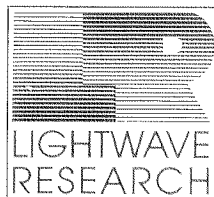


emulator

Laser Simulator System

User Manual

Version 1.0



2209 WEST BRAKER LN.
AUSTIN, TX 78758

emulator

Laser Simulator System

User Manual

Version 1.0 - Revised 1/92

by
Diana Lambiase

LIGHTWAVE RESEARCH, INC.
2209 West Braker Lane
AUSTIN, TEXAS USA

Table of Contents

List of Figures	iv
List of Tables.....	iv
Introduction	v
Section 1: Preliminary Planning.....	1
Power Requirements	1
Controller	1
Fixture	1
Fixture Voltage Selection.....	1
Changing the Jumpers	2
Data Cable Requirements	4
Section 2: Setting Up the Emulator System	5
Unpacking the Emulator System	5
Assembling the Fixture	6
Attaching the Yoke.....	6
Installing the Xenon Lamp	7
The Optimization Process: Why It Makes a Big Difference.....	9
Optimizing the Emulator Fixture	10
Personality DIP Switches	14
Setting the Fixture Personality DIP Switches	14
Setting the Controller Personality DIP Switches	16
Fixture Address DIP Switches	19
Data Cable Connections: General Information	20
Connecting the Data Cables	21
Master/Slave Configuration	22
Section 3: Controller Description	25
Emulator Controller: Front Panel	25
Emulator Controller: Rear Panel	31
Section 4: Operating the System	33
Initial Power-Up	33
Turning On the Controller.....	33
Controller Self-Test.....	33
Homing the Fixtures	34
Programming	34
Addresses	34
Address Lockout	35
Address Unlock	35

Creating a Page	35
The Four-Step Method (For Creating a Page)	36
Creating a Non-Initialized Page	37
Position Memory (Preset Focus)	38
Setting Reference Pages in Memory Nine	39
Using the Position of Reference Pages in Memory Nine	39
Presets	39
Recording A Loop (or Chase)	40
Recording A One Page Preset (Scene)	41
Copying	41
Page Copy	41
Block Copy	42
Address Parameter Copy	42
Copy Selected Addresses From One Page to Another	43
Editing Pages	44
Erasing Pages	45
All Memory Erase	45
Memory Lockout	46
Playback	46
Page Playback - Manual Advance	46
Page Playback - Automatic Advance Modes	47
Preset Playback	48
Preset Playback Advance Modes	48
Automatic All-Memory Playback	48
Creating a Simple Page	49
PRACTICE SESSION	49
Creating a Simple Loop	52
Creating the Second Simple Page	52
Copying a Page	54
Copying All Parameters (Except Position) From One Address to Other Addresses	56
Creating a Non-Initialized Page	56
Playing Back the Loop	57
Recording the Loop as a Preset	58
Playing Back the Preset	59
Section 5: Remote Access and Control.....	61
Remote Analog Access	61
Remote Page Access	63
Remote Preset Access	65
Twelve Level Access	65
Binary Access	65
Remote Enable	66

Section 6: External Memory Storage & Transfer	67
General Information	67
Setting up for Data Transfer with a Computer	68
Downloading	69
Uploading	70
Crossloading	71
Preset Playback from a Computer	72
Setting the Controller I.D. Number	72
 Section 7: General Maintenance & Troubleshooting Guide	 73
General Maintenance and Cleaning	73
Xenon Lamp Maintenance	74
Aging Damage to the Xenon Lamp	74
Replacing the Xenon Lamp	75
Disposing of the Xenon Lamp	75
Troubleshooting Guide	76
 Section 8: Warranty & Precautions	 81
Unpacking	81
Saving the Shipping Materials	81
Inspecting the Contents	81
Limited Warranty	81
Returning a Warrantied Item for Repair	82
Precautions	83
Cautions	83
Warnings	83
 Appendix A: Fixture Specifications	 85
 Appendix B: Fixture Illustrations	 86
TOP VIEW	86
SIDE VIEW	86
FRONT VIEW	87
REAR VIEW	87
 Appendix C: Controller Specifications	 88
 Appendix D: Controller Illustrations.....	 89
Emulator Controller: Front Panel	89
Emulator Controller: Rear Panel	90

List of Figures

Figure 1.1	Emulator Fixture Rear Panel	2
Figure 1.2	Multi-pin "Voltage Select" Connector	2
Figure 1.3	Multi-pin Connector Voltage Selection Configurations	3
Figure 1.4	Silkscreening on Printed Circuit Board	3
Figure 1.5	Proper Construction of a Data Cable	4
Figure 2.1	Emulator Fixture - Side View	5
Figure 2.2	Emulator Fixture - Side View	6
Figure 2.3	Emulator Fixture - Top View	6
Figure 2.4	Emulator Fixture - Top View	7
Figure 2.5	Inside the Emulator Fixture	7
Figure 2.6	Xenon Lamp	8
Figure 2.7	Positioning the Xenon Lamp	8
Figure 2.8	Orthographic View of the Emulator Optical Chain	9
Figure 2.9	Side View Emulator Optics	9
Figure 2.10	Emulator Fixture: Side View	10
Figure 2.11	Emulator Fixture: Bottom Door View	10
Figure 2.12	Emulator Fixture: Rear View	11
Figure 2.13	Emulator Fixture: Underside with Bottom Door Removed	11
Figure 2.14	Emulator Fixture: Top view with Top Door Removed	12
Figure 2.15	Proper Appearance of the Pinhole Aperture after Optimization	12
Figure 2.16	L-158 Supplied Light Meter	12
Figure 2.17	Emulator Fixture: Top View; How to Position the Light Meter	13
Figure 2.18	Emulator Fixture: Underside with Bottom Door Removed	13
Figure 2.19	Horizontal Mirror Image Display	15
Figure 2.20	Vertical Mirror Image Display	16
Figure 2.21	Controller Address Key & Corresponding Fixture Address	19
Figure 2.22	Rear Panel of the Emulator Controller	20
Figure 2.23	Rear Panel of the Emulator Fixture	20
Figure 2.24	Emulator Data Cable Connections - Daisy Chain Method	21
Figure 2.25	Emulator Data Cable Connections - Serial Data Distributor	21
Figure 2.26	Slaved Controllers	22
Figure 2.27	Location of Master/Slave Jacks	23
Figure 4.1	I.M.P. Display Self Test	33
Figure 4.2	The Emulator Controller	36
Figure 4.3	The Emulator Controller	49
Figure 5.1	Pinout of Remote Access Jacks	61
Figure 5.2	Remote Enable Mini-phone Jack	66
Figure 6.1	PC Backup of an Emulator Controller	67
Figure 6.2	Emulator Controller Backup of Another Controller	71

List of Tables

Table 1.1	Fixture Voltage Selection	3
Table 2.1	Fixture Address DIP Switch Setting	19
Table 5.1	Controller Pinout for Remote Analog Acc	62
Table 5.2	Remote Analog Input Channel Functions	64
Table 6.1	Pinout for Crossloading Memory	71

INTRODUCTION

Congratulations on your purchase of the Lightwave Research Emulator Laser Simulator System- a laser simulator system that uses a powerful, concentrated beam with high speed laser scanning to create dazzling laser-like effects without the complications associated with a true laser. Animated patterns and unique geometric shapes of multi-colored light come to life with the multiple head system, creating effects as dramatic as those produced by a true laser. Patterns can be used as programmed or altered with user-controlled parameters.

The power of the Emulator is augmented by the ease and simplicity of its use. Since it is not a true laser product, there are no variances, licenses, or permits required for operation. There are no plumbing lines, no sensitive optics cables, and no minimum height requirements to worry about. And because the Emulator head is controlled by a single data cable, it is easy to get started. Simply apply power to the fixture, plug the data cable from the controller to the fixture, and it's on line.

This manual was designed to make setting up and using your Emulator Laser Simulator System a smooth-going and easy-to-follow process. In this manual you will find simple step-by-step instructions for setting up and operating the system, detailed descriptions and illustrations of the Emulator Laser Simulator System Fixture and Controller, and a handy Quick Reference Troubleshooting Guide.

SECTION 1

PRELIMINARY PLANNING

Prior to setting up the Emulator system, the electrical and structural requirements of the system should be considered. The proper power distribution system should be in place and the correct cables should be constructed or purchased before the Emulator system is set up.

Warning: Both the fixture and the controller should be mounted in a location which is away from direct heat and protected from moisture.

Power Requirements

Controller

The controller requires very little power (approximately 300 milliamperes at 115VAC and approximately 150 milliamperes at 230VAC).

Fixture

The Emulator fixture requires no dimming or switching circuits for operation. Listed below are the average current requirements, in normal mode, per fixture at the specified voltages:

at 120VAC, 60hz	- 6.0 amps
at 100VAC, 50hz	- 7.0 amps
at 100VAC, 60hz	- 7.0 amps
at 230VAC, 50hz	- 3.0 amps

Multiple fixtures may be placed on a single circuit. The number of fixtures allowed per circuit depends on the current rating of the circuit.

Fixture Voltage Selection

If the voltage of the local power grid differs from the factory setting of the fixture, it can easily be re-configured to operate at the required voltage. The fixture has a jumper that is wired into a quick disconnecting terminal block. The jumpers can be set so that the fixture can operate at 100V, 120V, or 220/240V.

Changing the Jumpers

1. To change the jumpers, first disconnect the power to the unit.
(Turn off the power switch and unplug the fixture.) (See Fig. 1.1)

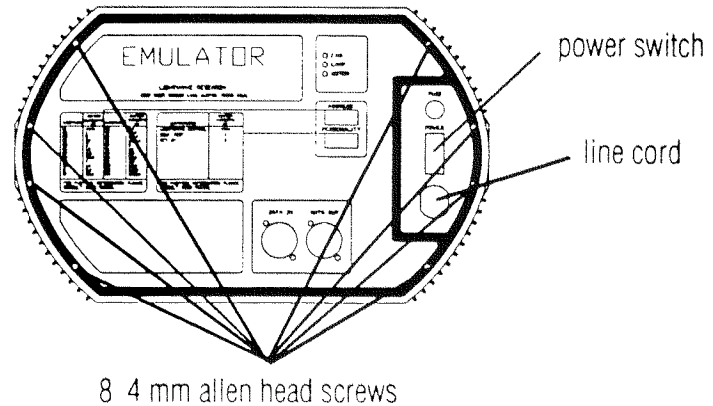


Figure 1.1 Emulator Fixture Rear Panel

2. Take off the rear panel by removing the eight 4 mm (9/64 in.) allen head screws securing it to the fixture. (See Fig. 1.1)
3. Carefully lower the rear panel out of the way, taking care not to strain the wiring harnesses attached to it.
4. Locate the multi-pin "voltage select" connector. Inside the fixture there will be a printed circuit board (the power supply board) in plain view. At the bottom of the board, near the center is a multi-pin connector which looks like the drawing below. (See Fig. 1.2)

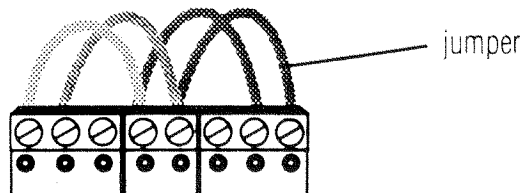
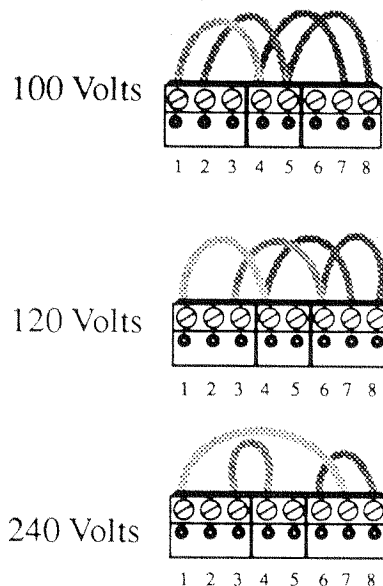


Figure 1.2 Multi-pin "Voltage Select" Connector

- Remove the multi-pin "voltage select" connector (with the jumpers attached.)
- Re-configure the jumpers according to the following chart and drawings.



SELECTION	PIN CONNECTIONS
100 Volts 50/60 Hz 12.5A Fuse	1 - 4 - 7 2 - 5 - 8
120 Volts 50/60 Hz 10A Fuse	1 - 4 - 7 3 - 6 - 8
240 Volts 50/60 Hz 6.3A Fuse	1 - 7 3 - 4 6 - 8

Figure 1.3 Multi-pin Connector Voltage Selection Configurations

Table 1.1 Fixture Voltage Selection

- The orientation of the jumpers is left to right one through eight.
- Neither the multi-pin "voltage select" connector or the silkscreening on the board are numbered. The silkscreening on the board indicates the voltage of each connection. (See Fig. 1.4)

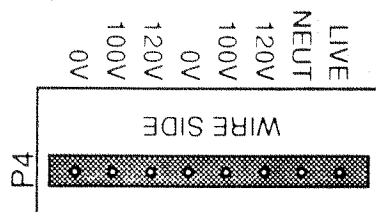


Figure 1.4 Silkscreening on Printed Circuit Board

- Be sure to replace the main fuse on the rear panel with the correct fuse size. (See Table 1.1)

After changing the voltage selection internally, replace the main fuse on the rear panel of the fixture with a type "FST," 250V, time lag fuse of the correct value.

Data Cable Requirements

Both the Emulator fixture and controller require standard 3-pin XLR connectors for data input and data output.

Data cables should be constructed using shielded, two-conductor cable with a male 3-pin XLR connector on one end and a female 3-pin XLR connector on the other end. Pin 1 is the shield, Pin 2 is the data complement (negative), and Pin 3 is the data true (positive.) (See Fig. 1.5)

Microphone cables will work if the pin connections are correct (the same as described above.)

Each cable should be tested with a VOM for correct polarity and to make certain that neither connector is grounded **before** use.

CAUTION:

All fixtures should be earth grounded for proper operation. Erratic operation may result from improperly grounded fixtures.

Do not use the ground lug on the XLR connectors. Do not connect the shield to ground or allow contact to ground. Grounding the shield could cause a ground loop and cause erratic behavior.

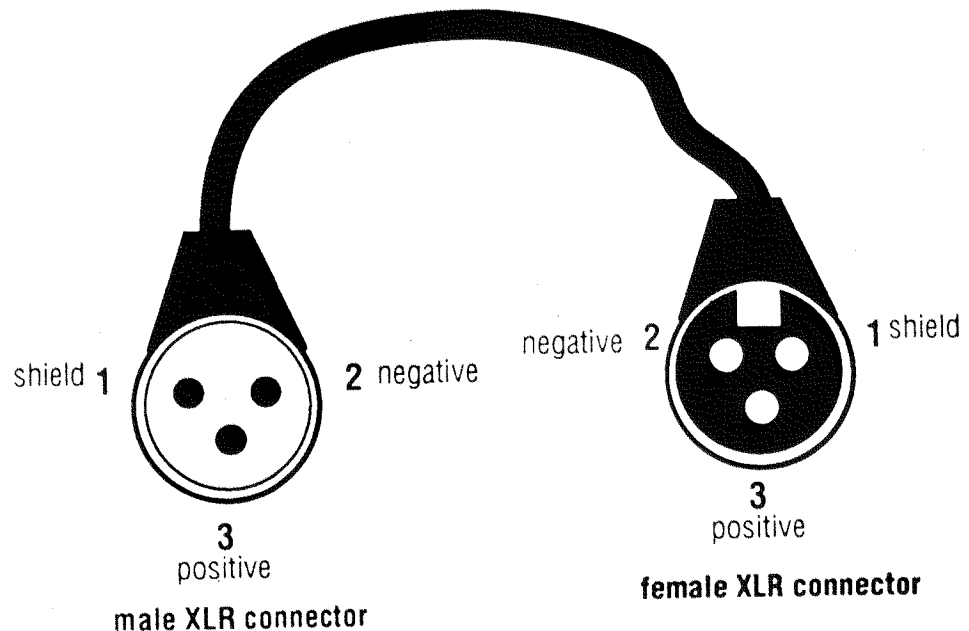


Figure 1.5 Proper Construction of a Data Cable

SECTION 2

SETTING UP THE EMULATOR SYSTEM

Unpacking the Emulator System

The shipping carton which contains the **controller** will also contain the following materials:

- One Emulator User Manual
- One Emulator Backup 13 cm (5 1/4 in.) Floppy Disk
- One book of schematic drawings
- Two controller keys
- One light meter

The shipping carton which contains the **fixture** will also contain the following materials:

- One xenon lamp
- Xenon lamp installation instructions
- Xenon lamp optimization instructions
- One yoke (See Fig. 2.1)
- Two 8 mm (5/16 in) allen cap screw bolts * (See Fig. 2.1)
- Two clamping T-handles * (See Fig. 2.1)

* **Note:** The two 8 mm (5/16 in) allen cap screw bolts and the two clamping T-handles are already installed when the fixture is shipped. You will need to remove them in order to install the yoke.

If your carton does not include all these items, contact your High End Systems dealer or distributor.

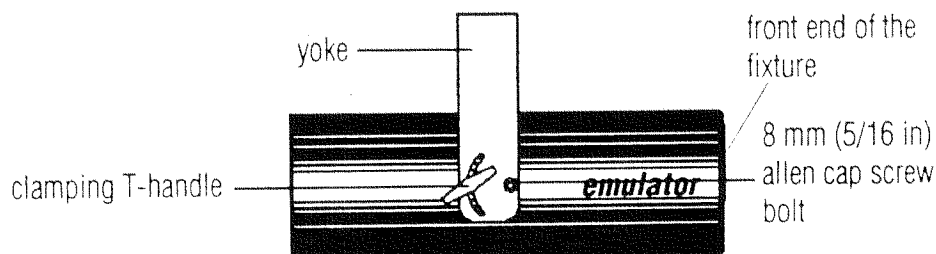


Figure 2.1 Emulator Fixture - Side View

Assembling the Fixture

The first step in assembling the fixture is to attach the yoke as described in the following instructions. After you attach the yoke, you will need to install the lamp. (See instructions on pages 7-8.) The final and most critical step in assembling the fixture is the optimization of the lamp. (See instructions on pages 10-13.)

Attaching the Yoke

You will need . . .

- 8 mm (5/16 in) allen wrench

1. Remove the two 8 mm (5/16 in) allen cap screw bolts and the two clamping T-handles from the fixture. (See Fig. 2.2)

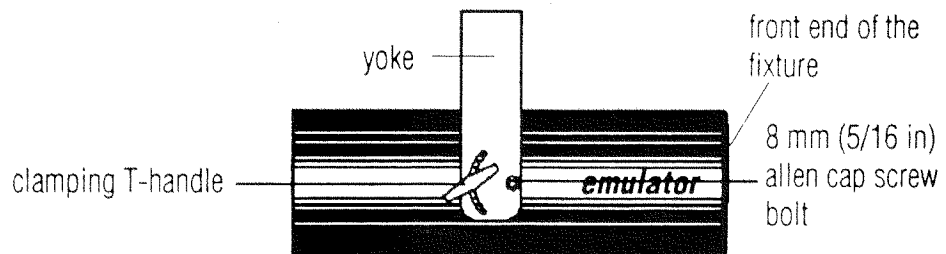


Figure 2.2 Emulator Fixture - Side View

2. Align the mounting holes on the yoke with those on the fixture.
3. Insert the 8 mm (5/16 in) allen cap screw bolts through the round holes on the yoke and insert the clamping T-handles into the slotted curved cut outs on the yoke.
4. Tighten the 8 mm (5/16 in) allen cap screw bolts with your allen wrench.

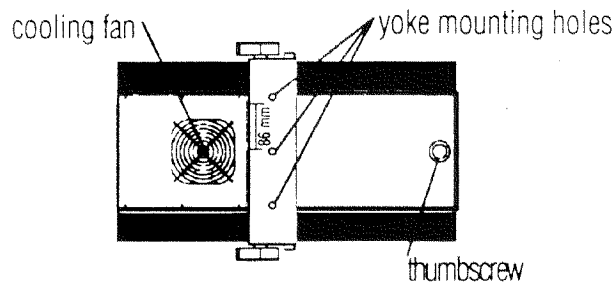


Figure 2.3 Emulator Fixture - Top View

The main function of the clamping T-handles is to position the angle of the fixture. They should not be tightened completely until the fixture is in place and positioned correctly.

5. On the top of each yoke are three mounting holes [13 mm (.5 in) diam.] which allow two different ways to mount the fixture. The three holes are spaced 86 mm (3.4 in) apart (See Figure 2.3) The fixture may be mounted with a single clamp in the center of the yoke, or with two clamps on either side of the yoke.

Installing the Xenon Lamp

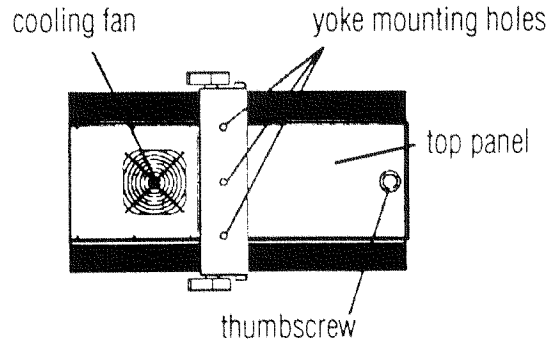
You will need . . .

- Protective eyewear
- Leather gloves
- Wire Cutters

CAUTION

Whenever you are working on or near the Emulator xenon Lamp, wear protective eyewear and leather gloves. The xenon lamp is pressurized, therefore, there is a possibility that it may shatter. When power is applied to the fixture, the unshielded Emulator xenon lamp emits Ultraviolet and visible radiation which could damage eyes and skin. Never remove the top fixture door when the lamp is on. If dirt or oil from dirty gloves, skin or fingers, etc. come in contact with the lamp glass, the lamp could overheat and burst causing damage to the fixture. If the lamp is soiled in any way, clean it carefully with an alcohol wipe.

1. Unscrew the thumbscrew on the top door of the fixture. (See Fig. 2.4) If you have already installed the yoke, you will need to push it back (down) toward the rear of the fixture to install the xenon lamp.



2. Remove the top door to gain access to the lamp base and lamp retaining screw. (See Fig. 2.5)

Figure 2.4 Emulator Fixture - Top View

3. Locate the lamp base, lamp retaining screw and lamp cap. (See Fig. 2.5)
4. Carefully cut the plastic tie-wrap which secures the lamp cap for transport. (See Fig. 2.5)
5. The lamp cap is attached to the fixture by the lamp cap wire. (See Fig. 2.5) Set the lamp cap up out of the way so it is not blocking the lamp base.

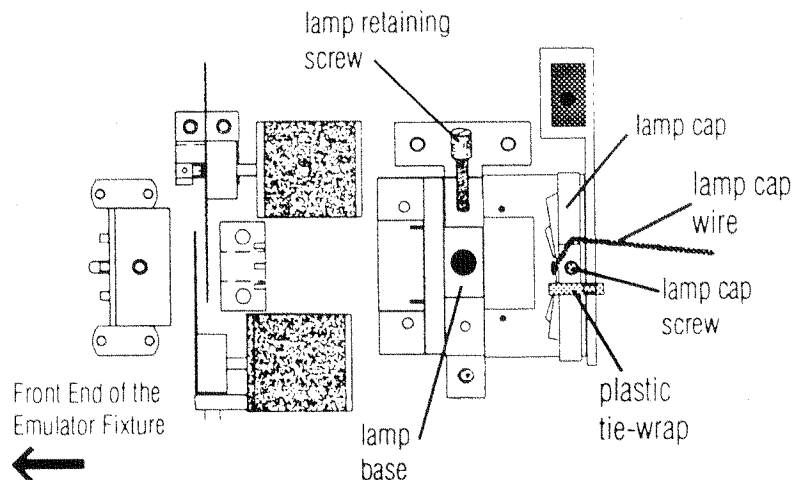


Figure 2.5 Inside the Emulator Fixture

6. Open the box containing the xenon lamp. The lamp is contained in a protective plastic tube. **Do not** open the plastic tube yet.

7. Put on your protective eyewear and leather gloves. You should always wear leather gloves and protective eyewear when handling the xenon lamp during this installation and in any future adjustments.
8. Carefully remove the xenon lamp from its protective plastic tube.
9. Locate the *lamp nipple* on the xenon lamp. (See Fig. 2.6)

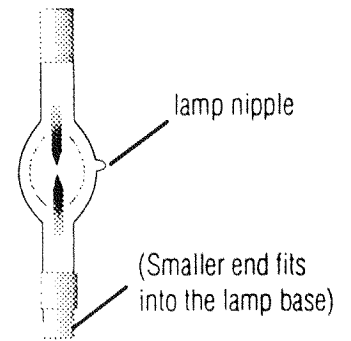


Figure 2.6 Xenon Lamp

10. Position the *lamp nipple* so that it is at a 90° angle to the *emission window* on the front panel of the fixture. (See Fig. 2.7) Proper placement of the lamp ensures that the lamp nipple will not obstruct or distort the light output of the xenon lamp.
11. Loosen the *lamp retaining screw* and insert the smaller end of the xenon lamp into the *lamp base*. (See Fig. 2.7)
12. Holding the xenon lamp in place, tighten the *lamp retaining screw* (See Fig. 2.7) by hand so that it fits securely. It is possible to safely tighten the lamp retaining screw to **10 inch pounds** without crushing the end of the lamp.
13. Loosen the *lamp cap screw*. (See Fig. 2.7) Place the *lamp cap* on top of the xenon lamp. Position the *lamp cap* so that the star-shaped points face towards the right side of the fixture (when you are looking into the fixture from the back end). (See Fig. 2.7) Tighten the *lamp cap screw* finger-tight. This screw can be safely tightened to **6 inch pounds**.
14. Replace the top door and tighten the thumb screw. **Do not remove your protective eyewear or leather gloves until the top door is in place.**

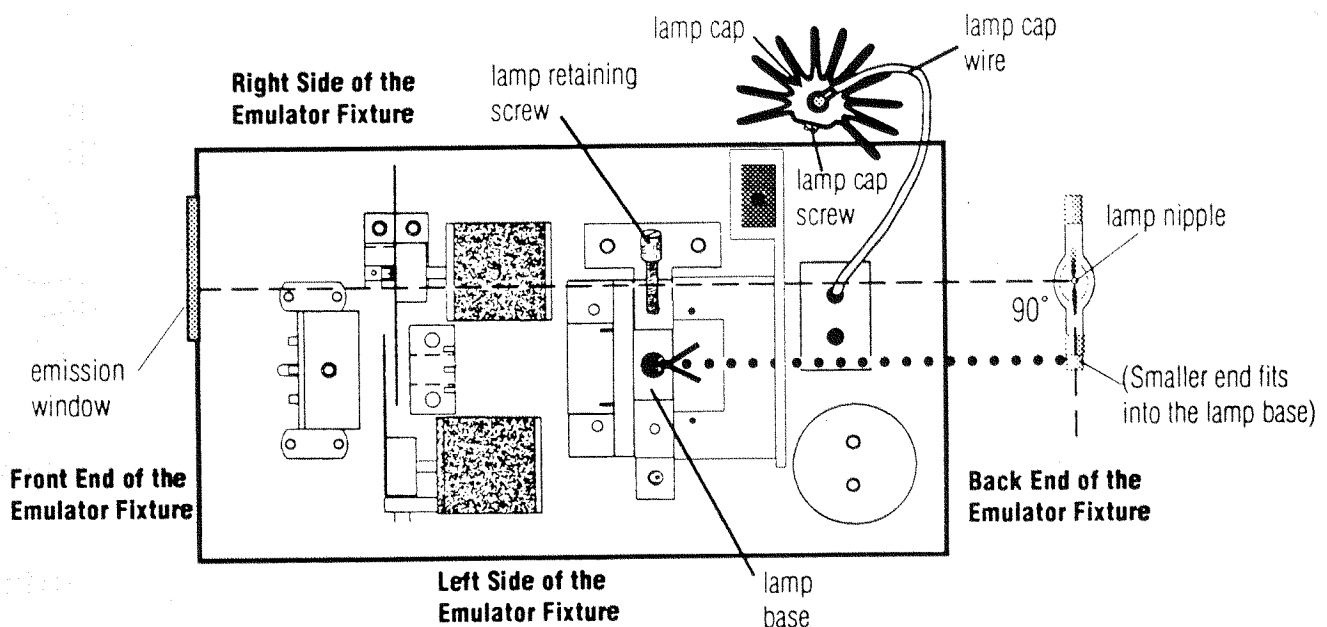


Figure 2.7 Positioning the xenon Lamp

The Optimization Process: Why It Makes a Big Difference

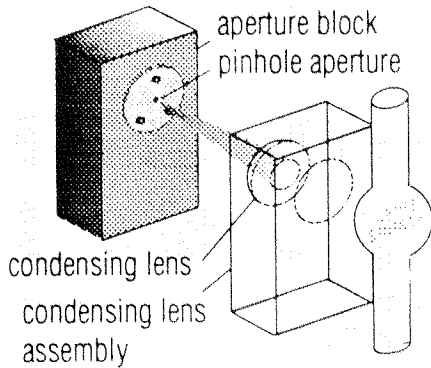


Figure 2.8
Orthographic view of the
Emulator optical chain -
detail of the pinhole
aperture

The xenon lamp used in the Lightwave Research Emulator is a *short-arc xenon lamp*. The entire light output of this powerful lamp occurs within a very small arc created by two electrodes located in the center of the pressurized quartz envelope of the lamp. This brilliant 'arc,' not unlike a welder's arc, must be positioned correctly in front of the condenser. This correct positioning is achieved through a process called *Optimization*. This is accomplished by turning the three adjustment t-screws located under the lamp base (See Fig. 2.9) to create the brightest possible point of light over the pinhole aperture. (See Fig. 2.8) To achieve a sharp-edged circle of light which is strong and even across the beam, it is equally important to adjust the focus t-screw found near the front end of the fixture under the focus lens (See Fig. 2.9). The intense point of light at the pinhole aperture is then concentrated to create the familiar laser-like effect that the fixture can achieve. **If the point of light is even *slightly* off, the difference in the final output intensity of the Emulator fixture can be significantly reduced. The optimization process is the most crucial setup adjustment for the Emulator.** If you feel you are having difficulty with the optimization process, or would like further assistance, please contact your High End Systems Dealer or HES Service at (512) 837-3063.

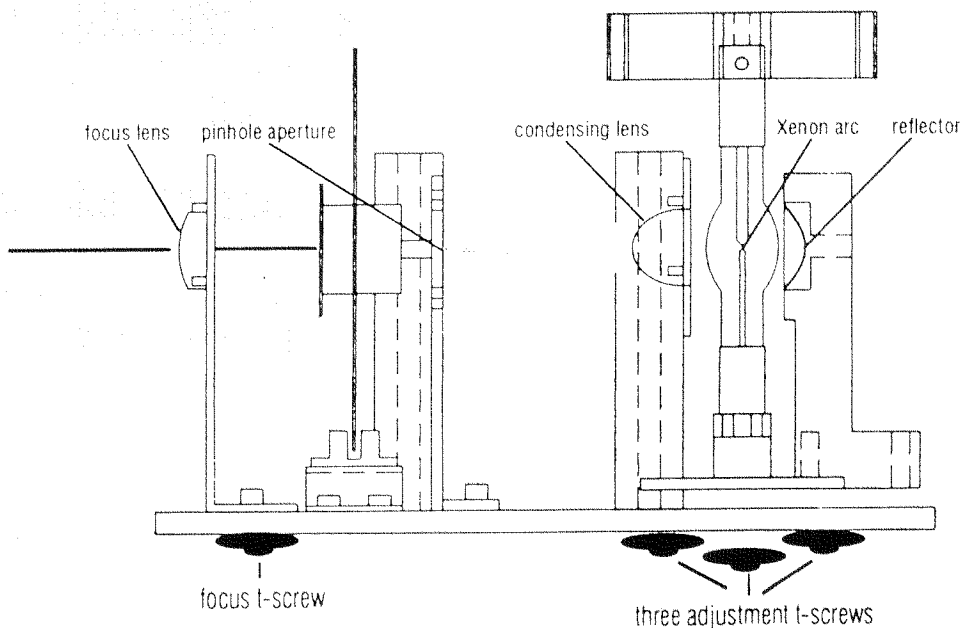
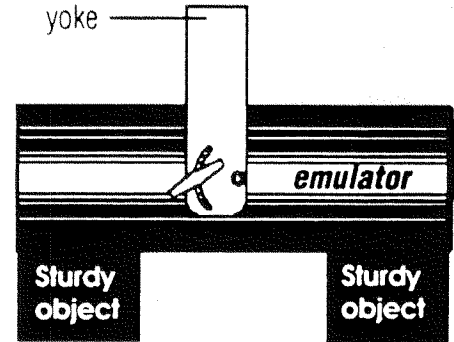


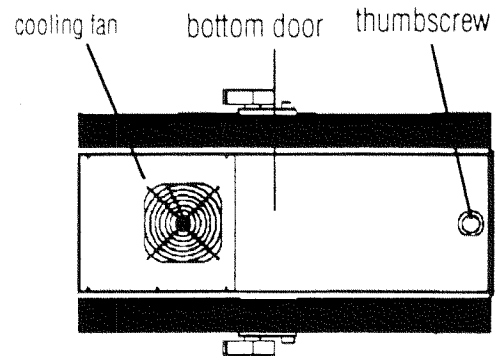
Figure 2.9 Side View Emulator Optics

Optimizing the Emulator Fixture

1. Before optimizing the Emulator fixture, you should have already installed the xenon lamp. If you have not installed the xenon lamp, you need to do so now. Refer back to the section of the manual titled "Installing the xenon lamp." (See pages 5-6.)
2. Be sure that the top door is secured by checking the tightness of the thumb-screw. **Never remove the top door when the lamp is on.**
3. Place the Emulator fixture near an electrical outlet or power supply.
4. Suspend the Emulator fixture from its *yoke* (See Fig. 2.10) where it will be used; or prop the fixture up on 2 sturdy objects, one at each end of the fixture, leaving enough room so that you can easily remove the bottom door and have access to the underside of the fixture. (As shown in Fig. 2.10) **Be careful not to block the cooling fan** (See Fig. 2.11) if you are propping the fixture up rather than hanging it.
5. Plug the fixture in.
6. Position the fixture so that the front of the unit is facing a white or neutral-colored wall or object which is close enough to you so that you will be able to see the output of the lamp clearly. You will need to rough focus the output of the Emulator on a wall or object that will allow you to immediately see the effects of your fine-adjustments. You will have to refocus the fixture after optimization.



**Figure 2.10 Emulator Fixture:
Side View**



**Figure 2.11 Emulator Fixture:
Bottom Door View**

7. Locate the *personality DIP switches* on the rear panel of the fixture. (See Fig. 2.12) Put the fixture in 'Set Up' mode by pushing personality DIP switch # 2 to the 'on' (up) position. All of the other personality DIP switches need to be in the 'off' (down) position. (See Fig. 2.12)
8. Remove the bottom door by loosening the thumbscrew and sliding the door off.

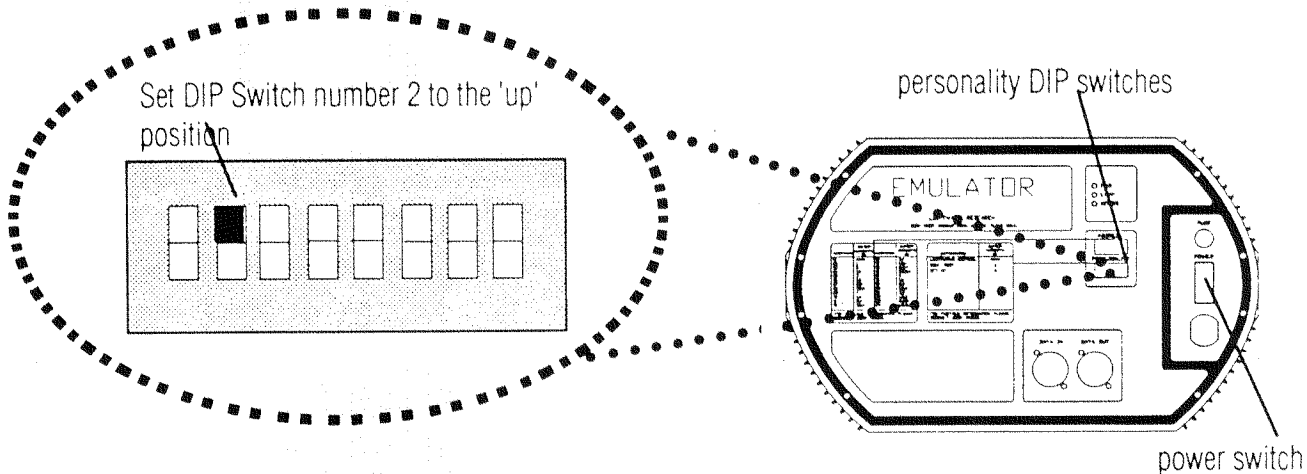


Figure 2.12 Emulator Fixture: Rear View

9. Locate the *power switch* on the rear panel of the fixture between the power cord and the fuse. (See Fig. 2.12)
10. Turn the fixture on by pressing the power switch.
11. Locate the *three adjustment t-screws* on the underside of the fixture beneath the lamp base. (See Fig. 2.13)

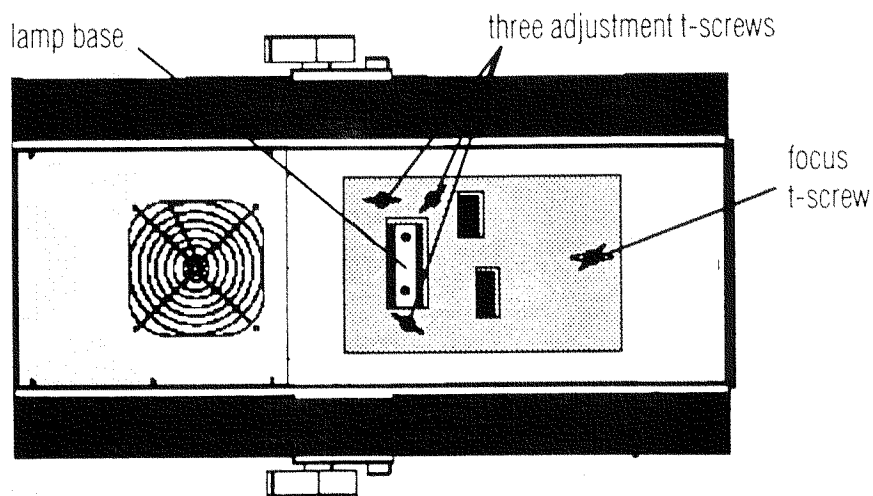
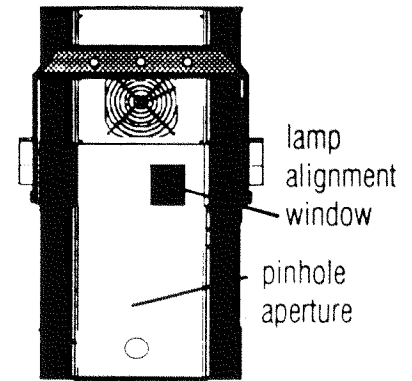


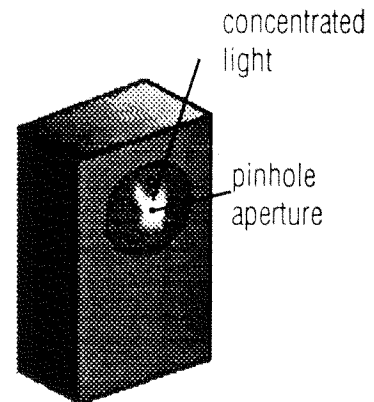
Figure 2.13 Emulator Fixture: Underside with Bottom door removed

12. Look down into the *lamp alignment window* towards the *pinhole aperture*. (towards the front end of the fixture)
(See Fig. 2.14)
13. While looking down into the lamp alignment window, turn each of the adjustment t-screws, noting how they affect the light shining on the pinhole aperture. You will notice that the adjustment t-screws are interactive, in that when one is adjusted, it changes how the other two behave.



**Figure 2.14 Emulator Fixture:
Top view with Top door in place**

14. You need to adjust these t-screws until you get the smallest, brightest, most concentrated point of light over the pinhole aperture.
15. The results of a good optimization process should look similar to the illustration at the right. (See Fig. 2.15) The brightest point of light should be directly over the pinhole aperture.

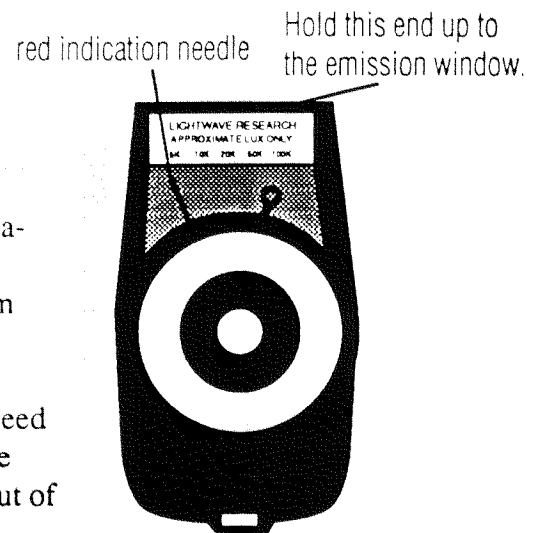


**Figure 2.15 Proper appearance of the
pinhole aperture after optimization**

16. After the light inside the fixture is concentrated on the pinhole aperture, look at the light beam hitting the wall or object where you focused it. It should be strong and even across the beam. Watch the circle of light as you turn the three adjustment t-screws to get the strongest and most even beam possible.

17. Use the light meter supplied with the Emulator controller (See Fig. 2.16) or your own light meter to get the maximum output from the fixture.

- On the supplied light meter, you only need to look at the *red indication needle* (See Fig. 2.16) to see the change in the output of the fixture. **No adjustments need to be made to any of the dials on the light meter itself.**



**Figure 2.16 L-158 Supplied Light Meter
(readings are given in approximate lux only)**

- Holding the light meter to the *emission window*, at the front of the fixture (See Fig. 2.17), note the reading shown by the red indication needle on the meter. Slowly slide the meter up and down and left and right on the emission window until you locate the brightest point of light. Carefully fine-adjust the three adjustment t-screws to get the highest possible reading on the meter.

18. Locate the *focus t-screw* on the underside of the fixture towards the front of the unit. (See Fig. 2.18)

19. Turn the focus t-screw while watching the circle of light emitted from the fixture. Adjust the focus t-screw until the circle of light has a sharp edge.

- If you have focused the fixture on a wall or object that is near to you for ease of viewing during optimization, it will need to be re-focused for the desired effect (floor viewing, screen viewing, aerial viewing, etc.) when it is hung for use in your operation.
- After you hang the fixture for use in your operation:
 - For aerial viewing, the beam needs to be focused so that it appears ‘in focus’ to the viewer. This procedure will require two people, one to focus the fixture and one to stand in the place of the viewer. The viewer will give directions to the focuser for adjusting the focus of the beam. The beam will not be focused directly on the viewer, but at some point between the fixture and the viewer which makes **the majority** of the beam appear to be aurally ‘in focus’ to the viewer.
 - For floor or screen viewing, position the beam at an average throw distance (in between the farthest and nearest point where it will be viewed) and adjust the focus t-screw until the circle of light is strong and even across the beam and has a sharp edge.
- The fixture should be re-focused, using the focus t-screw, each time it is moved.

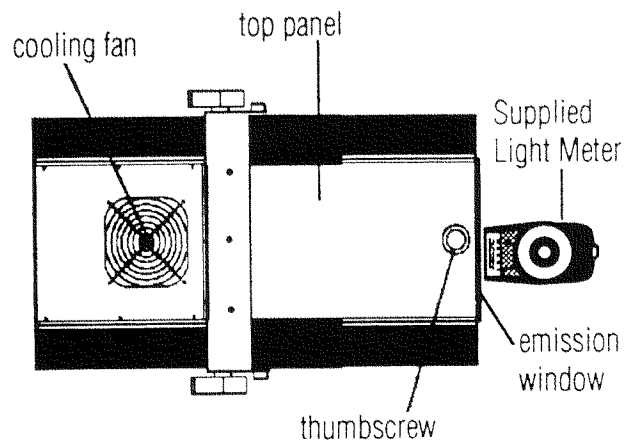


Figure 2.17 Emulator Fixture: Top View; How to Position the Light Meter to check the output of the fixture

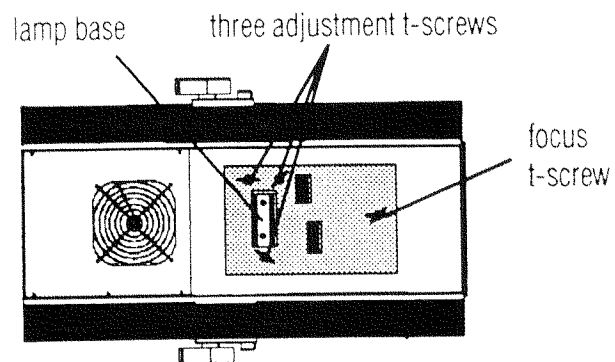


Figure 2.18 Emulator Fixture: Underside with Bottom door removed

20. You have successfully optimized the fixture when:

- you have gotten the highest possible reading from the light meter,
- you have centered the brightest point of light over the pinhole aperture and
- when the circle of light emitted from the fixture has a sharp edge and is strong and even across the beam.

Personality DIP Switches

You will find an 8-position DIP switch labeled "PERSONALITY" located on both the rear panel of the fixture and on the rear panel of the controller. These switches change the operating mode of the fixture and the controller. They are used for testing, set up, and control of specialized parameters.

Setting the Fixture Personality DIP Switches

The purpose of the Personality DIP switch on the rear of the fixture is to configure it for specific requirements. By turning particular switches on or off, the fixture will respond in different ways. **NOTE:** A switch is "on" in the up position and "off" in the down position.

No Switches On : Normal Mode

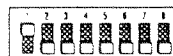
Personality DIP Switch



All switches in the "off" position, the fixture operates in a normal manner under the control of the Lightwave Research Emulator controller.

Switch # 1 : Self-Test

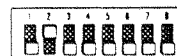
Personality DIP Switch



Switch number one activates the built-in self testing function. When it is in the "on" position, an internal self-diagnostic routine that tests each function of the fixture is activated. A fixture which uses Software Version 3.0 or later will display the software version number at the beginning of the self-test. In normal operation, switch number one must be in the "off" position. **Note:** Switch number 1 on the fixture (Self Test Mode) overrides the functions of the controller. Switch number 1 on the fixture (Self Test Mode) also overrides Switch number 2 on the fixture (Set Up Mode.)

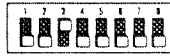
Switch # 2 : Set-up Mode

Personality DIP Switch



Switch number two pertains to setting up and adjusting the lamp after installation. When it is in the "on" position, the lamp will ignite. This allows you to adjust and focus (optimize) the lamp without the fixture being connected to a controller. It is very important to optimize the lamp before operating the fixture. An un-optimized lamp can greatly reduce the light output of the fixture. In normal operation, switch number two must be in the "off" position. **Note:** Switch number 2 on the fixture (Set-up Mode) overrides the functions of the controller.

Personality DIP Switch



Switch #3 : High Mode

Switch number three puts the fixture in high mode.

Note: Before the fixture is switched to high mode, the lamp must be allowed to warm up properly. The software installed in the fixture does not allow high mode to be used until the lamp has been on for two minutes. If high mode is selected before the lamp has been on for two minutes, the fixture will wait until the two minutes has elapsed then the high mode will be engaged automatically.

In high mode, the fixture will emit light 40% brighter than in normal mode. Using the fixture in high mode shortens lamp life from approximately 650 hours (normal mode) to approximately 250 hours. However, the Emulator fixture is designed to prolong the life of the lamp for as long as possible when it is in high mode by automatically returning the fixture to normal mode when the shutter is closed. Therefore, if you run the fixture in high mode with the shutter closed for some of the time that the fixture is on, you may extend your lamp life beyond the average 250 hours predicted for a lamp run in high mode with the shutter open constantly.

Personality DIP Switch



Switch #4 : Horizontal Mirror Image

On a fixture which uses Software Version 3.32 or later, turning switch number four on causes the fixture to produce a horizontal mirror image of the normal scan patterns. For example, if you are programming a fixture to display an alphanumeric pattern, in this case, an 'R', turning on DIP switch number 4 will cause the pattern to display this pattern's horizontal mirror image. (See Fig. 2.18) Some patterns, such as a circle, will not be affected by turning on switch number four.

- To test the effect of DIP switch #4, turn on DIP switch #4, then run a fixture self-test by turning on DIP switch #1. The letters and numbers that show the current software version should be reversed as shown in Figure 2.19.



Figure 2.19 Horizontal Mirror Image Display

Personality DIP Switch



Switch #5 : Vertical Mirror Image

On a fixture which uses Software Version 3.32 or later, turning switch number five on causes the fixture to produce a vertical mirror image of the normal scan patterns. For example, if you are programming a fixture to display an alphanumeric pattern, in this case, an R, turning on DIP switch number 5 will cause the pattern to display this pattern's vertical mirror image. (See Fig. 2.19) Some patterns, such as a circle, will not be affected by turning on switch number 5.

- To test the effect of DIP switch #5, turn on DIP switch #5, then run a fixture self-test by turning on DIP switch #1. The letters and numbers that show the current software version should be inverted as shown in figure 2.19.



Figure 2.20 Vertical Mirror Image Display

Switches #6, #7 & #8 : No Effect

Switches 6, 7 and 8 have no function assigned to them at this time. However, these switches provide for future expandability of the fixture features.

Setting the Controller Personality DIP Switches

The purpose of the eight-position Personality DIP switch on the rear of the controller is to configure it for specific requirements. By turning particular switches on or off, the controller will respond in different ways.

NOTE: A switch is "on" in the up position and "off" in the down position.

No Switches On : Normal Mode

Personality DIP Switch



All switches in the "off" position, the controller operates in a normal manner.

Switch # 1 : Master/Slave Mode

Personality DIP Switch



Switch number one pertains to the Master/Slave capability of the controller. The system is expandable beyond the first twenty-four addresses by linking multiple controllers together via the Master/Slave ports.

- When switch number one is "off," the controller functions normally in **Master Mode**. All front panel keys will function normally. When a controller is in Master Mode, it dictates the mode of playback for all controllers that are slaved to it.
- Turning switch number one "on" puts the controller in **Slave Mode**. In Slave Mode, the controller can be connected to and run by another controller via the 6 mm (1/4 in.) stereo plug located on the rear panel of the controller.

The slaved controller will retain the programming and editing functions, but will not play back any programs. All Standby, Advance and Modulate settings of the Slaved controller will be determined by the Master controller. The only accessible function keys on the Slaved controllers are Power, Home, Select, Record, Standby and Erase. If any other function keys on the Slaved controller are pressed, "SL" will be displayed in the [L.E.D.] Window.

Switch #2 : Time Base

Personality DIP Switch

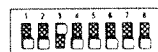


Switch number two allows the controller to operate at either 50 or 60 Hertz.

- When switch number 2 is "off" the controller operates at 60 Hertz.
- When switch number 2 is "on" the controller operates at 50 Hertz.

Switch #3 : Analog Input Access Mode - Page Access or Preset Level

Personality DIP Switch



Switch number three sets up the controller to respond to the Remote Analog Access port by accessing either a controller's pages or presets.

- When switch number three is "off," the controller is in Page Access Mode. (See page 59 for further details.) In Page Access Mode, the Remote Analog Access port will access the **pages** in the controller's selected memory.
- When switch number three is "on," the controller is in Preset Level Mode. (See page 61 for further details.) In Preset Level Mode, the Remote Analog Access port will shift the controller to different preset levels.

Switch #4 : No Effect

Switch number four is reserved for future use. It has no effect on the controller's mode whether it is in the "on" or "off" position.

Switch #5 : Binary Analog Access

Personality DIP Switch



When switch number five is "on," the controller accesses preset numbers in a binary fashion. It uses the first ten analog input channels in binary combinations to provide remote access to 1023 different presets. The remaining two analog input channels control Blackout and Standby respectively. Channel eleven puts the controller in Blackout mode. Blackout closes the fixtures' shutters but leaves everything else running as is. Channel twelve functions just like the Standby key on the controller. If the controller is in Standby, channel 12 will take it out of Standby. The fixtures will go back to doing whatever they were doing before.

Switch #6 : Club Mode or Touring Mode

Personality DIP Switch



- When switch number six is "off," the controller is in Club Mode. In Club Mode, the master dimming function is predetermined by how it has been set in the Presets. The master dimming setting of the Master controller determines the master dimming settings of the Slave controllers. All of the Advance functions of the Slave controllers are determined by the Master controller's Advance setting.
- When switch number six is "on," the controller is in Touring Mode. In Touring Mode, the master dimming function is independent of the presets. All Slave controllers and the Master controller have independent master dimming controls. The Audio Modulate functions of each Slave controller are independent per controller. All Advance functions are controlled by the Master controller.

Switches #7 & #8 : No Effect

Switch numbers seven and eight are reserved for future use. They have no effect on the controller's mode whether they are "on" or "off."

Fixture Address DIP Switches

These switches assign an Address number to each fixture corresponding to an Address number on the controller's Address/Preset keypad. (See Fig. 2.21)

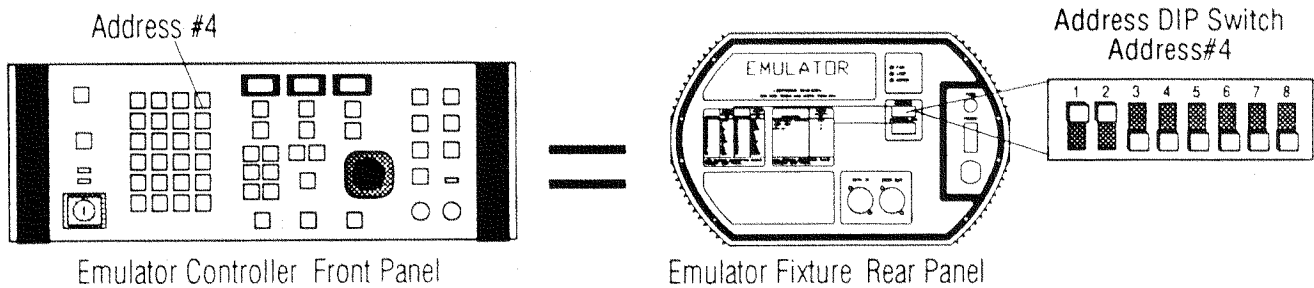


Figure 2.21 Controller Address Key & Corresponding Fixture Address DIP Switch Setting

An Address Table is silkscreened on the back of the fixture which shows the DIP switch settings for twenty-four addresses. The Fixture Address DIP Switch Setting Table is also shown below. (See Table 2.1)

ADDRESS #	DIP SWITCH SETTING
01	none
02	1
03	2
04	1,2
05	3
06	1,3
07	2,3
08	1,2,3
09	4
10	1,4
11	2,4
12	1,2,4
13	3,4
14	1,3,4
15	2,3,4
16	1,2,3,4
17	5
18	1,5
19	2,5
20	1,2,5
21	3,5
22	1,3,5
23	2,3,5
24	1,2,3,5

Table 2.1 Fixture Address DIP Switch Setting

Data Cable Connections: General Information

Both the Emulator fixture and controller require standard 3-pin XLR connectors for data input and data output. The data cables should be constructed using shielded, two-conductor cable with a male 3-pin XLR connector on one end and a female 3-pin XLR connector on the other end. Pin 1 is the shield, Pin 2 is the data compliment (negative), and Pin 3 is the data true (positive.)

Microphone cables will work if the pin connections are correct (the same as described above). You should have constructed or purchased all of your cables (one cable for each fixture), as described in Section 1 of this manual, before you attempt to set up the Emulator System.

The *data link out* connection on the Emulator controller is a female connection. It is located on the rear panel of the controller in the bottom left corner. (See Fig. 2.22)

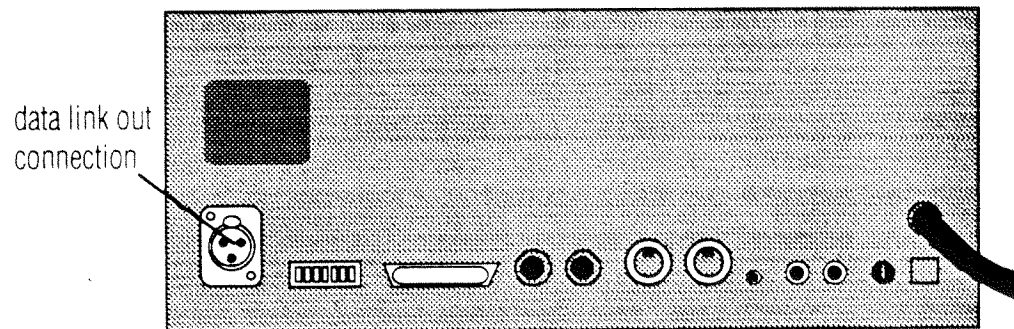


Figure 2.22 Rear Panel of the Emulator Controller

The *data in* connection on the Emulator fixture is a male connection. It is located on the rear panel of the fixture near the bottom center of the panel. (See Fig. 2.22)

The *data out* connection on the Emulator fixture is a female connection. It is located on the rear panel of the fixture near the bottom center of the panel to the right of the *data in* (male) connection. (See Fig. 2.23)

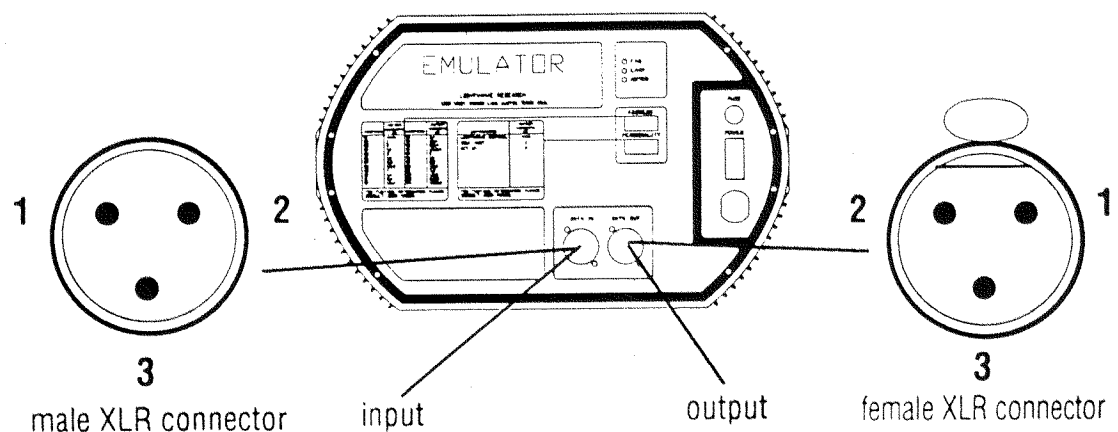


Figure 2.23 Rear Panel of the Emulator Fixture

Connecting the Data Cables

You will need . . .

- *one data cable for each fixture*

1. Plug the male end of a data cable into the *data link out* connection on the rear panel of the controller. (See Fig. 2.23)
2. Plug the female end of that data cable into the *data in* (male) connection of the first fixture. (See Fig. 2.23)
3. If you are attaching 24 or less fixtures to one controller, the easiest way to string the fixtures together is to use the *daisy chain method*. (See Fig. 2.24)

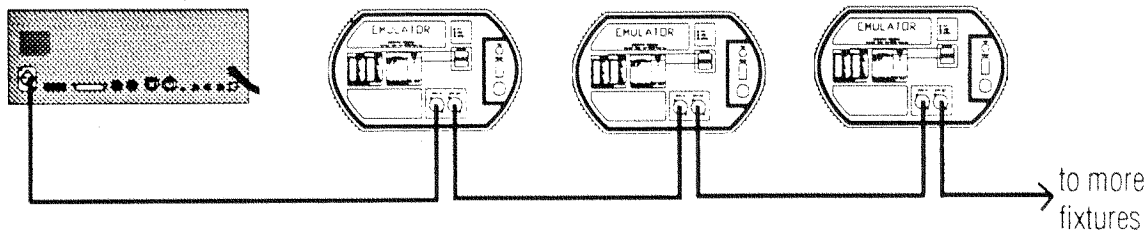


Figure 2.24 Emulator Data Cable Connections - Daisy Chain Method

The *daisy chain method* involves connecting the first fixture to the controller (as in steps 1 and 2 above) then simply connecting the *data out* connection (female XLR) of the first fixture to the *data in* connection (male XLR) of the second fixture. Then connect each successive fixture in the same manner in which you connected fixture one to fixture two.

These cables may also be run in parallel at any point, although the daisy-chain method is easier to troubleshoot, and it insures proper signal strength for larger systems. The cables can only run parallel (or "Y") two times before signal loss occurs.

A Lightwave Research Serial Data Distributor may be used to split the data signal up to six ways. The single-unit rack-mountable distributor is an active signal splitter. It is commonly used in situations where a group or groups of instruments are separated by a long distance. (See Fig. 2.25)

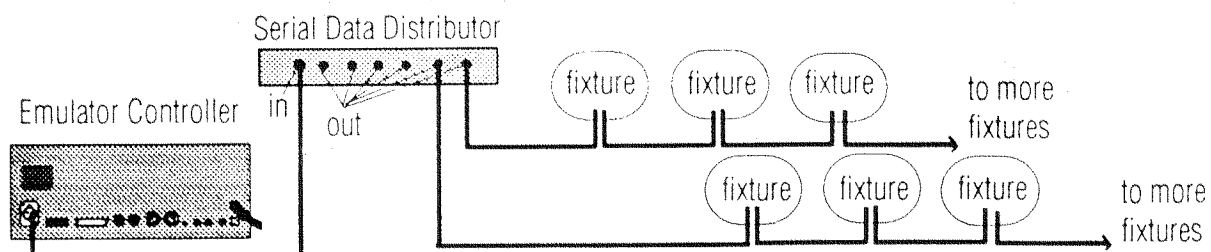


Figure 2.25 Emulator Data Cable Connections - Serial Data Distributor

Master/Slave Configuration

Twenty-four Addresses are available on a Lightwave Research Emulator controller which will control twenty-four fixtures or twenty-four sets of fixtures. If several fixtures are assigned to the same Address, they will all share the same parameters (color, scale, angle, gate, scan, speed, program, and delay) and they will all move in response to the joystick when their Address is Selected.

An Emulator system can be expanded practically infinitely by *slaving* any number of controllers together. When controllers are *slaved*, one controller, called the Master controller controls the mode of playback of all of the slaved controllers. The Slave controllers are programmed separately in the normal manner, but their mode of playback is dictated by the Master controller.

Many controllers can be slaved together to include any multiple of twenty-four increments of control, each fixture or set of fixtures would be Addressed 1-24 corresponding to the Address/Preset keypad of each controller. (See Fig. 2.26)

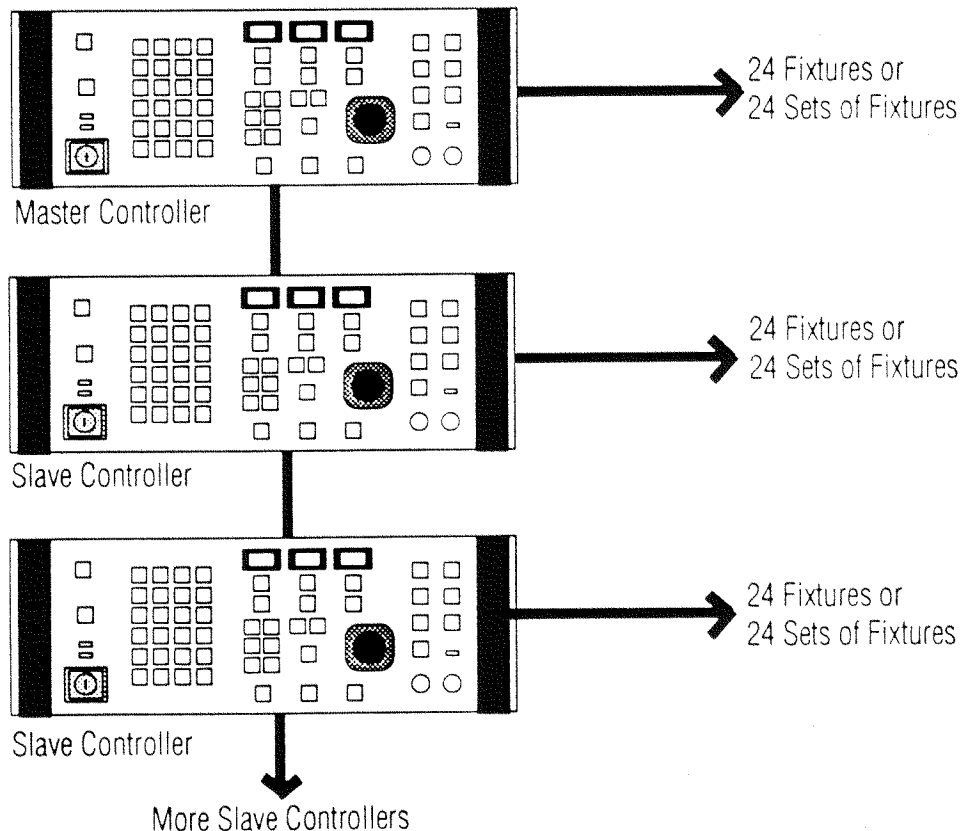


Figure 2.26 Slaved Controllers

To put a controller in Slave Mode, set Personality DIP switch number one on the rear panel of the controller to the "on" or up position.

The Slaved controllers will retain their programming and editing functions, but will not play back any programs. All Standby, Advance and Modulate settings of the Slaved controllers will be determined by the Master controller.

The only accessible function keys on the Slaved controllers are Power, Home, Select, Record, Standby and Erase. If any other function keys on the Slaved controllers are pressed, "SL" will be displayed in their Construct display windows.

Run a cable (with a 6 mm (1/4 in) stereo connector on each end) from the Master controller's Master (out) jack located on the rear panel to the Slave controller's Slave (in) jack. To slave more than one controller to a single Master controller, continue running cables from one controller to the next, as previously described, in a daisy chain fashion. (See Fig. 2.27)

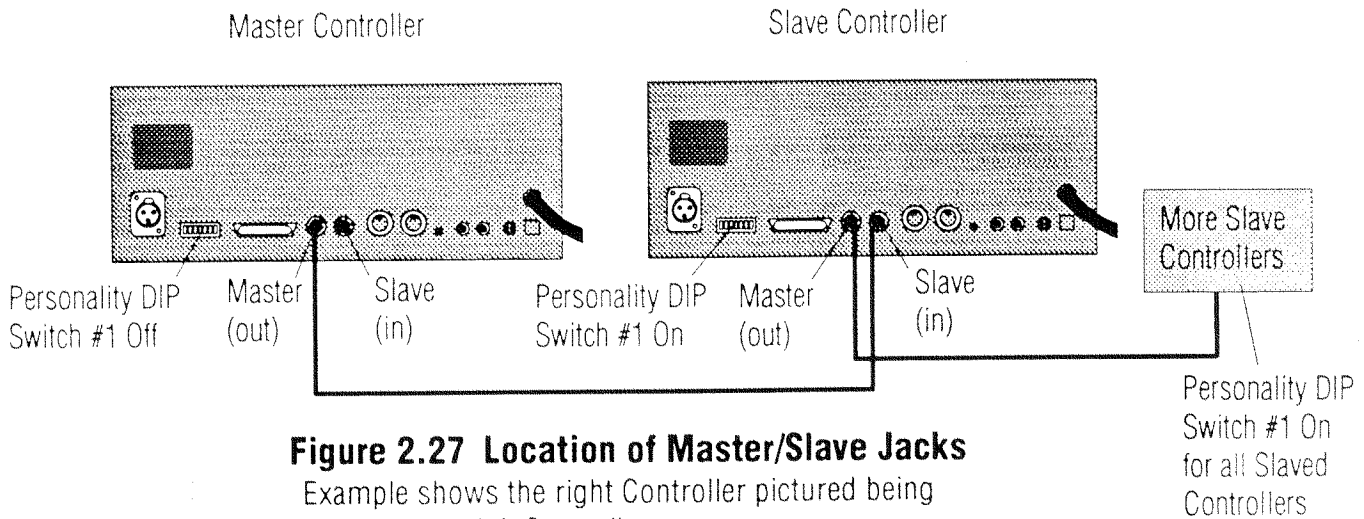
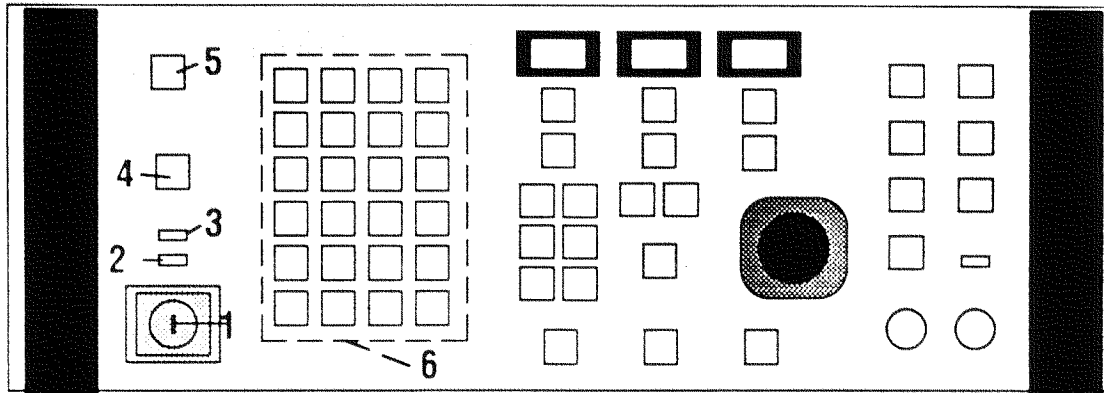


Figure 2.27 Location of Master/Slave Jacks

Example shows the right Controller pictured being slaved by the left Controller.

SECTION 3

CONTROLLER DESCRIPTION



Emulator Controller: Front Panel

1. POWER KEYSWITCH

activates controller power and enables fixtures. The key-type switch provides protection from unauthorized users.

2. SLAVE MODE INDICATOR LED

displays mode of controller set by the personality DIP switch located on the rear panel of the controller. When DIP switch #1 is on (up) the controller is in slave mode.

3. MASTER MODE INDICATOR LED

displays mode of controller set by the personality dip switch located on the rear panel of the controller. When DIP #1 switch is off (down) the controller is in master mode.

4. STANDBY KEY

closes the light Gates of all connected fixtures. The controller will default to Standby Mode when it is initially powered up. Depressing and holding this key while powering up will display the current EPROM version number.

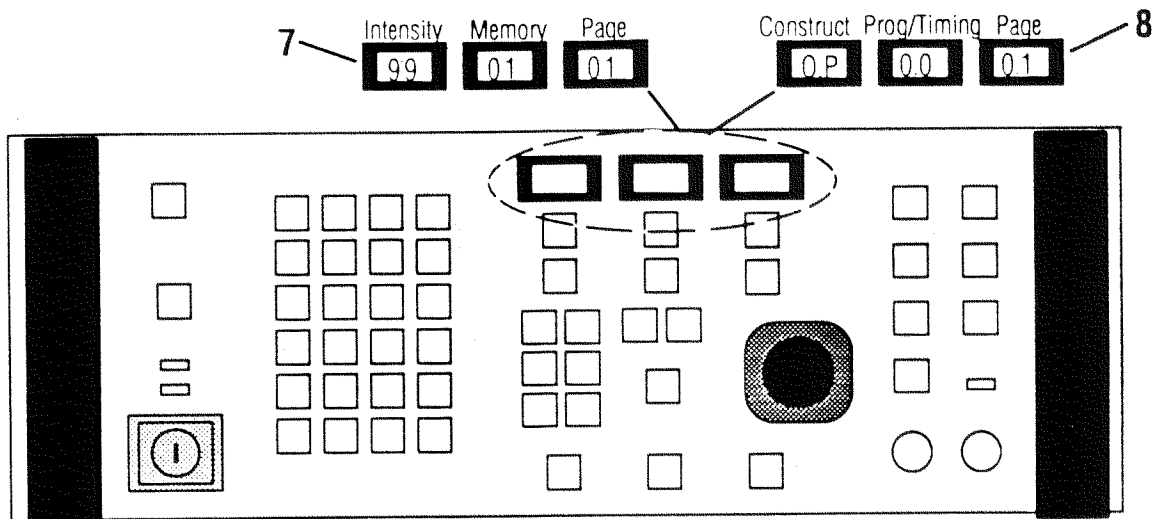
5. ADDRESS/PRESET SELECT KEY

toggles the Address/Preset keys between the Address and Preset modes, lighting the corresponding LED to indicate the selection.

6. ADDRESS/PRESET NUMBERS

provide visual confirmation of active Addresses and Presets.

- In Address mode, (the default) the keys correspond to the 24 fixture Addresses. The twenty-four Address keys can be used to Select an Address for programming, editing, or the viewing of parameters.
- When switched to the Preset mode, the keys correspond to the 24 individual front panel Presets. Each preset is capable of storing a single Page or a loop of pages (up to 99 consecutive pages) within a memory for instant recall.



Emulator Controller: Front Panel

7. I.M.P. DISPLAY WINDOWS

consist of Intensity, Memory, and Page information indicated by decimal points at the top of the displays. I.M.P. values are adjusted with the up / down keys located below each display.

INTENSITY

is the current intensity setting for all Addresses. In this mode, it is used as a dimming function. Value "00" represents completely closed and "99" represents full open. This control functions as the master dim level.

MEMORY

shows the number of the current Memory (1-9). Use the up/down arrow keys below this display window to change the memory number.

PAGE

shows the current Page number (1-99). A Page contains the values of the programmed Addresses.

8. C.T.P. DISPLAY WINDOWS

consist of Construct, Program/Timing, and Page information, indicated by decimal points at the bottom of the displays. The decimal points move to the bottom when Select and an Address key are depressed. When an Address key alone is depressed the display shows the current parameter settings of that Address.

CONSTRUCT

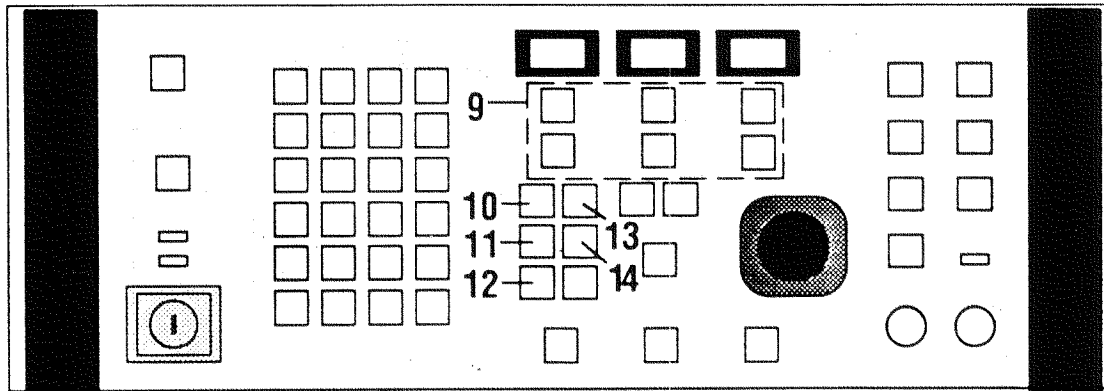
displays the current parameters for each Address. (color, scale, angle, gate, scan, and speed)

PROGRAM/TIMING

shows the current Program settings and Delay times for a Page. Each individual address can have a different program, however, the Delay time is the same for all addresses on a page.

PAGE

displays the current Page number being programmed.



Emulator Controller: Front Panel

9. UP \ DOWN KEYS

are used to adjust the various parameters. These keys will repeat and accelerate to their limits if held. Special functions are located past these limits for Construct parameters. All settings will wrap-around in either direction.

10. COLOR KEY

enables the selection of one of twelve colors or the one of the eight forward (F1-F8) or eight reverse (A1-A8) rotational speeds of the color wheel for each Address on a Page. The Color parameter is the default whenever the C.T.P. mode is accessed (i.e. when an Address key is depressed or when an Address key and the Select key are depressed together). The default Color is white.

11. SCALE KEY

determines the size of the scan pattern for each address on a page. Value 0.1 is the smallest, tightest scan. Value 0.2 is exactly double the size of 0.1. (0.2 = 2x, 0.3 = 3x, . . . 1.2 = 12x) Scale size defaults to 12 if the page has never been programmed.

12. ANGLE KEY

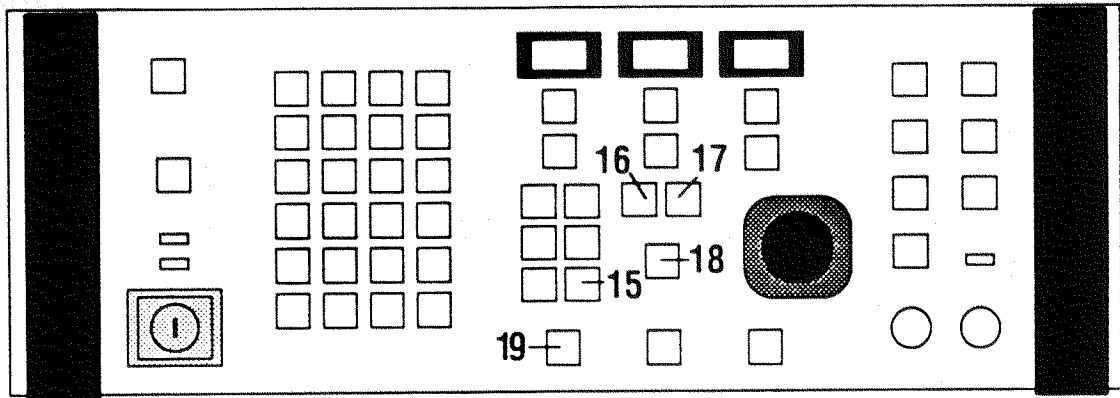
determines the rotation of a scan pattern, with the axis being the center of the scan. Value 0.0 leaves the scan unaffected, and values of 0.1-8.9 incrementally turn the scan clockwise (in 4° increments). After the static angle variations, there are eight clockwise pattern rotation speeds (F1-F8) and eight counterclockwise speeds (A1-A8).

13. GATE KEY

enables the selection of the light Gate. The gate can be: open (OP), closed (CL) or strobing at variable speeds (S1-S8.) Gate defaults to closed if a Page has never been programmed.

14. SCAN KEY

enables the selection of a scanning speed for each Address on a Page from 0.1 to 1.2. Some Programs will not be affected by this setting, on the other hand, some Programs (scan patterns) are dramatically changed by this setting. Default scanning speed is 0.1.



Emulator Controller: Front Panel

15. SPEED KEY

determines the movement speed of individual Address on a page. The Speed setting determines how long it takes for a fixture (Address) to reach its programmed position on a page. Value (0.0) is the slowest movement, and value (9.9) is the fastest movement. All fixtures that are set to the same speed will arrive at their positions simultaneously.

16. PROGRAM KEY

enables the selection of one of 99 different beam (scan) patterns assignable to individual Addresses. These patterns can be positioned with the joystick and modified by changing the parameters (color, scale, angle, gate, scan and speed) to create a wide variety of different looks from each program setting. The default is Program 0.1.

17. DELAY KEY

enables the setting of a delay (from 0.1 to 99 seconds or infinite hold). When playing back a programmed loop using the auto advance mode, the delay setting determines the amount of time the current page is displayed before the next Page is displayed. The hold function is located after 99 seconds. H.O holds a page infinitely until page up arrow key is pressed). The default delay setting is 0.0 seconds, no delay.

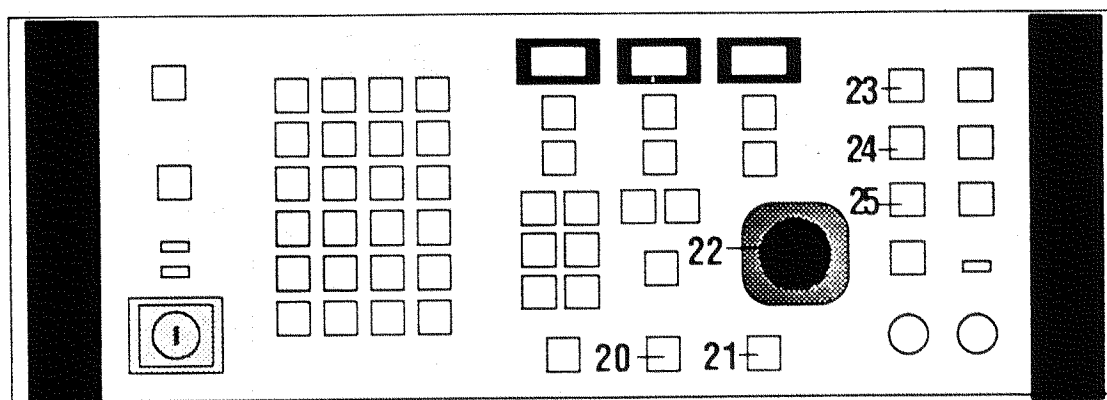
18. HOME KEY

allows a fixture or several fixtures and their color wheels, gates, and scanners to be returned to their Home positions at any time with the light Gate closed. All fixtures are Homed each time the controller is switched on. Homing will also strike a fixture's lamp if it did not strike upon initial start-up.

- Depress the Home key. The Home key will flash for 10 seconds during which time any number of Address keys can be pressed (selected to be homed). The Home and Address LEDs will flash for 10 seconds during the homing procedure and then turn off. Once Homed, the fixtures will then join the sequence running and open their light Gates.

19. SELECT KEY

allows you to choose an Address that you want to modify and/or store. It is also used to select a Page or a loop of pages in a Memory to be stored as a Preset.



Emulator Controller: Front Panel

20. RECORD KEY

stores the new settings for a chosen Address or Preset. It is also used to download a controller's memory to a personal computer or to copy its memory to another controller.

21. ERASE KEY

is used for editing, for the removal of programming from a Memory, and for the creation of Non-initialized Pages. Non-initialized Pages are used in creating a Page looping sequence. (See Section 4 of this manual.) This key is also used to upload memory from a personal computer or another controller. (See Section 6 of this manual.)

22. JOYSTICK

is used to position the scanning beam of an Address for Recording or for manual control of a beam. The farther the joystick is moved off its center axis, the farther and faster the beam will move. A slight tap on the joystick will produce a similar small movement of the beam. If it is moved a small amount in any direction, the beam will move slowly until the joystick is released.

ADVANCE SECTION -

Selects the method of sequencing a Memory's Pages

23. RANDOM ADVANCE

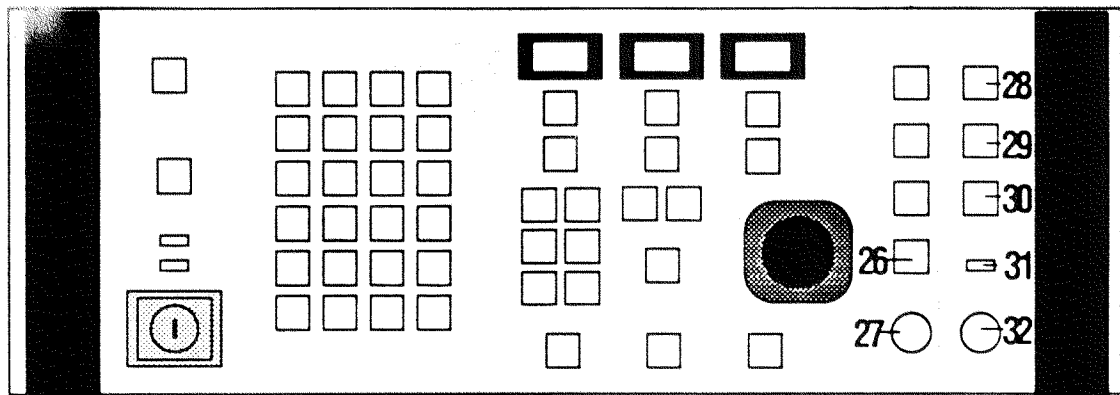
is a mode that modifies the other Advance modes by sequencing the Pages Randomly.

24. AUDIO 1 ADVANCE

is a mode that changes Pages with the beat of the audio input and ignores any programmed Delay settings. Sensitivity to the audio input is regulated by the Audio knob. When the knob is turned all the way to the right it is most sensitive to the audio input, all the way to the left it is the least sensitive to the audio input.

25. AUDIO 2 ADVANCE

is a mode that halts the changing of Pages with the beat of the audio input and ignores any programmed Delay settings. The sensitivity to the audio input is regulated by the Audio knob. When the knob is turned all the way to the right it is most sensitive to the audio input, all the way to the left it is the least sensitive to the audio input.



Emulator Controller: Front Panel

26. AUTO ADVANCE

changes Pages based on the speed set by the Rate Knob below it. However, programmed delays are completed before Page advancement regardless of the Rate setting (set by the Rate Knob #27.)

27. RATE KNOB

regulates the speed of Page change in Auto mode from about .025 seconds (extremely fast) to about 2.5 seconds. It also regulates page advance rate in Audio 1 and 2 modes. If the knob is turned completely clockwise, Page change is the quickest, if no delays have been programmed. When a delay is encountered, the knob's time setting is added to the delay time.

MODULATE SECTION -

Overrides and changes the parameter settings of all active fixtures with the audio signal.

28. COLOR MODULATE

instructs all active fixtures to begin changing Colors from their current settings with the beat of the audio input.

29. SIZE MODULATE

changes size of the pattern with the level of the audio input. (Quiet = small scan, Loud = large scan)

30. CHORUS MODULATE

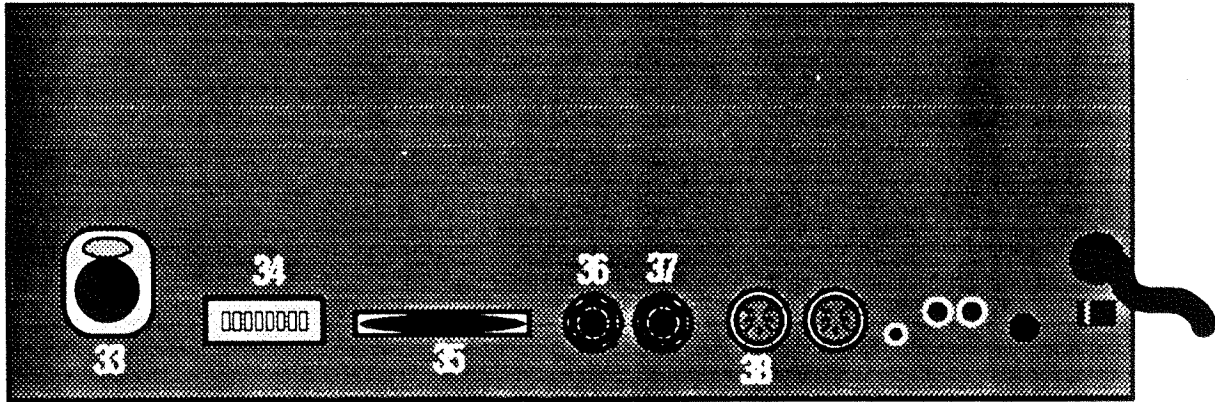
causes all fixtures to follow the position of fixture #1. If the operator uses the inductive joystick, all fixtures will follow the movement of the joystick. When the joystick is released for 3 seconds, all fixtures will go back to following the position of fixture #1.

31. AUDIO LEVEL INDICATOR

indicates the presence and strength of the audio signal.

32. AUDIO KNOB

adjusts the controller's sensitivity to the musical information for Audio Advance and Modulate. When the knob is turned all the way to the right it is most sensitive to the audio input, all the way to the left it is the least sensitive to the audio input.



Emulator Controller: Rear Panel

33. DATA LINK OUT

XLR female jack that provides control signals to all connected fixtures. Pin 1 is shield, Pin 2 is negative (Data Complement), and Pin 3 is positive (Data True).

34. PERSONALITY DIP SWITCHES

set the mode of operation of the controller. To turn a switch on put it in the "up" position. To turn a switch off put it in the "down" position. (For more information about the Personality DIP switches, please refer to Section 1 of this manual.)

- | | |
|--------------------------------------|---|
| Switch #1 - On = Slave Mode | - Off = Master Mode |
| Switch #2 - On = 50 Hertz | - Off = 60 Hertz |
| Switch #3 - On = Preset Level Access | - Off = Page Access |
| Switch #4 - On = No Effect | - Off = No Effect |
| Switch #5 - On = Binary Access | - Off = Preset Level Access |
| | (To use Preset Level Access Switch #3 must be On) |
| Switch #6 - On = Touring Mode | - Off = Club Mode |
| Switch #7 - On = No Effect | - Off = No Effect |
| Switch #8 - On = No Effect | - Off = No Effect |

35. RS-232 SERIAL PORT

is used for transfer of data with computers when using Lightwave Show Control and during external memory backup and retrieval. It operates at 9600 BAUD, 8 data bits, no Parity, 1 stop bit.

36. MASTER OUT

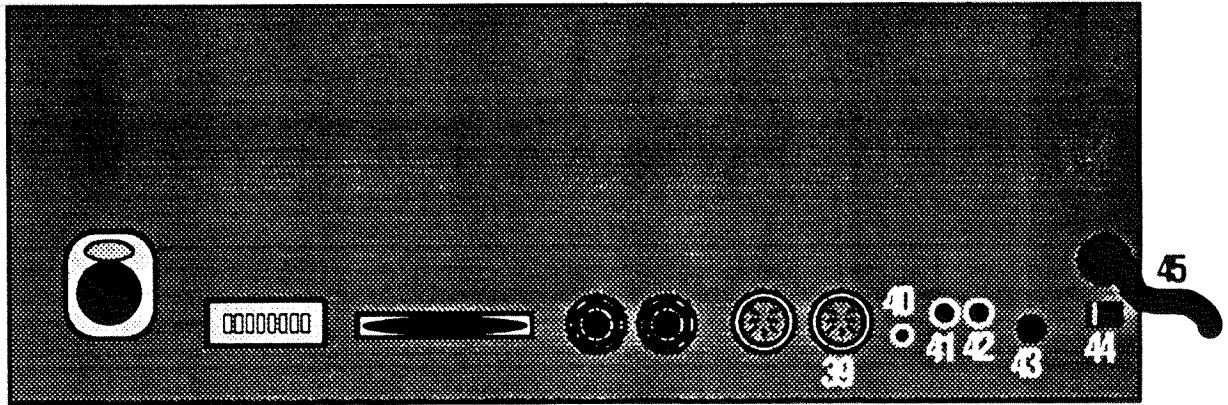
is a 6 mm (1/4 in) stereo jack for linking from a Master controller to a Slave controller.

37. SLAVE IN

is a 6 mm (1/4 in) stereo jack for linking to a Slave controller from a Master controller or from other Slaved controllers.

38. REMOTE PAGE SELECT/ANALOG INPUT CONNECTOR

is a locking 8-pin DIN connector (Channels 1-6) that enables the remote recall of a Memory's Pages or Presets using an analog control device such as a dimmer board or touch panel.



Emulator Controller: Rear Panel

39. REMOTE PAGE SELECT/ANALOG INPUT CONNECTOR

is a locking 8-pin DIN connector (Channels 7-12) that enables the remote recall of a Memory's Pages or Presets using an analog control device such as a dimmer board, touch panel, or rock desk.

40. REMOTE ENABLE

is a 3.5 mm (1/8 in) mini-jack to allow for remote Standby and Enable of a controller.

41. LEFT STEREO/AUDIO INPUT

is an RCA-type phono connector for line-level audio signals.

42. RIGHT STEREO/AUDIO INPUT

is an RCA-type phono connector for line-level audio signals.

43. FUSE

is a 1.5 amp slow blow fuse.

44. VOLTAGE SELECT SWITCH

switches the voltage of the controller from 115 volts to 230 volts.

45. AC LINE CORD

is the mains supply for the controller.

SECTION 4

OPERATING THE SYSTEM

Initial Power-Up

Turning On the Controller

Before you learn how to program the controller, your Emulator Laser Simulator System should be completely and properly set up. You should be familiar with the layout of the front panel of the controller. (See Sections 1, 2, and 3 of this manual) All of the fixtures should be assembled, optimized, tested, hung, and their Personality and Address DIP switches should be set correctly. All of the data cables should be constructed, tested, run, and connected properly. And all of the fixtures and the controller(s) should be connected to appropriate power sources.

- To turn the controller on, insert the controller key and turn the key-switch clockwise. This will cause the Master, Standby, and Address LEDs to light and will enable the controller's self testing function.

CAUTION: DO NOT TOUCH OR MOVE THE JOYSTICK WHEN APPLYING POWER. IT IS BEING INITIALIZED AT ITS REST POSITION. THE CONTROLLER USES THE INITIAL VALUE OF THE COORDINATES OF THE JOYSTICK AS A REFERENCE POINT.

Controller Self-Test

Upon initial power-up, the controller's CPU and memory will perform a brief self-test. As the controller performs its self-test, the three display windows in the center of the controller will show six dashes in the Intensity and Page windows. The Memory window will count up slowly from 01 to 09 and then count up again very quickly. (See Fig. 4.1)

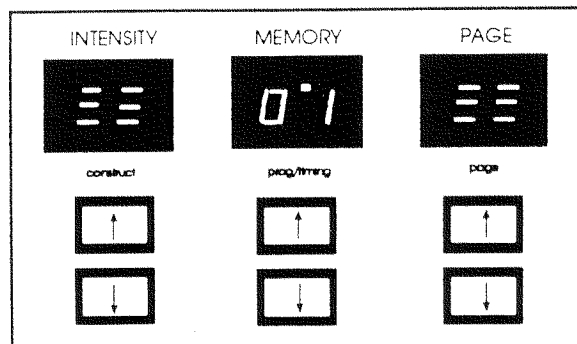


Figure 4.1 I.M.P. Display Self Test

When the self-test is complete, the Display windows will show 99 01 01 indicating that the controller is currently at Intensity level 99, Memory 1, and Page 1. The controller will be in Standby mode.

Homing the Fixtures

Upon initial start-up, the cooling fans will turn on and the fixtures will all *Home*. *Homing* a fixture closes the shutter, strikes the lamp (if it is not already on), turns on the cooling fan, and sets all parameters to their home (default) positions.

Homing allows a fixture or several fixtures and their color wheels, gates, and scanners to be returned to their Home positions at any time with the light Gate closed.

- To home a fixture at any time, press the Home key. The Home key will flash for 10 seconds during which time any number of Address keys can be pressed (selected to be homed). The Home and Address LEDs will flash for 10 seconds during the homing procedure and then turn off. Once Homed, the fixtures will then join the sequence running and open their light Gates.

Programming

The Emulator controller has nine separate Memories, each containing 99 pages. There are a total of 891 total Pages of storage in the controller's memory. Each Page can be programmed individually. A Page (traditionally called a scene) is comprised of the parameters and positions of up to 24 fixture Addresses and their modifications.

Addresses

Twenty-four Addresses are available on a Lightwave Research Emulator Controller which will control twenty-four fixtures or twenty-four sets of fixtures. If several fixtures are assigned to the same Address, they will all share the same parameters (color, scale, angle, gate, scan, speed, program, and delay) and they will all move at the same time in response to the joystick when their Address is selected.

Address Lockout

This feature enables the temporary removal of one or more fixture Addresses from all sequences. This might be necessary in the event of a malfunction or if you want to remove an Address from a Program for a special event or effect. Removing a fixture in this manner requires no reprogramming because no Memory is actually changed.

- Address Lock-out is performed by pressing and holding the Address key of the Address that is to be locked out for 20 seconds.

The LED above the key will begin to flash and then L.O will be displayed in the middle display window.

After an Address has been locked out, anytime that Address key is pressed, L.O will appear to as a reminder that it is locked-out.

Address Unlock

Any locked-out Addresses can be returned to normal operation by repeating the above procedure. All Addresses are returned to their unlocked settings upon power up of the controller.

- Press and hold the locked-out Address key for 20 seconds.

The LED above the key will show L.O. in the middle window. The decimal points will begin to flash and then the settings programmed for that Address will appear in the display windows.

Creating a Page

A Page is comprised of the parameters and positions of up to 24 fixture Addresses and their modifications. A single page can be likened to a 'scene' in traditional lighting desk nomenclature. An individual Page can be as simple as a single fixture, in plain white light, shooting straight out, or as complicated as multiple fixtures with completely different colors and scan patterns pointing everywhere.

These pages can be played back as static scenes, simple chases or very complex chases. No individual chase can be longer than 99 pages. Creating a page can be accomplished easily by using the simple four-step method outlined on the next page.

The Four-Step Method (For Creating a Page)

1. Press Select. (See Fig. 4.2)
2. Select one or more Addresses. (See Fig. 4.2)
3. Set the parameters for the selected Address(es). (See Fig. 4.2)
4. Press Record. (See Fig. 4.2)

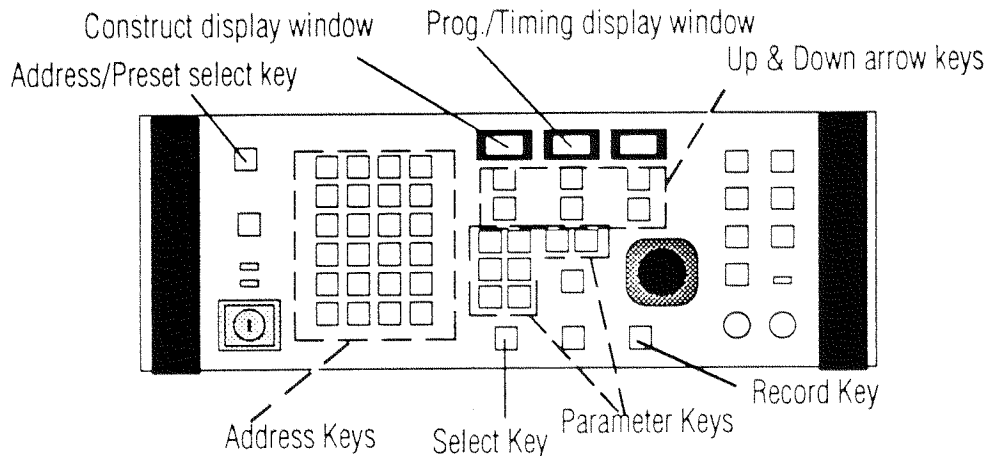


Figure 4.2 The Emulator Controller

To begin Programming, make sure you are in I.M.P. (Intensity, Memory, Page) mode. The decimal points between the numbers in the display windows will be at the top of the display windows. In this mode, you can go to the Memory and Page where you want to begin programming.

If you are not in I.M.P. mode, press the Select key to take you out of C.T.P. (Construct, Program/Timing, Page) mode. This will return you to I.M.P. mode. The Select key toggles the controller between these two modes.

Make sure you are in Address mode. (The light above the Addresskey will be lit, if you are in Address mode.) If you are not in Address mode, press the Address/Preset select key to change the controller to Address mode. The Address/Preset key toggles the controller between these two modes. (See Fig. 4.2)

Use the up/down arrow keys under the Memory and Page display windows to go to a Memory and Page where you want to begin programming.

- **Step #1:** Press the Select key. The Select key LED will start to flash. The controller is now in C.T.P. (Construct, Program/Timing, Page) mode. The displays will go dark until an Address is chosen.
- **Step #2:** Select an Address by pressing the numbered key in the Address/ Preset area of the controller.

If you want to select a block of Addresses, you can do so by pressing the lowest numbered key of the block and the highest numbered key of the block at the same time. (For, example, to select 1 - 8, press keys 1 and 8 at the same time.)

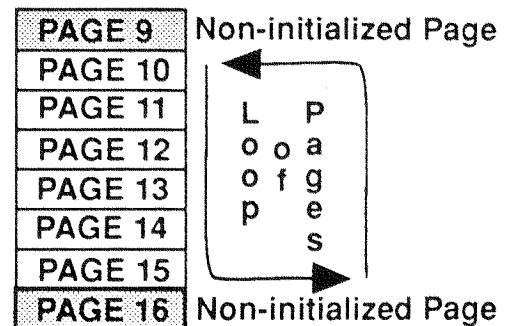
After you have selected the Address or Addresses, the decimals in the display windows will drop to the bottom and the chosen Address's LED will flash with the Select key's LED. The Gate LED in the Construct section and the Delay LED in the Program/Timing section will illuminate. All parameters will be at their default values unless prior programming has occurred.

- **Step #3:** Set the parameters for the selected Address or Addresses. You can set all of the parameters (color, scale, angle, gate, scan, speed, program and delay) for the selected Address(es) by pressing each parameter key and adjusting the setting with the up/down arrow keys under the Construct display window (for color, scale, angle, gate, scan, speed) or Program/Timing display window (for program and delay).
- **Step #4:** Press the Record key to save all of the parameter settings which you have changed.

Creating a Non-Initialized Page

- To create a Loop of pages, a Non-Initialized Page needs to be created. A Non-Initialized Page acts as a 'placeholder' to indicate the beginning or ending of a chase or loop.

The controller's memory automatically places a Non-Initialized 'Page' before Page 1 and after Page 99. However, if you wanted to program a Loop from Page 10 to Page 15, for example, you would need to make Pages 9 and 16 Non-Initialized Pages in order for Pages 10 through 15 to act as a Loop.



Step 1: Go to the Page to be 'Non-Initialized'

Use the up/down arrow keys under the Page display window to go to the Page that you want to define as a Non-Initialized Page.

Step 2: Press Select

Press the Select key. The LED above the Select key will flash, indicating that the controller is now in C.T.P. (Construct, Program/Timing, Page) mode. The intensity and memory indicators will go blank except for a decimal point at the bottom of each display window. The number of the page which you are programming will be displayed in the Page display window.

Step 3: Press Erase

Press the Erase key. C.L will appear in the Construct display window and 0.0 will appear in the Program/Timing display window.

Step 4: Press Erase

Press the Erase key again. Both the Construct display window and the Program/Timing display window will briefly go blank, then the controller will automatically exit out of C.T.P. Mode into I.M.P. Mode.

Position Memory (Preset Focus)

The Emulator controller revision 1.01 or higher has a time-saving function called **position memory** (commonly called "preset focus.") Position memory allows a page to refer to another page for pan and tilt positions. This allows many pages to use the pan and tilt position of another single page. When that one reference page is altered, all pages which refer to it reflect the change. Memory nine is the memory designated as "position memory." All ninety-nine pages of memory nine can be programmed as position reference pages.

The following scenario is a typical example of position memory : A show is designed to have the lights hit specific points on a stage (i.e. lead singer - center and front, drummer - back center stage, keyboard player - stage left.) In memory nine, page one is programmed with all fixtures hitting the lead singer. Since this position is stored in page one of memory nine, it will be referred to as "position number one" or "position one." Similarly, positions two and three for the drummer and keyboard player are programmed into memory nine pages two and three respectively.

A show can be programmed in memories one through eight, or in pages of memory 9 that have not been designated as position reference pages. The positions of the fixtures can now be easily adjusted by position number instead of by joystick movement on each individual page.

Position memory provides for a simple process by which a show can be quickly updated when it moves from one venue to another. At each venue the fixtures may be mounted in different positions and the stage and trusses might be arranged differently. In the above example, only pages one, two, and three of memory nine will need to be changed in order to update the whole show. All pages with positions one, two, and three will be adjusted automatically.

Setting Reference Pages in Memory Nine

- Go to Memory nine.
- Press the Select key.
- Press the Address key(s) for one or more fixtures. (Usually, you will want to set all of the available fixtures to a certain position.)
- Use the joystick to position the fixtures as desired on a reference point (i.e. lead singer - center and front.)
- Press the Record key.

Using the Position of Reference Pages in Memory Nine

- Go to the Memory and Page which you want to program.
- Press the Select key.
- Press the Address key(s) for one or more fixtures which you want to refer to the position of the fixtures on a certain page in memory nine.
- Press the Delay key (or Program key) until the light above it is out. (Both the light above the Delay key and the light above the Program key need to be out.) The display now shows either "JS" for joystick, or 1 through 99 for position numbers.
- Use the up and down arrow keys below the Program/Timing window to adjust the position number or select the joystick.
- Press the Record key.

The fixtures which you selected will automatically copy the position of the fixtures on the reference page in memory nine. Now any time you change the position of the Addresses on the reference pages in Memory nine, the pages which refer to that page for position will also change.

Presets

A Preset is a recording of a programmed Page or sequence of Pages. Presets are provided to allow immediate recall of a programmed page or sequence of pages. Presets store the all of the Parameters, Advance and Modulate Settings that were programmed with a Page or sequence of Pages. The Advance and Modulate Settings can be changed during the Preset recording process. These Settings can also be adjusted during the playback of a Preset. The Audio level is independent of the presets.

The Emulator Controller is capable of storing up to 1,023 Presets using the Remote Analog Access port. In most cases, however, Presets are Selected by Front Panel Access, using the Preset keys. Each Preset can hold either a single Page (a static scene) or a large group of consecutive Pages (a chase or loop) which advances automatically.

Recording A Loop (or Chase)

To record a Loop (Chase) as a Preset, the Loop must be running. That is, the pages must be advancing in auto playback mode or an audio playback mode. A Loop is a group of consecutive pages bounded by a Non-initialized page before the group of consecutive pages and a Non-initialized page after the group of consecutive pages. (See page 35 for instructions for creating a Non-initialized page.)

- Press the up or down arrow key under the Page display window to go to any page in the loop which you want to record as a preset.
- Press the Auto key. The pages will start advancing, playing back the loop.

To record a Preset, the controller must be in Preset Mode. Press the Address/Preset Select key to change the controller from Address Mode to Preset Mode. The Preset LED below the Address/Preset Select key will light to indicate that the controller is in Preset Mode.

- Press the Select key. The Select LED will flash.
- Press the Preset Number where the Loop is to be stored.

You can now adjust the Advance Method, Advance Rate, and Modulate Settings. These settings will be recorded as part of the Preset. Whenever you playback a Preset, the Preset will advance through its pages according to the Advance Method, Advance Rate, and Modulate Settings you set when you recorded the Preset. However, if you ever want to change the Advance Method, Advance Rate, or Modulate Settings when you are playing back a Preset, you can do so manually while the Preset is playing. These manual adjustments will not permanently change the way the Preset plays back. The Preset will return to the settings that were selected when it was recorded.

- Press any of the keys in the Advance and Modulate sections on the controller and set the Rate knob to the desired rate of page advance.
- Press the Record key. You have now recorded a Loop as a Preset.

Recording A One Page Preset (Scene)

If you want to record a single page (static scene) as a preset, the page does not need to be bounded on either side by Non-Initialized pages in order to be recorded as a preset as does a Loop of Pages.

- Go to the page that you want to record as a preset.
- Select Preset mode by pressing the Address/Preset select key.
- Press the Select key.
- Press the numbered Preset key where you want to store that page as a preset.
- Press the Record key.

Copying

The Emulator controller remembers all parameters that are programmed by the operator. Because of this internal Memory, it is easy to repeat certain parts of the controller's Memory by copying.

The copying function of the controller allows the user to copy:

- certain parameters of an Address to another Address or Addresses.
- the entire contents of a programmed Page to any another Page in any other Memory.
- a group of programmed Pages to any other group of Pages in any other Memory.

Page Copy

This method of copying allows for the entire contents of a programmed Page to be copied to any other Page in any other Memory. This is most useful for creating a Loop or Chase of Pages that only contain slight changes, such as movement changes or single parameter changes.

- First, make sure that you are not in C.T.P. mode, that is, the Select key LED is not lit or flashing. Go to the page **to be copied** using the up/down arrow keys under the Memory and Page display windows.
- Press Select. The two left displays will be dark. Go to the Memory and Page you wish **to copy to** with the Memory and Page up-down arrows. When you do this, the Construct display window will show [P.C] and your destination will be indicated in the Memory and Page windows.
- Depress Record. The Page copy is complete. This procedure can be repeated as often as you wish.

Block Copy

When multiple consecutive pages need to be repeated, the Block copy function is very useful. If you wish to have multiple chases with slight parameter changes each time the chase repeats, you can utilize this function to save a great deal of time.

- Go to the group of Pages you want to copy, using the up/down arrow keys under the Memory and Page display windows.
- Press the Select key.
- Press the Auto key, located in the Advance section on the front panel of the controller to the right of the joystick. The Construct display indicates [S.P], for Start Page. The first page of the sequence is automatically selected, but it can be changed now if you want a different page in this sequence to be the starting page.
- Press the Auto key again. The Construct display now shows [E.P], for End Page. The Memory and Page displays indicate the last Memory and Page the controller will copy. The last page of the sequence is automatically selected, but it can be changed now if you want a different page in this sequence to be the ending page.
- Press the Auto key once again. Note the Construct display window now shows [C.P], for Copy Page.
- Using the up-down arrow keys under the Memory and Page display windows, go to the location (Memory and Page) where you want the block of pages you are copying to begin. The Default condition for this is the Page where you first pressed Select.
- (Optional Step) Using the up/down arrow keys under the **Intensity** display window at this point will toggle the controller between Copy Page (C.P.) and Copy Inverse (C.I.). Copy Inverse reverses the sequence of pages that you are copying.
- Press Record. After a brief display of the Page numbers advancing, the Select key LED will go out and the controller will be back in I.M.P. mode.

Address Parameter Copy

Once an Address has been programmed, some or all of the parameter settings can be copied to other Addresses on the same page or onto another page. This will save a great deal of time when many fixtures on a Page or within a Loop of Pages need to have the same or similar settings.

Copy All Parameters (Except Position) From One Address to Another

- Press the Select key.
- Select the Address with the parameters to be copied.
- Select the Addresses which you want to receive all of the same parameters as the first Address (except joystick position).
- Press the Record key to save changes or Select to discard changes.

Copy Selected Parameters From One Address to Another

- Press the Select key.
- Select the Address with the parameters to be copied.
- Select the parameter(s) to copy by pressing the appropriate construct keys or by altering the value of the selected parameter. Position may be selected by moving the joystick, but this will not copy the exact position of the Address you are copying, it will copy the original position plus the movement of the joystick.
- Press the numbered key(s) of the Address(es) which you want to have the same parameters you selected to copy from the first Address.
- Press the Record key to save changes or Select to discard changes.

Copy Selected Addresses From One Page to Another

- Press the Select key.
- Select the Addresses to be copied.
- Use the Up and Down Arrow keys under the Page Display window to go to the page to receive the selected Addresses. All parameters (selected or not) of the selected Addresses will be copied to the new page.
- Press the Record key to save changes or Select to discard changes.

Copy Positions of Addresses From One Page to Another

- Press and hold the Select key.
- Select the Addresses whose positions are to be copied.
- Release the Select key any time after at least one Address has been selected. By doing this you have selected the position of these Addresses.
- If you want to copy any other parameters, in addition to the position, press those parameter keys now.
- Use the Up and Down Arrow keys under the Page Display window to go to the Page to where you want the Address position to be copied. Only the selected parameters of the selected Addresses (including position) will be copied to the new page.
- Press the Record key to save changes or Select to discard changes.

Editing Pages

When you edit a page which has been previously programmed, one or more address LEDs will typically be lit, indicating that the gates of these fixtures are open. If you select an already-programmed fixture, you will notice the Construct display window will indicate [O.P] if the gate is open, or [F1-F8] if a strobe is set. Modifying a page's Addresses is accomplished in the same fashion as programming previously un-addressed fixtures.

- To change the programming of certain Addresses on a Page, make sure you are in I.M.P. (Intensity, Memory, Page) mode, that is, the decimal points between the numbers in the display windows are at the top of the display windows. If you are not in I.M.P. mode, press the Select key to take you out of C.T.P. (Construct, Program/Timing, Page) mode. This will return you to I.M.P. mode.
- Use the up/down arrow keys under the Memory and Page display windows to go to a Memory and Page where you want to program.
- Press the Select key. The Select key LED will start to flash. The controller is now in C.T.P. mode (Construct, Program/Timing, Page). The displays will go dark until an Address is chosen.
- Select an Address or Addresses which you want to program by pressing the numbered keys in the Address/Preset area on the controller.

After you have selected the Address or Addresses, the decimals in the displays will drop to the bottom and the chosen Address's LED will flash with the Select key LED.

The Gate LED in the Construct section and the Delay LED in the Program/Timing section will illuminate. All parameters will be at their default values unless prior programming has occurred.

- After an Address or Addresses have been selected, you can set all of the parameters (color, scale, angle, gate, scan, speed, program and delay) for the selected Address(es) by pressing each parameter key and adjusting the setting with the up/down arrow keys under the Construct and Program/Timing display windows.
- To save all of the new parameter settings, press Record.

Erasing Pages

You may want to erase a page if there are undesirable or old pages in memory. It is often best to clear out these pages to prevent confusion in future programming. An erased page is not a Non-initialized page. An erased page does not act as a 'placeholder' page in a loop of pages. (See pages 35-36 for instructions for creating a Non-initialized page.)

- To erase a page, go to the Page you wish to delete using the arrow keys under the Memory and Page display windows.
- Press the Select key. The Construct and Program/Timing display windows will go blank.
- Press the Erase key once. [C.L] will appear in the Construct display window.
- If you are certain that this is the Page you want to erase, press the Record key. Both the Construct and the Program/Timing Displays will briefly go blank, then the controller will automatically exit out of C.T.P. mode into I.M.P. mode.

All Memory Erase

- To erase all memory from a controller (not including locked memories), turn the controller off.
- Press and hold the Select key and the Erase key.
- Turn the controller on. The Memory display window will count up through the memories. Then the controller will run a normal self-test. All memory is now erased from the controller.

Memory Lockout

Entire Memories can be protected from unauthorized editing or Programming. To lock a Memory to protect it from being changed:

- Press and hold the Standby key while turning on the Key Switch.
- While still pressing the Standby key, you may Lock or Unlock the Memories by pressing the corresponding Address key number in the Address/Preset Region of the controller.

When an LED in the Address/Preset Section 1-9 is lit, it indicates that these Memories are available for Programming. If the LEDs are off, it means that the Memories are Locked. You may toggle between Locked and Unlocked as long as Standby is pressed. Once Standby is released, the controller will perform its normal Memory check.

A locked Memory is protected from all Erase and Record functions (including All-Memory Erase). If a protected Memory is accessed and an attempt is made to Record an adjusted setting, [L.C] will be displayed in the first window, indicating that changes may be made temporarily but not Recorded.

Playback

Page Playback - Manual Advance

To manually playback the Pages within a Memory:

- If the controller is in Standby mode, remove the controller from Standby by pressing the Standby key.
- Press either the up or down arrow key beneath the Page display window once. The fixtures will change their settings immediately according to what has been recorded on each page. The controller will advance one Page at a time each time an arrow key under the Page display window is pressed.
- If either the up or the down arrow key under the Page display window is pressed and held, the Pages will change quickly until 1 or 99 is reached. If the up/down arrow key is released and then pressed again, the process will begin over.

Page Playback - Automatic Advance Modes

Auto Playback Mode:

- Press the Auto key in the Advance section on the controller located to the right of the joystick. The controller will automatically begin to playback all of the pages within a Memory until it encounters a Non-Initialized page. When it encounters a Non-Initialized page, it will go back to the first Initialized (Programmed) page it encounters and play all of the pages within that loop of pages (between the two Non-Initialized pages).
- You can adjust the rate at which the pages are played back by turning the Rate knob located just below the Auto key in the Advance section on the controller. If the Rate knob is turned as far as it will go clockwise, the playback will be fastest. If it is turned as far as it will go counterclockwise, the playback will be the slowest. The Rate knob adds to the Delay time, if there is a Delay time set on a page.

Audio Input Playback Modes:

If you have a musical source plugged into the RCA audio input(s) on the rear panel of the controller, you can utilize the audio playback modes.

Audio 1: Press the Audio 1 key. This method of Auto playback uses the audio signal received through the RCA audio input(s) on the rear panel of the controller to *advance* Pages *with* the beat of the musical information. The strength of the audio signal can be adjusted using the Audio knob located directly to the right of the Rate knob. The strength of the signal is indicated by the Audio level LED located just above the Audio knob. (Turn knob to Left = weak audio signal, Right = strong audio signal)

Audio 2: Press the Audio 2 key. This method of Auto playback uses the audio signal received through the RCA audio input(s) on the rear panel of the controller to *halt the advance* of Pages *with* the beat of the musical information. The strength of the audio signal can be adjusted using the Audio knob located directly to the right of the Rate knob. The strength of the signal is indicated by the Audio level LED located just above the Audio knob. (Turn knob to Left = weak audio signal, Right = strong audio signal)

Color Modulate: Press the Color key in the Modulate Section on the controller. This key instructs all active fixtures to begin changing colors from their current settings with the beat of the audio input.

Size Modulate: Press the Size key in the Modulate section on the controller. This key instructs all active fixtures to change size of the pattern with the level of the audio input. (Quiet = small scan, Loud = large scan)

Chorus Modulate: Press the Chorus key in the Modulate section on the controller. This key instructs all active fixtures to follow the position of fixture #1. If the operator uses the inductive joystick, all fixtures will follow the movement of the joystick. When the joystick is released for 3 seconds, all fixtures will go back to following the position of fixture #1.

Preset Playback

Presets store a page or group of pages and their Advance setting, Modulate setting, Master dim setting and the Rate knob setting. However, when a Preset is played back, the Advance and Modulate controls can be altered for live control over the Preset playback. Any changes made to the Advance and Modulate selections during Preset playback will not affect the Advance and Modulate selections stored in the Preset Memory. When a Preset is played back, it will continue to playback indefinitely until another Preset is selected.

Preset Playback Advance Modes

Presets are played back in the same manner as playing back a loop of Pages within a Memory. [The Playback Advance Modes are: Auto, Audio, and Random Modulate - Color, Scan, Chorus.]

- Press the Address/Preset Select key choose Preset mode. The Preset LED will light. The controller is now in Preset Mode.
- Select the number of the Preset by pressing the corresponding key on the Address/Preset keypad. The Preset will automatically begin to playback. (See page 43 of this manual for a description of the Playback Modes.)

Automatic All-Memory Playback

The Emulator controller can automatically sequence through (playback) all of the Pages in all of its Memories.

To automatically sequence through all of the Pages of all of all of the Memories programmed into a controller:

- Press and hold the up or down arrow key below the Memory display window until the display reads A.1 or A.9.
- Release the arrow key and the Initialized Pages in Memory 1 will be sequenced through according to the Advance mode and Rate setting. Upon the completion of playing back Memory 1's highest Initialized Page the controller will advance to Memory 2, and playback all of its Initialized Pages. This playback process will continue through Memory 9.

An "A" will precede each Memory number as the Memories playback. When the controller reaches Memory 9, Page 99, it will wrap around and continue to run through Memories 1-9 until memory sequencing is disabled.

- To disable All-Memory Sequencing, press and hold the up or down arrow key below the Memory display window until "A" no longer appears in the display.

Creating a Simple Page

- Turn on the Controller by turning the controller key clockwise. (See Fig. 4.3)
- Press the Standby key. This will take the controller out of Standby mode. The controller is now enabled and ready to be programmed.
- Check the Address/Preset Select LED located above the Standby key on the front panel of the controller to make sure you are in Address mode. If you are not in Address mode, the Preset indicator LED will be lit. Press the Address/Preset Select key to return to Address mode.
- You will now program a Page at Intensity level 9'9, in Memory 0'1, on page 0'1 using the **Four Step Method** (1. Press Select, 2. Select the Address, 3. Set the Parameters, 4. Press Record). If your controller is not at Intensity level 9'9, in Memory 0'1, on page 0'1, use the up/down arrow keys below each display window to go to this setting. (See Fig. 4.3)

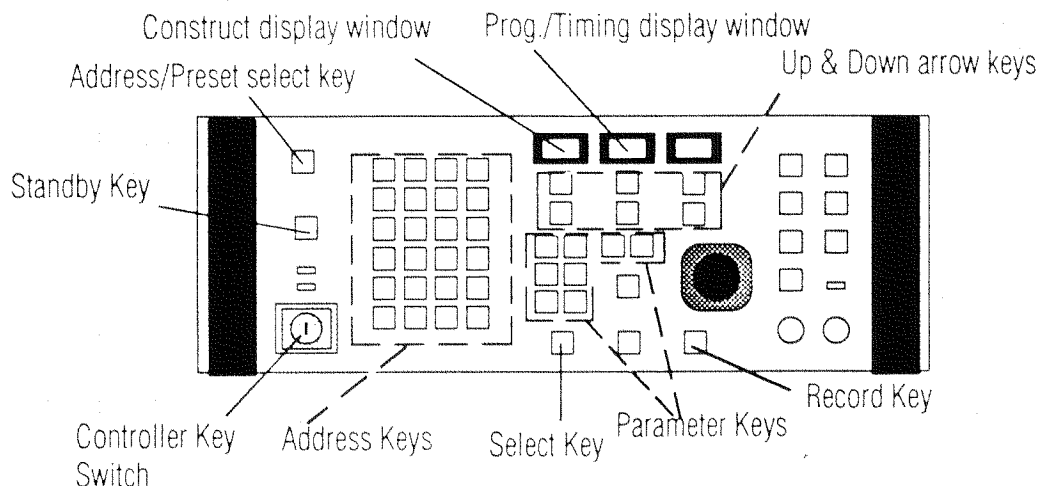


Figure 4.3 The Emulator Controller

Step 1: Press Select

Press the Select key. (See Fig. 4.3) The LED above the Select key will flash indicating that the controller is now in C.T.P. (Construct, Program/Timing, Page) mode. In C.T.P. mode you can adjust and record all of the parameters (settings) for an Address. The intensity and memory indicators will go blank except for a decimal point at the bottom of each display window. The Page display window will display the number of the page the controller is on (0.1).

Step 2: Select an Address

Press the key in the Address/Preset region labeled 1. You have now selected the fixture(s) assigned to Address #1. The LED above Address key 1 will flash, indicating that it has been successfully selected.

PRACTICE SESSION

Step 3: Set the Parameters for the Selected Address

Adjust the parameters for Address #1. The parameters for each address include: gate, program, color, scale, angle, scan, and speed. The delay parameter key affects all of the addresses on one page.

GATE

- The default parameter in the Construct display window is Gate. That is, whenever you select an address the Gate key LED will light up first.
- With the Gate key LED lit, press the up arrow key under the Construct display window eight times pausing briefly at each of the eight strobing speeds. Notice the speed of the eight strobing effects (F1-F8).
- Press the up arrow key under the Construct display window again. Now the Gate is closed.
- Press the up arrow key under the Construct display window one more time. Now the Gate is open. The Construct display window will show O.P. Leave Gate set to O.P (open).

SCAN

- Press the Scan key. The Scan LED will light. Press the up arrow key under the Construct display window to look at the 12 scanning speeds.
- Use the arrow keys under the Construct display window to set the Scan speed at 1.2, the fastest scanning speed.

PROGRAM

- Press the Program key. The Program LED will light. Press the up arrow key under the Program/Timing display window, to look at each of the 99 different programs available.
- Use the arrow keys under the Program/Timing display window to set the Program to 0.6, a triangle.

JOYSTICK

Experiment with the inductive joystick by moving it in all directions, watching how it affects the beam(s). Set the beam(s) to the far left where you can still see the output of the fixture(s) clearly on a flat surface.

COLOR

- Press the Color key. The Color LED will light. Press the up arrow key under the Construct display window to view the 12 different colors and 16 (8 clockwise and 8 counterclockwise) rotational speeds of the color wheel.
- Use the arrow keys under the Construct display window to set the Color to 1.2, orange.

SCALE

- Press the Scale key. The Scale LED will light. Press the up arrow key under the Construct display window to see the 12 sizes that can be displayed.
- Use the arrow keys under the Construct display window to set the Scale to 1.2, the largest size.

ANGLE

- Press the Angle key. The Angle LED will light. Press the up arrow key under the Construct display window to see the effects of the angle settings (from 0.0 to 8.9), the 8 counterclockwise spinning angle speeds (F1-F8) and the 8 clockwise spinning angle speeds (A1-A8.) Notice how different the pattern can look at different angle rotation speeds.
- Use the arrow keys under the Construct display window to set the Angle to 0.0.

SPEED

- Press the Speed key. The Speed LED will light.

Speed indicates the time it will take for a fixture or fixtures at a certain Address to reach the position where the operator sets the joystick on that Page. 0.1 is the longest (slowest) time and 9.9 is the shortest (fastest) time.

- Use the arrow keys under the Construct display window to set the Speed at 7.8.

DELAY

- Press the Delay key. The Delay LED will light.

Delay is the length of time in seconds and tenths of seconds that a page is displayed.

- Use the arrow keys under the Construct display window to set the Delay for 5.0 seconds.

Step 4: Press Record

Now that you have set all the parameters for Address 1, press Record.

You have created a simple page, programming only one Address.

Creating a Simple Loop

- Follow the steps for initial power-up and creating a page on the previous pages in this Section.
- Now you will create a simple loop containing 3 pages.
- Since you have already created Page 1, press the up arrow key under the Page display window to go to Page 2 of Memory 0'1, at Intensity level 9'9.

Creating the Second Simple Page

Step 1: Press Select

Press the Select key. The LED above the Select key will flash, indicating that the controller is now in C.T.P. (Construct, Program/Timing, Page) mode. The intensity and memory indicators will go blank except for a decimal point at the bottom of each display window. 0.2 will be displayed in the Page display window.

Step 2: Select an Address

Press the key in the Address/Preset region labeled 1. You have now selected the fixture(s) assigned to Address #1. The LED above Address key 1 will flash, indicating that it has been successfully selected.

Step 3: Set the Parameters for the Selected Address

Adjust the parameters for Address #1. The parameters for each address include: gate, program, color, scale, angle, scan, and speed. The delay parameter key affects all of the addresses on one page.

GATE

- Press the Gate key. The Gate LED will light.
- Use the up/down arrow keys under the Construct display window to set the Gate to O.P.

SCAN

- Press the Scan key. The Scan LED will light.
- Use the up/down arrow keys under the Construct display window to set the Scan speed at 1.2, the fastest scanning speed.

PROGRAM

- Press the Program key. The program LED will light.
- Use the up/down arrow keys under the Program/Timing window to set the Program to 0.6, a triangle.

JOYSTICK

Position the beam(s) in the center-most point of your viewing area where you can clearly see the output of the fixture(s) on a flat surface.

COLOR

- Press the Color key. The Color LED will light.
- Use the up/down arrow keys below the Construct display window to set the Color to A.4. (spinning color wheel)

SCALE

- Press the Scale key. The Scale LED will light.
- Use the up/down arrow keys below the Construct display window to set the scale to 0.5.

ANGLE

- Press the Angle key. The Angle LED will light.
- Use the up/down arrow keys below the construct window to set the Angle to F.4, (a rotating angle).

SPEED

- Press the Speed key. The Speed LED will light.

Speed indicates the time it will take for a fixture or fixtures at a certain Address to reach the position where the operator sets the joystick. 0.1 is the longest (slowest) time and 9.9 is the shortest (fastest) time.

- Use the up/down arrow keys under the Construct display window to set the Speed at 8.6.

DELAY

- Press the Delay key. The Delay LED will light.

Delay is the length of time in seconds and tenths of seconds that a page is displayed.

- Use the up/down arrow keys under the Program/Timing display window to set the Delay for 5.0 seconds.

Step 4: Press Record

Now that you have set all the parameters for Address 1, press Record.

Copying a Page

- You have already created two Pages. Now you will copy Page 1 to Page 3 and then adjust the parameters for Address 1 on Page 3.
- Press the down arrow key under the Page display window to go to Page 1.
- Press the Select key.
- Press the up arrow key under the Page display window to go to Page 3.
- Press the Record key.
- There is now an exact copy of Page 1 on Page 3. All of the parameters for all of the Addresses programmed on Page 1 are identical to all of the parameters for all of the Addresses on Page 3.
- Now you will adjust the parameters for Address 1 on Page 3.

Step 1: Press Select

Press the Select key. The LED above the Select key will flash indicating that the controller is now in C.T.P. (Construct, Program/Timing, Page) mode. The intensity and memory indicators will go blank except for a decimal point at the bottom of each display window. 0.3 will be displayed in the Page display window.

Step 2: Select an Address

Press the key in the Address/Presets region labeled 1. You have now selected the fixture(s) assigned to Address #1. The LED above Address key 1 will flash, indicating that it has been successfully selected.

Step 3: Set the Parameters for the Selected Address

Adjust the parameters for Address #1. The parameters for each address include: gate, program, color, scale, angle, scan, and speed. The delay parameter key affects all of the addresses on one page.

GATE

- The default parameter in the Construct display window is Gate. That is, whenever you select an address, the gate key LED will light up first.
- Use the up/down arrow keys under the Construct display window to set the Gate to F.2.

SCAN

- Press the Scan key. The Scan LED will light.
- Use the up/down arrow keys below the Construct display window to set the Scan speed at 1.2, the fastest scanning speed.

PROGRAM

- Press the Program key. The program LED will light.
- Use the up/down arrow keys under the Program/Timing display window to set the Program to 1.4, a spinning circle.

JOYSTICK

Position the beam(s) to the farthest right point of your viewing area where you can clearly see the output of the fixture(s) on a flat surface.

COLOR

- Press the Color key. The Color LED will light.
- Use the up/down arrow keys below the Construct display window to set the Color to 0.4, yellow.

SCALE

- Press the Scale key. The Scale LED will light.
- Use the up/down arrow keys below the Construct display window to set the Scale to 1.2.

ANGLE

- Press the Angle key. The Angle LED will light.
- Use the up/down arrow keys below the Construct display window to set the Angle to F.5.

SPEED

- Press the Speed key. The Speed LED will light.

Speed indicates the time it will take for a fixture or fixtures at a certain Address to reach the position where the operator sets the joystick. 0.1 is the longest (slowest) time and 9.9 is the shortest (fastest) time.

- Use the up/down arrow keys below the Construct display window to set the Speed at 8.6.

DELAY

- Press the Delay key. The Delay LED will light. Delay is the length of time in seconds and tenths of seconds that a page is displayed.
- Use the up/down arrow keys under the Program/Timing display window to set the Delay for 3.0 seconds.

Step 4: Press Record

Now that you have set all the parameters for Address 1, press Record.

PRACTICE SESSION

Copying All Parameters (Except Position) From One Address to Other Addresses

Once an Address has been programmed, some or all of the parameter settings can be copied to other Addresses. This will save a great deal of time when many fixtures on a Page need to have the same or similar settings. After the parameters for a particular Address have been adjusted and Recorded, you can copy all or some of the parameters of that Address to other Addresses on the same page or on other pages.

- On Page 3 of the Simple Loop you will copy Address #1's parameters to several other addresses.
- Press Select. The Select LED will flash.
- Press the numbered Address key corresponding to the Address whose parameters you want to copy (Address 1.)
- Press the numbered Address keys of those Addresses which you want to have the same parameter values as the Address you selected to copy. (Press the Address keys of all of the Addresses available on your controller.)
- Press Record. All of the parameter settings that you programmed for the first Address (Address 1) will be copied to the Addresses you have just selected.

Creating a Non-Initialized Page

- To complete the Simple Loop, a Non-Initialized Page needs to be created. A Non-Initialized Page acts as a 'placeholder' to indicate the beginning or ending of a chase or loop.

Since you began your Loop on Page 1, there is no need to program a Non-Initialized page before Page 1. The controller's memory automatically places a Non-Initialized 'Page' before Page 1 and after Page 99. However, if you wanted to program a Loop from Page 10 to Page 15, for example, you would need to make Pages 9 and 16 Non-Initialized Pages in order for Pages 10 through 15 to act as a Loop.

Step 1: Go to the Page to be 'Non-Initialized'

Use the up/down arrow keys under the Page display window to go to the Page that you want to define as a Non-Initialized Page, (Page 4).

Step 2: Press Select

Press the Select key. The LED above the Select key will flash, indicating that the controller is now in C.T.P. (Construct, Program/Timing, Page) mode. The intensity and memory indicators will go blank except for a decimal point at the bottom of each display window. 0.4 will be displayed in the Page display window.

Step 3: Press Erase

Press the Erase key. C.L will appear in the Construct display window and 0.0 will appear in the Program/Timing display window.

Step 4: Press Erase

Press the Erase key again. Both the Construct display window and the Program/Timing display window will briefly go blank, then the controller will automatically exit out of C.T.P. Mode into I.M.P. Mode.

- You have created a Loop including Pages 1, 2 and 3.

Playing Back the Loop

- Now you can play back the Loop you have just created.
- Use the arrow keys under the Page display window to go to Page 1.

Manual Playback:

To manually step through the Pages, simply press the Up arrow under the Page display window. When you get to Page 4, it will be black (dark). Now press the Down arrow key to go back to Page 1.

Auto Playback:

Now press the Auto key in the Advance section on the controller located to the right of the joystick. Your Loop will automatically begin to playback.

- You can adjust the rate at which the Loop is played back by turning the Rate knob located just below the Auto key in the Advance section on the controller. If the Rate knob is turned as far as it will go clockwise, the playback will be fastest. If it is turned as far as it will go counterclockwise, the playback will be the slowest. The Rate knob adds to the Delay time, if there is a Delay time set.

Audio Input Playback:

If you have a musical source plugged into the RCA audio input(s) on the rear panel of the controller, you can utilize the audio playback modes. In the audio playback modes, the advance and modulate settings respond to musical input in various ways.

Audio 1: Press the Audio 1 key. This method of Auto playback uses the audio signal received through the RCA audio input(s) on the rear panel of the controller to *advance* Pages *with* the beat of the musical information. The strength of the Audio signal can be adjusted using the Audio knob located directly to the right of the Rate knob. The strength of the signal is indicated by the Audio level LED located just above the Audio knob.

Audio 2: Press the Audio 2 key. This method of Auto playback uses the audio signal received through the RCA audio input(s) on the rear panel of the controller to *halt the advance* of Pages with the beat of the musical information. The strength of the Audio signal can be adjusted using the Audio knob located directly to the right of the Rate knob. The strength of the signal is indicated by the Audio level LED located just above the Audio knob.

Color Modulate: Press the Color key in the Modulate section on the controller. This key instructs all active fixtures to begin changing Colors from their current settings with the beat of the Audio input.

Size Modulate: Press the Size key in the Modulate section on the controller. This key instructs all active fixtures to change size of the pattern with the level of the audio input. (Quiet = small scan, Loud = large scan)

Chorus Modulate: Press the Chorus key in the Modulate section on the controller. This key instructs all active fixtures to follow the position of fixture #1. If the operator uses the inductive joystick, all fixtures will follow the movement of the joystick. When the joystick is released for 3 seconds, all fixtures will go back to following the position of fixture #1.

Recording the Loop as a Preset

A Preset is a recording of a programmed Page or sequence of Pages. Presets are provided to allow immediate recall of a programmed page or sequence of pages. Presets store the all of the Parameters, Advance and Modulate Settings that were programmed with a Page or sequence of Pages. The Advance and Modulate Settings can be changed during the Preset recording process. These Settings can also be adjusted during the playback of a Preset. The Audio level is independent of the presets.

Step 1: Go to the Pages (Loop) to be Recorded as a Preset

To record a Loop (Chase) as a Preset, the Loop must be running; that is, the pages must be advancing in auto playback mode or in an audio playback mode.

- Press the up or down arrow key under the Page display window to go to any page in the loop (Page 1, 2, or 3).
- Press the Auto key. The pages will start advancing, playing back the loop.

Step 2: Select Preset Mode

To record a Preset, the controller must be in Preset Mode.

- Press the Address/Preset Select key to change the controller from Address Mode to Preset Mode. The Preset LED below the Address/Preset Select key will light to indicate that the controller is in Preset Mode.

Step 3: Press Select

- Press the Select key. The Select LED will flash.

Step 4: Select the Preset Number

- Press the Preset Number where the Loop is to be stored, Preset Number 1.

Step 5: Set the Playback Method

You can now adjust the Advance Method, Advance Rate, and Modulate Settings. These settings will be recorded as part of the Preset. Whenever you playback a Preset, the Preset will advance through its pages according to the Advance Method, Advance Rate, and Modulate Settings you set when you recorded the Preset.

However, if you ever want to change the Advance Method, Advance Rate, or Modulate Settings when you are playing back a Preset, you can do so manually while the Preset is playing. These manual adjustments will not permanently change the way the Preset plays back. The Preset will return to the settings that were selected when it was recorded.

- Press the Auto key and turn the Rate knob completely counterclockwise.

Step 6: Press Record

- Press the Record key. You have now recorded this Loop as Preset 1.

Playing Back the Preset

Preset are played back in the same manner as playing back a loop of Pages within a Memory. [The Playback Advance Modes are: Auto, Audio, and Random Modulate - Color, Scan, Chorus.]

- Press the Address/Preset Select key choose Preset mode. The Preset LED will light. The controller is now in Preset Mode.
- Select the number of the Preset that you want to playback (#1) by pressing the corresponding key on the Address/Preset keypad. The Preset will automatically begin to playback. (See the previous section, *Playing back the Loop*, for a description of the Playback Modes.)

SECTION 5

REMOTE ACCESS AND CONTROL

Remote Analog Access

Any control device such as a dimmer console or a control desk can be used to remotely access the Emulator controller memory. Twelve channels are required to control ninety-nine pages of a selected memory, or up to 1023 presets.

The controlling device connects to the Remote Analog Access ports on the rear panel of the Emulator controller via two 8-pin locking DIN connectors. The minimum turn-on voltage for each channel is +5VDC, and the maximum safe voltage input is +16VDC.

There are two types of remote access; Page Access and Preset Access. Personality DIP switch number three on the rear panel of the controller is used to choose between page access or preset access (Switch #3 'off' = Page Access; Switch #3 'on' = Preset Access). In addition, if the controller is in the Preset Access mode, then switch number five of the Personality DIP switch determines whether to access presets through binary combinations of the input channels, or whether each input corresponds to one of twelve levels of twenty-four presets.

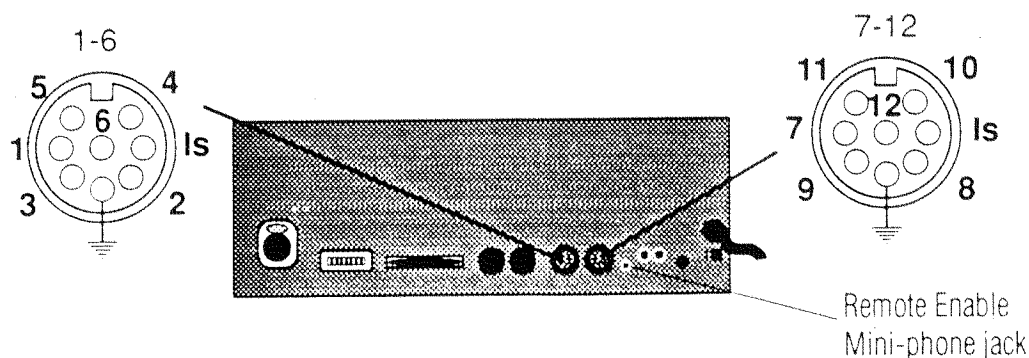


Figure 5.1 Pinout of Remote Access Jacks

In Page Access mode, the Remote Analog Access port has priority over the front panel of the controller ; that is, an active input channel will prevent any subsequent change of page numbers or presets on the controller front panel until the active input channel is de-activated. However, in Preset Access mode, the input channels and the controller front panel can be active at the same time.

The analog input port can be used with the controller in or out of the Standby mode.

- If the controller is in Standby mode, the analog input signal will override it. The Standby key will begin to flash, indicating that it is receiving a higher priority signal. Only the Remote Enable input signal can override the analog input port signal. As long as the analog input port is active, the Standby key will continue to flash. When the analog input port is de-activated, the controller will return to the Standby mode.
- If the controller is not in the Standby mode, the analog input signal will take control of the front panel. When the input port is de-activated, the controller will resume normal operation.

NOTE: A FLASHING STANDBY LED INDICATES THAT THE CONTROLLER IS BEING OVERRIDDEN BY THE REMOTE ANALOG INPUT PORT OR BY THE REMOTE ENABLE.

The following table gives the pin numbers and channel assignments for the Remote Analog Access ports.

REMOTE ANALOG CONNECTORS		1 - 6 & 7 - 12
CHANNEL NUMBER	PIN NUMBER	
1 or 7	3	
2 or 8	4	
3 or 9	5	
4 or 10	6	
5 or 11	7	
6 or 12	8	
common negative	2	
not used	1	

Table 5.1 Controller Pinout for Remote Analog Access Port

Remote Page Access

To use the Remote Page Access feature, the auxiliary control device should be connected as described on the previous pages in this section, and Personality DIP switch number three of the Emulator controller must be set in the “off” position.

In the Page Access Mode:

- Input channels one through twelve correspond directly to page numbers one through twelve. Activating channel one will call up page one on the control panel, and channel two will call up page two, and so on.
- If any combination of two channels are turned on simultaneously, it will call up the page number corresponding to the combination of the two channel numbers, with the lowest channel number first and the highest channel number second. For example, if channels one and two are activated simultaneously, it will call up page twelve on the control panel. If channels three and seven are activated, it will call up page thirty-seven.
- Channels ten, eleven and twelve, besides corresponding to the matching page numbers, are also used as special function keys as follows:
 - Channel ten is a ten-times multiplier. That means that when channel ten is active, it will multiply any other active channel by ten and call up the resulting page number. For example, if channels five and ten are activated, it will call up page fifty.
 - Channel eleven is a number doubler. It will cause any other active channel to be doubled before calling up the page number. If channels two and eleven are activated, it will call up page twenty-two.
 - Channel twelve is a number inverter. For example, if channels two, four, and twelve are activated, it will call up page forty-two (instead of twenty-four).

Table 5.2 below, summarizes the function of the twelve Remote Analog input channels.

If more than two of the input channels one through nine are activated simultaneously, only the lowest two will be selected. The Advance, Modulate, and Memory selection features remain fully active when the controller is in the Remote Access mode.

Channels 1-12	Access Page or Preset group 1-12
Channels 10-12	Are also special function keys
Channel 10	Ten times multiplier for channels 2-9. Allows access to Pages 20, 30, 40, 50, 60, 70, 80, & 90
Channel 11	Number doubler for channels 2-9. Allows access to Pages 22, 33, 44, 55, 66, 77, 88 & 99
Channel 12	Number inverter for channels 2-9. Inverts the order of the two lowest channels activated simultaneously, e.g. 32 will become 23

Table 5.2 Remote Analog Input Channel Functions

Remote Preset Access

To use the Remote Preset Access feature, the auxiliary control device should be connected as described on the previous pages of this section of the manual, and switch number three of the Emulator controller Personality DIP switch must be set in the "on" position. Also, switch number five must be set to choose between binary access or twelve level access (Switch #5 "off" =12 Level Access, Switch #5 "on" = Binary Access).

In the twelve level access mode, each channel can activate one of twelve levels of twenty-four presets. When a level has been selected using the remote access device, the presets are called up from the Address/Preset keypad on the controller. In the binary access mode, there are 1023 combinations of ten of the input channels that correspond to 1023 presets. This mode offers the greatest flexibility for totally remote, "hands off" control.

Twelve Level Access

In the twelve level access mode, there are twelve levels of twenty-four presets, or a total of 288 presets available when used in conjunction with a remote analog input. Each level of twenty-four Presets can be accessed by activating the corresponding analog input channel. For example, the first level of presets can be called up by activating analog input channel number one. The second level can be called up by activating channel two, and so on. The signal used to activate a level of presets can be a momentary signal or it can be a latching signal. If the remote analog port is not used, then the controller can only access the twenty-four Presets stored in level one.

Once the appropriate analog input channel has been activated, a particular preset can be called up by depressing an Address/Preset key (numbered keys 1-24) on the controller. The preset that is called up will continue to operate until: 1) another preset key is depressed, 2) the preset level number is changed, or 3) the controller is put in the Standby mode.

Binary Access

In the binary access mode, there are 1023 presets available by using different combinations of the first ten input channels. The last two channels are used for a master blackout and a remote enable, respectively. For example, one preset can be called up by activating analog input channels one and two. Another can be called up by activating input channels three, four, and seven. This can be continued until every possible combination of the ten channels is exhausted. The use of combining input channels in this way is very similar to counting in binary, hence the term, binary access.

The input signals which activate a preset can be either momentary or latching signals. The preset selected will continue to playback until: another preset key is depressed, the preset level number is changed, or the controller is put in the Standby mode.

WARNING :

Since the Analog inputs are read as either High or Low, cross-fading of the inputs is NOT RECOMMENDED.

Remote Enable

Located on the rear panel of the controller is a Remote Enable input jack that allows an external source to take the controller in and out of the Standby mode. The Remote Enable input overrides all other functions. The jack is a normally closed, 3.5 mm (1/8 in) mini-phone jack that accepts a 3.5 mm mini-phone plug. When a plug is inserted into the jack, the controller goes into the Standby mode and remains there until voltage (+5VDC to +16VDC) is sensed. The voltage restores the controller to its prior mode of operation.

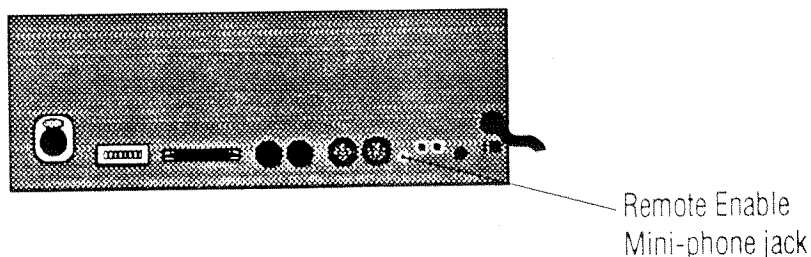


Figure 5.2 Remote Enable Mini-phone Jack

SECTION 6

EXTERNAL MEMORY STORAGE & TRANSFER

General Information

The Emulator controller contains a self-recharging NiCad battery backup for memory storage. All programming information is automatically retained even during power down or power failure. It is possible, however, to backup the memory on a high-density floppy disk or hard drive to insure against the loss of data or to increase the amount of programming space available.

To connect a computer to the Emulator controller for memory backup, plug in one end of an RS-232 serial cable into the RS-232 Serial port on the rear panel of the Emulator controller and the other end into the RS-232 Serial port on the computer (See Figure 6.1).

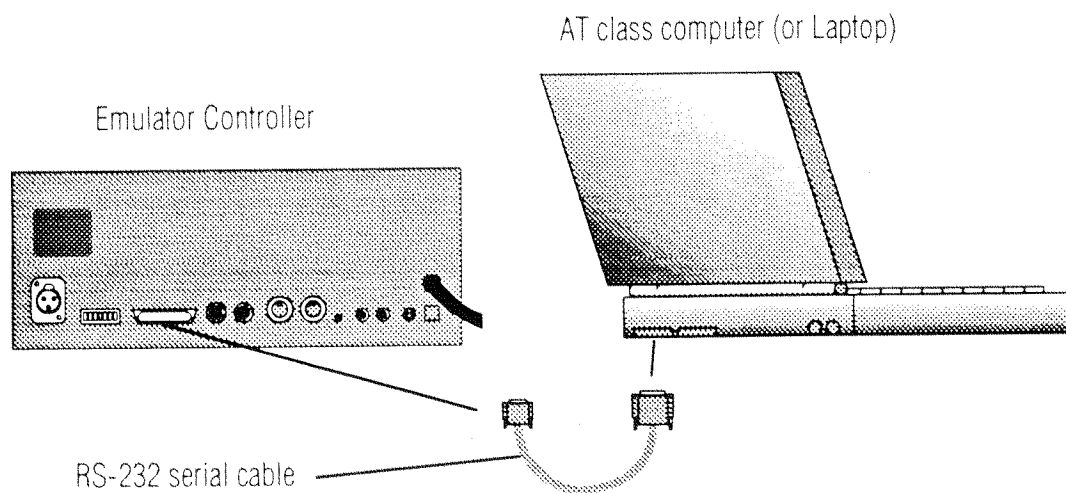


Figure 6.1 PC Backup of an Emulator Controller

NOTE: Memory storage and transfer can be performed with most commercially available communications software capable of ASCII file transfer.

Inside the front cover of this manual is a 5 1/4 in. floppy disk which contains a software communication program used to transfer a controller's memory to and from a computer. **Note:** You should make a backup copy of the floppy disk provided with your Emulator. This backup copy can be used if the original disk is ever damaged.

Memory transfer requires an IBM AT (TM) (or compatible) or a Macintosh computer with a high-density disk drive and an RS-232 serial port. The controller and computer should be linked together with a standard RS-232 cable using their respective RS-232 output ports.

Setting up for Data Transfer with a Computer

- Put the controller in the Standby mode by pressing the Standby key to initiate a memory transfer.
- To begin the program, boot up the computer and insert the disk into the floppy drive.
- From the DOS prompt, type the command "EB."
- Press the ENTER key.

After loading, the program will display the title "Lightwave Backup and the current Version number ," followed by the menu.

- Select from the menu by typing the first letter of the line or moving the light bar with the arrow keys until the proper line is highlighted and pressing the Enter key.
- The program will then provide instructions on how to proceed.

Downloading

Note: To cancel the transfer of data at any time during the downloading process, **press the Select key**. The downloading process will take approximately fifteen minutes.

To download the memory from the controller to the computer:

- Follow the steps described above for transferring data from the controller to a computer.
- Choose the “S” (save) option from the backup program menu.
- It will then prompt you to enter a file name to which the memory will be saved. Enter a file name.
- After entering the file name, press and hold the Record key for approximately eight seconds until the display reads “S A 0 1 0 1.”
- When the computer is ready to receive the data, press the Record key again to begin the transfer to the computer.

The controller will display the memory and page number as it is being saved to disk. After saving all nine memories and ninety-nine pages, the program will prompt you to terminate the transfer at the computer keyboard.

- Return the controller to normal operation by pressing the Select key.

Upon completion of the memory transfer, all memories will have been downloaded to the computer and saved on disk. The controller will still retain all of the data.

Uploading

Note: To cancel the transfer of data at any time during the downloading process, **press the Select key**. The downloading process will take approximately fifteen minutes.

To upload the memory from the computer to the controller:

- Follow the steps described previously in "Setting up for data transfer with a computer" (on page 64).
- The controller must be in the Standby mode to initiate a memory transfer.
- Choose the "P" (play) option from the backup program menu.
- It will then prompt you to enter the file name from which the memory will be loaded. If you do not know the file name, all of the files can be listed by choosing the "L" (list) option from the main menu. Enter the file name.
- After entering the file name, press and hold the Erase key for about twenty seconds until the display reads "P L 0 1 0 1."
- When the Erase key is released the Select key LED will light up. The computer will prompt you to enter a "Y" (yes) on the keyboard and the transfer will begin.

As the file is being transferred to the controller, the Memory and Page display will count up. When the transfer is complete, the display will be at memory nine, page ninety-nine and the controller will be loaded with the new memory.

- Press the Select key once to return to normal operation.

Crossloading

To crossload the memory from one controller to another controller:

- It is possible to copy the memories from one controller (controller "A") to another controller (controller "B"). (See Figure 6.2) To do so requires a null-modem cable. A null-modem cable is a cable with a male RS-232 connector on both ends, with only three wires connected in the following fashion; pin seven to pin seven, pin two on one connector to pin three on the other, and pin three on one to pin two on the other (See Table 6.1)
- Put the controller in the Standby mode by pressing the Standby key to initiate a memory transfer.

CONNECTOR "A"	CONNECTOR "B"
Pin 2	Pin 3
Pin 3	Pin 2
Pin 7	Pin 7

Table 6.1 Pinout for Crossloading Memory

- Connect the RS-232 cable between the two RS-232 ports on the back of the controllers. (See Fig. 6.2)

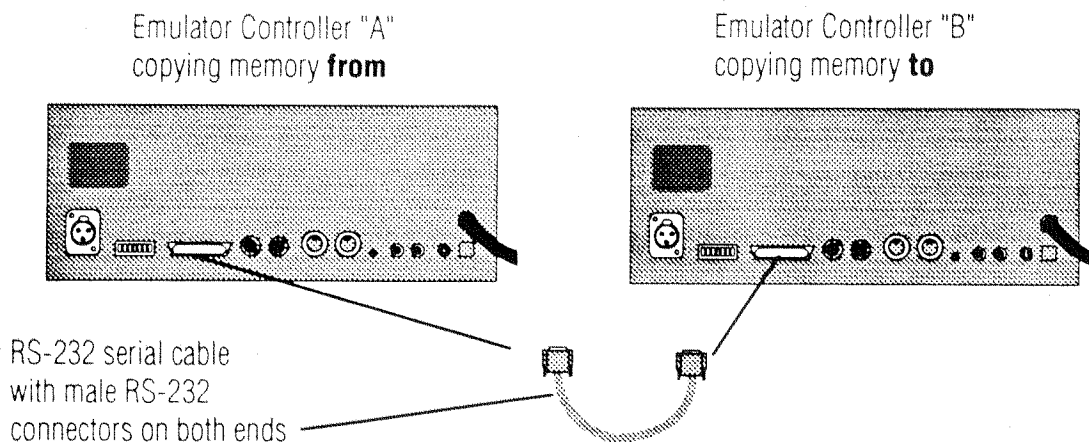


Figure 6.2 Emulator Controller Backup of another Emulator Controller

- Put controller "A" (the controller being copied from) in the Save mode by pressing and holding the Record key for about twenty seconds until the display reads "S A 01 01."
- Put controller "B" in the Play mode by pressing and holding the Erase key for about twenty seconds until the display reads "P L 01 01."
- Press the Record key of controller "A" to begin the transfer.

When the transfer is complete, the display will be at memory nine, page ninety-nine, and the controller will be loaded with the new memory.

- Press the Select key once on each controller to return to normal operation.

Preset Playback from a Computer

Several computer programs have been designed to exchange serial data between a computer to a controller, such as Lightwave Research's Show Control. These programs are designed to allow you to store, organize and playback one or more controller's presets from a computer keyboard. It is possible to link several Lightwave Research Emulator and Intellabeam controllers to one computer to playback their presets. In order to do this the computer has to be able to identify each controller separately, therefore, each controller must be assigned a unique I.D. number.

Setting the Controller I.D. Number

- Press and hold the Standby key.
- Turn the controller ON (OFF and ON) if necessary.
- The Revision number will be displayed. It must be 1.01 or higher.
- Press the Intensity down arrow once. The display should show "I.D. = 0" or some other I.D. number.
- Use the Page up and down arrows to adjust the I.D. number.
- The Standby button may now be released.

An I.D. of 0 (zero) is a special case. A controller set to I.D. 0 will respond to all commands sent to all I.D. numbers.

For more information about Lightwave Research Show Control, call your High End Systems Dealer/Distributor.

SECTION 7

GENERAL MAINTENANCE & TROUBLESHOOTING GUIDE

General Maintenance and Cleaning

There should be no power connected to the Emulator System when any cleaning or maintenance is done. Maintenance and cleaning should be done on a regular basis. The fixtures and controllers should be kept clean of dust and dirt that could cause overheating or malfunctions.

- To clean the outer surfaces of the controller and the fixture:

Unplug the units, then wipe them off with a soft cloth or tissue or use a small vacuum to remove the built-up dust and dirt.

If the Controller is in an environment susceptible to moisture, take care to prevent any fluids from entering the switches on the face-plate.

- To clean the inside of the fixture:

Unplug the fixture.

Open the top door by loosening the thumbscrew. When this door is opened, a safety-interlock will cut power to the lamp socket to prevent a possible shock or accidental exposure to an already lit or striking lamp.

Remember to wear leather gloves and protective eyewear when working near an unshielded xenon lamp. Avoid touching the lamp with bare skin. Dirt and oils from skin can greatly reduce lamp life.

All moving parts (fans, stepper motors, and opto-sensors) can be cleaned of any accumulated dirt with a duster or low-pressure compressed air.

To clean the lens and mirror of the fixture: Apply a small amount of mild glass cleaning solution to a clean, soft cloth or tissue. Gently wipe the lens and mirror with the cloth. Be careful not to apply excessive pressure on the mirror while cleaning.

Xenon Lamp Maintenance

The Emulator System is designed to prolong the life of the xenon lamp for as long as possible. However, eventually the lamp will wear out and need to be replaced. Due to the pressurized envelope surrounding the xenon lamp, it needs to be treated with the proper precautions and respect.

If an Emulator fixture consistently strikes the lamp, and a moment later extinguishes the lamp, it is an indication that the electrodes in the lamp are worn past a useful state. The lamp should be replaced. (To install the lamp, follow the procedures outlined in Section 2 of this manual.)

Aging Damage to the Xenon Lamp

The Emulator Fixture uses a xenon arc-type lamp. In this lamp, there are two electrodes that electricity arcs across, creating the intense light source required by the fixture. As your Emulator ages, these electrodes in the lamp will erode from natural wear. The Emulator circuitry is designed to sense this condition, and when the lamp has worn out enough to become unstable, the Emulator will shut down and no longer strike up the lamp.

Due to variations in lamp manufacturing, however, there is a remote possibility that the pressurized lamp will shatter during its useful life. When a lamp shatters, it may destroy the collimating lens as well as the reflector behind the lamp. Lightwave Research has anticipated this possibility by providing a reflector and lens kit for replacement. Ask your High End systems dealer for information about the kit.

In the unlikely event that a lamp shatters,

- Turn the fixture off.
- Using good safety procedures, clear all loose glass from the Emulator fixture.
- If the condensing lens is damaged, remove and replace the lens holding ring with a phillips head screwdriver.
- Remove the remains of the lamp from its mount.
- If the reflector is damaged, you will need to return your Emulator fixture for replacement of the reflector and factory alignment of the reflector assembly.
- Replace and Optimize the lamp following the instructions in Section 2 of this manual.

Replacing the Xenon Lamp

CAUTION

Whenever you are working on or near the Emulator xenon Lamp, wear protective eyewear and leather gloves. The xenon lamp is pressurized, therefore, there is a possibility that it may shatter. When power is applied to the fixture, the unshielded Emulator xenon lamp emits Ultraviolet and visible radiation which could damage eyes and skin. Never remove the top fixture door when the lamp is on. If dirt or oil from dirty gloves, skin or fingers, etc. come in contact with the lamp glass, the lamp will overheat and burst. If the lamp is soiled in any way, clean it carefully with an alcohol wipe.

To replace the xenon lamp, follow the procedure for installing the xenon lamp. (See **Installing the xenon Lamp** in Section 2 of this manual.) All of the procedures will be the same, except that you will not have to cut the tie-wrap from the lamp cap because the fixture has already been used.

After you replace the lamp, you will need to optimize the fixture. Follow the procedure for optimizing the fixture explained in **Optimizing the Emulator Fixture** in Section 2 of this manual.

Disposing of the Xenon Lamp

There are two methods to properly dispose of the burnt-out lamp:

- (1) Send the lamp, in its protective cover and original packaging, to your High End Systems Dealer.
- (2) Destroy the lamp as follows: **Completely** wrap the lamp in a protective cover (e.g. a thick dry scrubbing cloth, etc.), put it on a hard surface and smash it with a hammer. Safely dispose of the shattered lamp, being careful not to touch any of the broken glass.

Troubleshooting Guide

This troubleshooting guide is for the basic diagnosis of an Emulator system. It is meant to be used as a guideline to point out simple solutions for common problems. If the problem encountered is beyond the scope of this guide, please contact your High End Systems dealer for further guidance or an on-site examination of your system. Due to the modular nature of Lightwave Research products, most repairs are quickly and easily accomplished.

SYMPTOM: Unit will not power up

Fixture not plugged in:	Plug the fixture in.
Fixture not turned on:	Turn on power switch on rear panel of the fixture.
Line fuse blown:	Replace fuse with specified type. If fuse continues to blow, return the fixture for service.
No lamp installed:	Install the lamp as per installation procedure in Section 2 of this manual.
Top door open:	Replace and tighten top door to activate safety interlock switch.

SYMPTOM: Lamp will not ignite/strike

REMEMBER TO ALWAYS WEAR LEATHER GLOVES AND PROTECTIVE EYEWEAR ANY TIME YOU HANDLE THE LAMP. DIRT AND OILS FROM THE SKIN CAN GREATLY REDUCE LAMP LIFE.

Lamp not installed:	Install lamp as per installation procedure in Section 2 of this manual.
Data cable not connected:	Connect data link between controller and fixtures.
Controller not turned on:	Turn on the controller.

Top door open:	Replace and tighten top door.
Lamp ignites and then shuts off:	Replace lamp. See instructions for installing the lamp in Section 2 of this manual. (The Emulator fixture senses when a lamp is at the end of its useful life and automatically shuts itself off.)
Lamp expired:	Replace lamp. (See instructions for installing the lamp in Section 2 of this manual.)
Lamp not seated properly:	Loosen lamp retaining screw in the lamp base, reposition lamp and tighten the screw. (See Figure 2.7 in Section 2 of this manual to locate the lamp retaining screw and lamp base.)
Lamp cap not seated properly on lamp:	Loosen lamp cap screw, position cap and tighten the lamp cap screw securely. (See Figure 2.7 in Section 2 of this manual to locate the lamp cap screw.)
Any other reason :	Call your HES Dealer/Distributor to return the fixture for servicing.

Note: Before sending anything to the factory, be sure to call your HES Dealer/Distributor for a Return Authorization Number. Any goods shipped without an RA number will be refused at the factory.

SYMPTOM: Fixture will not respond to data

Data cable not connected:	Install datalink between controller and fixtures.
Personality not set properly:	Set Personality DIP Switches 1 (Self-Test mode) and 2 (Set-Up mode) to the "off" position. Review the proper settings of the Personality DIP switches of both the fixture and the controller in Section 2 of this manual.
Fixture is addressed wrong:	Set address switches to match controller addressing.
Controller not turned on:	Turn on the controller.
Bad datalink cable:	Find and replace bad datalink.
Fixture connected to the wrong controller:	Make sure the Emulator fixture is connected to an Emulator controller.

SYMPTOM: Low output from lamp

Lamp not optimized:	Follow lamp optimization procedure in Section 2 of this manual
Large number of usage hours on the lamp:	Lamp is at the end of its useful life. Replace it with new lamp following the procedure described in Section 2 of this manual.
Controller intensity set below "Full Brightness":	Be sure that the Master Intensity level is set to "Full Brightness" (99).
Contaminants and/or dust build-up on optics:	Clean optics very carefully with soft cloth or tissue. Slight pressure on mirrors can damage galvos.

Contact your Dealer/Distributor for assistance with the following:

- 1) Scanners (galvos) distorting images
- 2) Shutter or color wheel not homing or operating properly
- 3) Damaged optics
- 4) Fuses continue to blow

Problems that can be fixed by replacing fuses

Galvos won't operate:

Check F1 and F2 on power the supply board.

Steppers (color wheel & shutter) won't operate:

Check F4 and F5; also check main fuse on rear panel of the fixture.

Motor LED is lit but fixture won't operate:

Check F3.

Lamp and fan won't operate, but all motors are working properly and lamp LED is flashing:

Check F5.

In any of above situations, if fuse is good or the replacement fuse blows, contact your HES Dealer/Distributor.

Problems that can be fixed by replacing Eprom

Fixture won't operate
and only the motor LED is lit:

Check to see if the Eprom is
inserted properly:

- If the pins are not seated in the sockets correctly, they will probably be bent. Straighten the pins and replace the Eprom.
- If you remove the Eprom for any reason, take care not to re-install the Eprom backwards. If the Eprom is installed backwards and the controller is turned on, that Eprom will be inoperable. Do not turn it around and replace it. Remove it. Contact your High End Systems Dealer to get a new Eprom. Install the new Eprom by lining up the notch on the Eprom with the silkscreening on the printed circuit board.

Fixture won't operate,
the motor LED is lit and
the fan and lamp LEDs
are flashing:

Check to see if the Eprom is
inserted properly:

- If you remove the Eprom for any reason, take care not to re-install the Eprom backwards. If the Eprom is installed backwards and the controller is turned on, that Eprom will be inoperable. Do not turn it around and replace it. Remove it. Contact your High End Systems Dealer to get a new Eprom. Install the new Eprom by lining up the notch on the Eprom with the silkscreening on the printed circuit board.

SECTION 8

WARRANTY & PRECAUTIONS

Unpacking

Saving the Shipping Materials

Do not discard the Emulator controller shipping carton and packing materials or the Emulator fixture shipping carton and packing materials. These shipping cartons and packing materials are specifically designed to protect the products during transport.

If you ever need to return a product for repair or maintenance, you **must** return it in its original shipping carton and packing materials. You will be billed for a new shipping carton and new packing materials if you return your Emulator fixture or controller in a non-factory shipping carton with non-factory packing materials.

Note: Before sending anything to the factory, be sure to call your HES Dealer/Distributor for a Return Authorization Number. Any goods shipped without an RA number will be refused at the factory.

Inspecting the Contents

The contents of each shipping carton should be carefully removed and inspected for signs of freight damage. If any such damage is found, you need to notify both the shipping agent and the sales agent immediately.

Note: Freight Damage Claims are invalid for fixtures or controllers shipped in non-factory shipping cartons and packing materials.

Limited Warranty

Your Emulator system is covered by a one year parts and labor limited warranty. It is the owner's responsibility to furnish receipts or invoices for verification of purchase, date, and dealer or distributor. If purchase date cannot be provided, date of manufacture will be used to determine warranty period.

Returning a Warrantied Item for Repair

It is necessary to obtain a return authorization number (RA#) from your dealer/ point of purchase BEFORE any units are sent in for repair. The manufacturer will make the final determination as to whether or not the unit is covered by warranty. This warranty does not cover lamps, fuses, or glass parts. **Please Note: Freight Damage Claims are invalid for fixtures shipped in non-factory boxes and packing materials.**

All shipping will be paid by the purchaser and warrantied items shall have return shipping paid by the manufacturer only in the Continental United States. **Under no circumstances will freight collect shipments be accepted.** Prepaid shipping does not include rush expediting such as air freight. Air freight can be sent customer collect in the Continental United States.

REPAIR OR REPLACEMENT AS PROVIDED FOR UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE CONSUMER. LIGHTWAVE RESEARCH, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON THIS PRODUCT IS LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY.

Warranty is void if the product has been misused, damaged, or modified in any way. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Precautions

When handling and working with the Emulator System, please observe the cautions and warning listed below.

Cautions

- Please note and heed the Warning labels found on the outer panels of both the controller and the fixture.
- Tighten the thumbscrews securely on both the top and bottom access doors of the fixture.
- To avoid electrical shock and reduce the risk of fire, do not operate either the fixture or the controller near moisture of any kind.
- For further protection against fire, fuses must only be replaced by those with the specified voltage and current ratings.
- The Emulator System is not designed for residential use.
- These units contain no user-serviceable parts. Servicing must be conducted by the manufacturer or other qualified service personnel.

Warnings

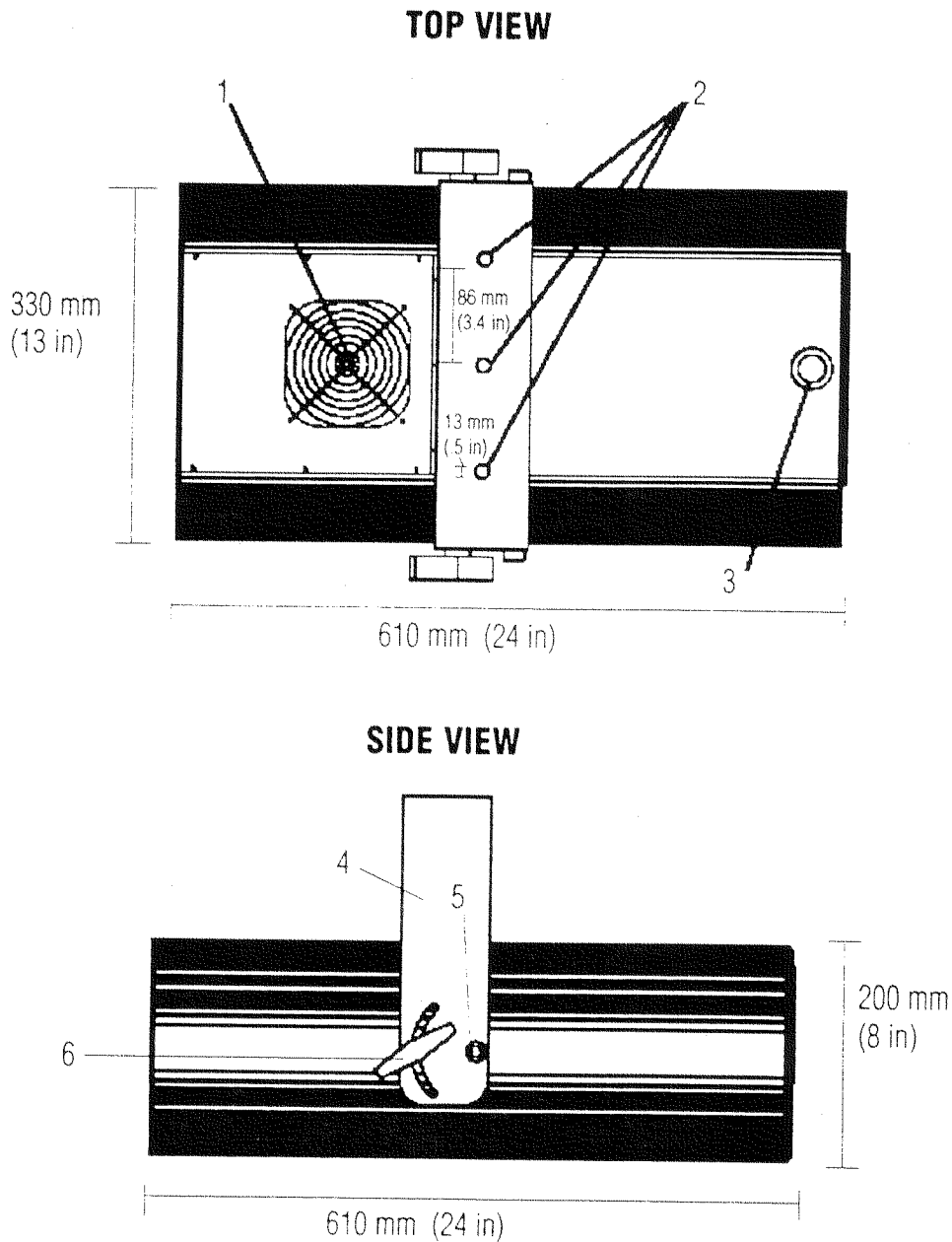
- Whenever you are working on or near the Emulator xenon lamp, wear protective eyewear and leather gloves.
- The xenon lamp is pressurized, therefore, there is a possibility that it may shatter.
- When power is applied to the fixture, the unshielded Emulator xenon lamp emits Ultraviolet and visible radiation which could damage eyes and skin.
- Never remove the top door of the fixture when the lamp is on.

Appendix A: Fixture Specifications

- High output xenon lamp source
- 11 dichroic colors plus white
- Variable speed strobe
- High resolution stepper motors
- Precision galvanometers
- Self diagnostics
- Lightweight aluminum construction
- Anti-reflective emission window
- Auto remote cooling system shutdown
- Variable speed color rotation
- Balanced RS-422 serial data link
- 650 hours average lamp life
- X & Y scan angles: 60° x 60°
- Voltage selectable:
 - 100 Volts @ 50/60Hz
 - 120 Volts @ 50/60Hz
 - 240 Volts @ 50/60 Hz
- Power consumption:
 - (Normal mode)
 - 7 amps @ 100 V/50Hz
 - 6 amps @ 120V/60 Hz
 - 3 amps @ 230 V/50 Hz
- Dimensions:
 - 610 mm L x 330 mm W x 200 mm H
 - 24 in L x 13 in W x 8 in H
- Weight:
 - 23 kg (50 lbs)

specifications subject to change without prior notice

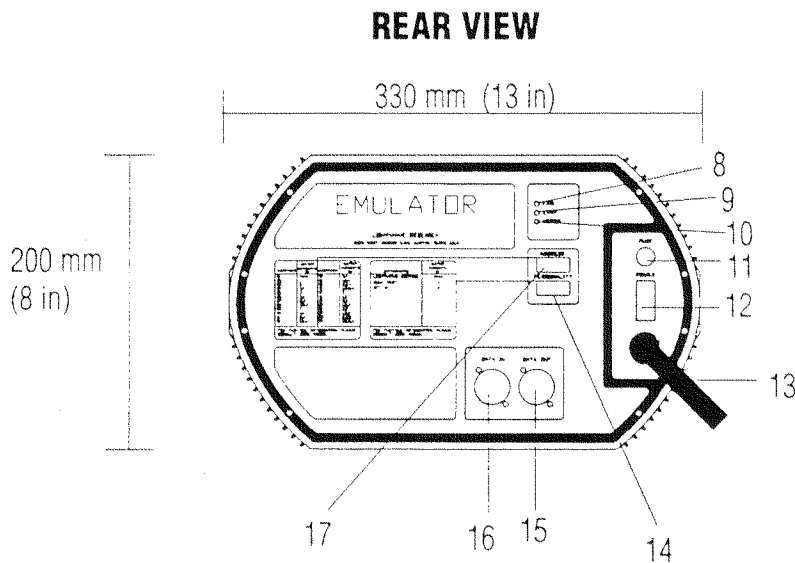
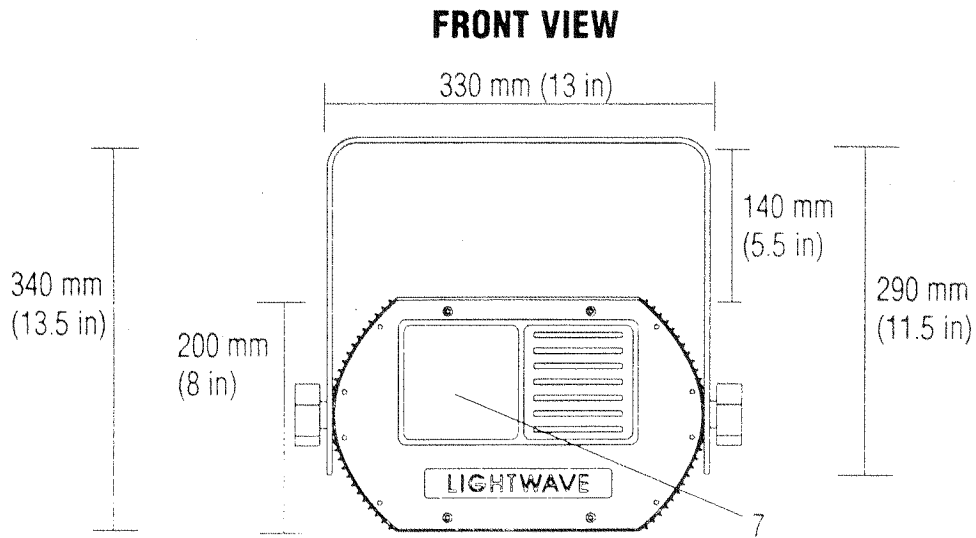
Appendix B: Fixture Illustrations



Emulator Fixture Illustration: Top View & Side View
(See Appendix A for fixture specifications.)

1. COOLING FAN
2. YOKE MOUNTING HOLES
3. TOP DOOR THUMBSCREW
4. YOKE
5. ALLEN CAP SCREW BOLT
6. CLAMPING T-HANDLE

Appendix B: Fixture Illustrations



Emulator Fixture Illustration: Front View & Rear View
(See Appendix A for fixture specifications.)

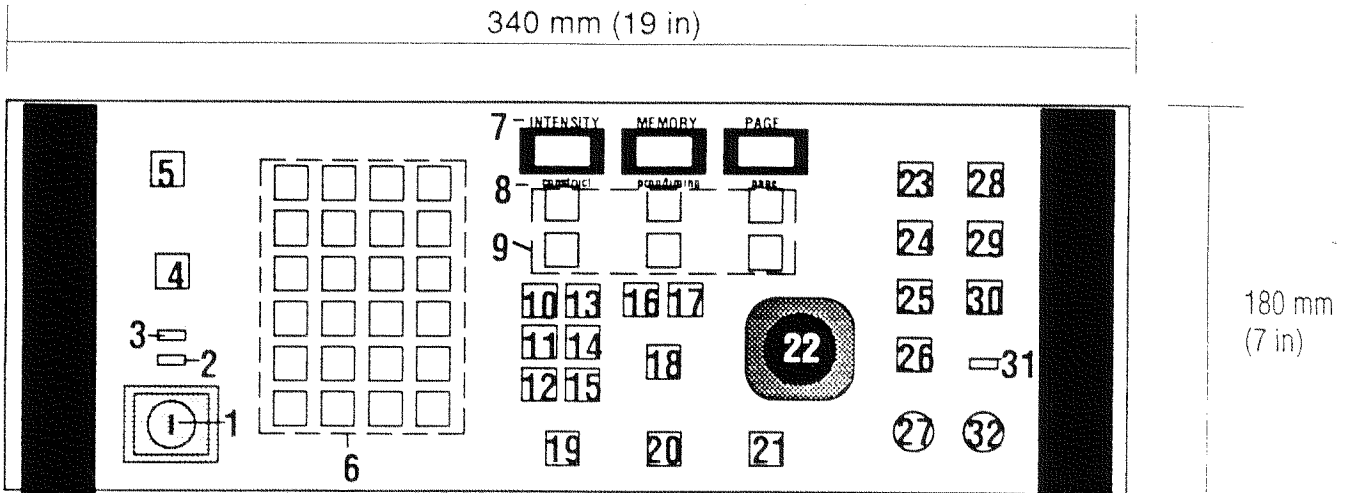
- 7. ANTI-REFLECTIVE EMISSION WINDOW
- 8. FAN INDICATOR LED
- 9. LAMP INDICATOR LED
- 10. MOTOR INDICATOR LED
- 11. FUSE
- 12. POWER SWITCH
- 13. AC LINE CORD
- 14. PERSONALITY DIP SWITCH
- 15. DATA OUT CONNECTION
- 16. DATA IN CONNECTION
- 17. ADDRESS DIP SWITCH

Appendix C: Controller Specifications

- 99 infinitely variable patterns
- 891 programmable scenes
- 1023 programmable presets
- 24 individual addresses
- Scrolling and alphanumeric graphic capability
- Application-specific editing functions
- Inductive joystick
- Remote operation capability
- Stereo audio inputs
- Self diagnostics
- Rack mountable - 4 units high
- Fixture exclusion
- Master/slave capability
- Positive feel switches
- Locking key switch
- Voltage selectable:
 - 100 Volts @ 50/60Hz
 - 120 Volts @ 50/60Hz
 - 240 Volts @ 50/60 Hz
- Frequency selectable:
 - 50 Hz
 - 60Hz
- Dimensions:
 - 180 mm H x 480 mm W x 280 mm D
 - 7 in H x 19 in W x 11 in D
- Weight:
 - 8.1 kg (18 lbs)

specifications subject to change without prior notice

Appendix D: Controller Illustrations

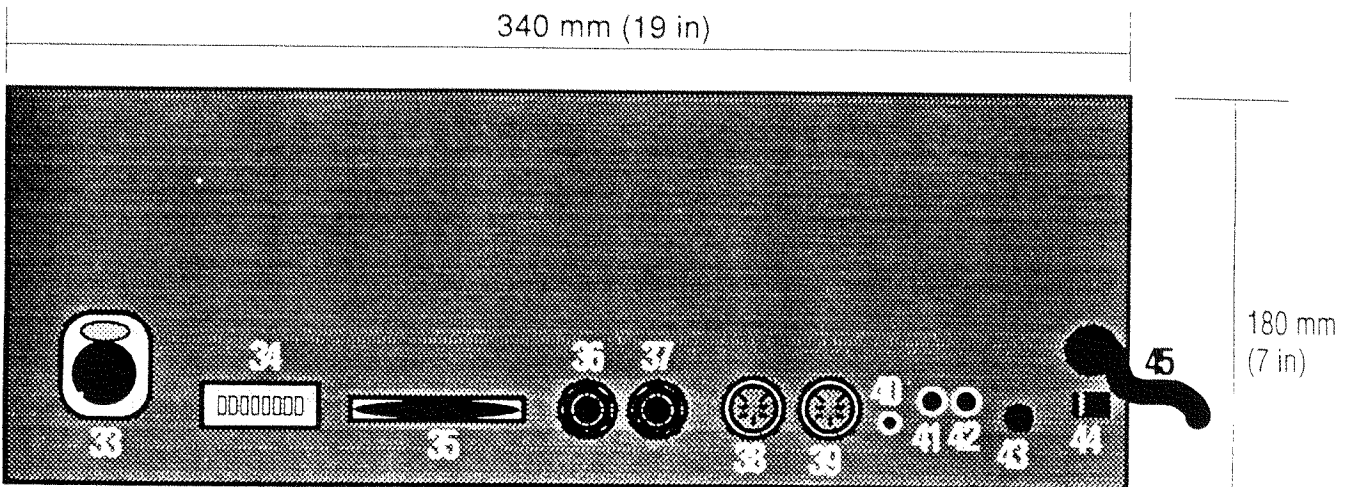


Emulator Controller: Front Panel

(See page *Appendix A* for controller specifications. For detailed descriptions, please see Section 3.)

- | | |
|--|---------------------------|
| 1. POWER KEYSWITCH | 16. PROGRAM KEY |
| 2. SLAVE MODE INDICATOR LED | 17. DELAY KEY |
| 3. MASTER MODE INDICATOR | 18. HOME KEY |
| 4. STANDBY KEY | 19. SELECT KEY |
| 5. ADDRESS/PRESET SELECT KEY | 20. RECORD KEY |
| 6. ADDRESS/PRESET NUMBERS | 21. ERASE KEY |
| 7. I.M.P. DISPLAY (INTENSITY,
MEMORY, PAGE) | 22. JOYSTICK |
| 8. C.T.P. DISPLAY (CONSTRUCT,
PROGRAM/TIMING, PAGE) | 23. RANDOM ADVANCE |
| 9. UP/DOWN ARROW KEYS | 24. AUDIO 1 ADVANCE |
| 10. COLOR KEY | 25. AUDIO 2 ADVANCE |
| 11. SCALE KEY | 26. AUTO ADVANCE |
| 12. ANGLE KEY | 27. RATE KNOB |
| 13. GATE KEY | 28. COLOR MODULATE |
| 14. SCAN KEY | 29. SIZE MODULATE |
| 15. SPEED KEY | 30. CHORUS MODULATE |
| | 31. AUDIO LEVEL INDICATOR |
| | 32. AUDIO KNOB |

Appendix D: Controller Illustrations



Emulator Controller: Rear Panel

(See page *Appendix A* for controller specifications. For detailed descriptions, please see Section 3.)

- 33. DATA LINK OUT
- 34. PERSONALITY DIP SWITCHES
- 35. RS-232 SERIAL PORT
- 36. MASTER OUT
- 37. SLAVE IN
- 38. REMOTE PAGE SELECT/ANALOG INPUT CONNECTOR (CHANNELS 1-6)
- 39. REMOTE PAGE SELECT/ANALOG INPUT CONNECTOR (CHANNELS 7-12)
- 40. REMOTE ENABLE
- 41. LEFT STEREO/AUDIO INPUT
- 42. RIGHT STEREO/AUDIO INPUT
- 43. FUSE
- 44. VOLTAGE SELECT SWITCH
- 45. LINE CORD