay time slightly to help smooth the sound as desired.