

# Chapter 2

## *emulator* Fixture Set Up and Assembly

In Section 2 you:

- Unpack and inspect the fixture and controller contents
- Set fixture voltage (if required)
- Assemble the *emulator* Fixture
- Set configuration DIP switches as required

### **Unpacking the *emulator* System**

---

In this section you unpack your *emulator* System and verify that it arrived complete and without any damage.

#### **Saving the Shipping Materials**

---

**Do not discard** the *emulator* Fixture or *emulator* Controller shipping cartons and packing materials. These shipping cartons and packing materials are specifically designed to protect these 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 (RA#). Any goods shipped without an RA number will be refused at the factory.

#### **Inspecting the Contents**

---

Your *emulator* System arrives in two shipping cartons. One carton contains the controller and its accessories, and the other contains the fixture and its accessories. Carefully unpack both cartons and inspect their contents for damage. If any of the items in the following lists are missing or damaged you must notify both the shipping agent and your sales agent immediately.

The controller carton contains the following items (refer to Figure 2.1):

- One Lightwave Research T-Shirt
- One *emulator* Laser Simulator User Manual
- One book of *emulator* schematic drawings

- One *emulator* Backup Floppy Disk (5 1/4 inch) (inside manual)
- Two controller keys
- One light meter
- One Memory Card

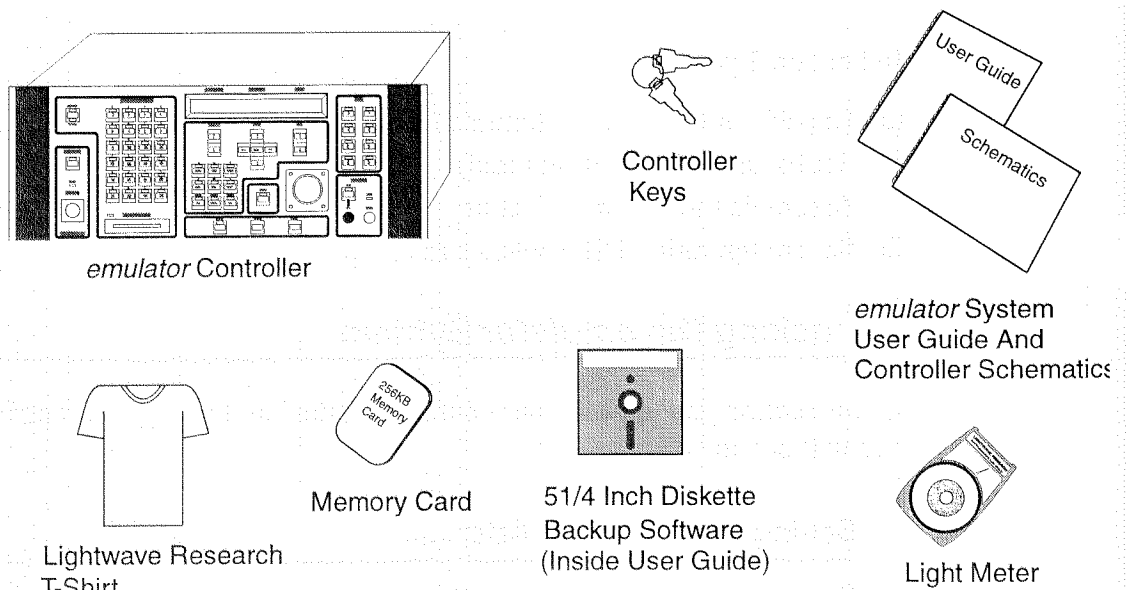


Figure 2.1. Identifying Contents of Controller Carton

The fixture carton contain the following items (refer to Figure 2.2):

- One *emulator* Fixture
- One xenon lamp packaged in separate box
- An Initial Setup Instruction packet containing the xenon lamp installation and optimization instructions
- One yoke
- Two 5/16 inch allen cap screw bolts
- Two clamping T-handles

**Note:** The factory installs the two 5/16 inch allen cap screw bolts and the two clamping T-handles. You will need to remove them in order to install the yoke. Refer to Figure 2.3.

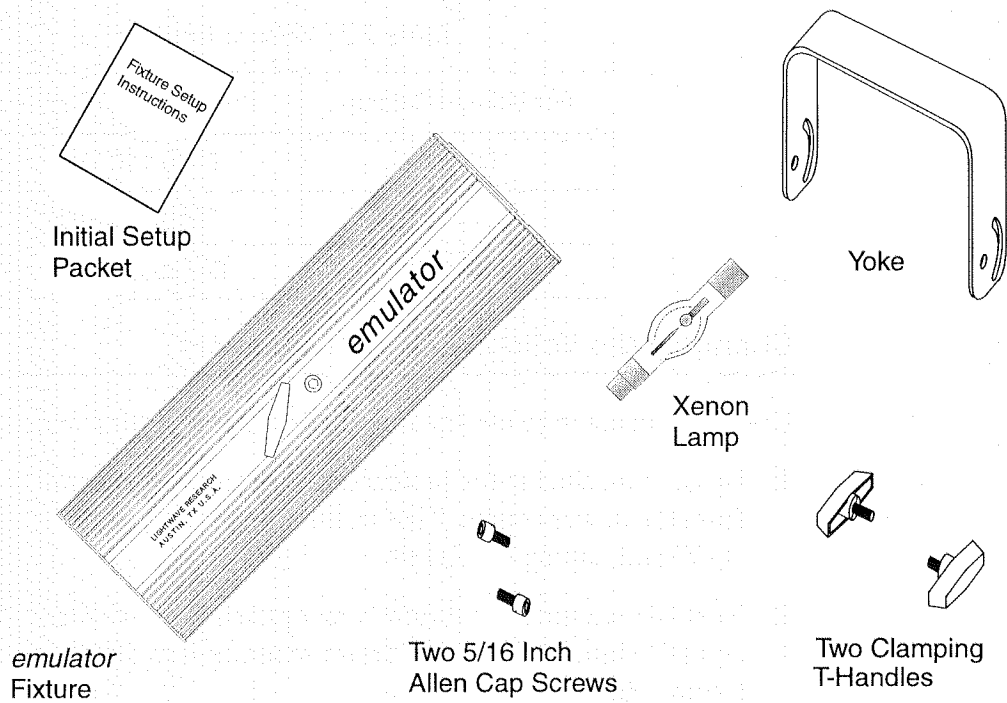


Figure 2.2. Identifying Contents of Fixture Carton

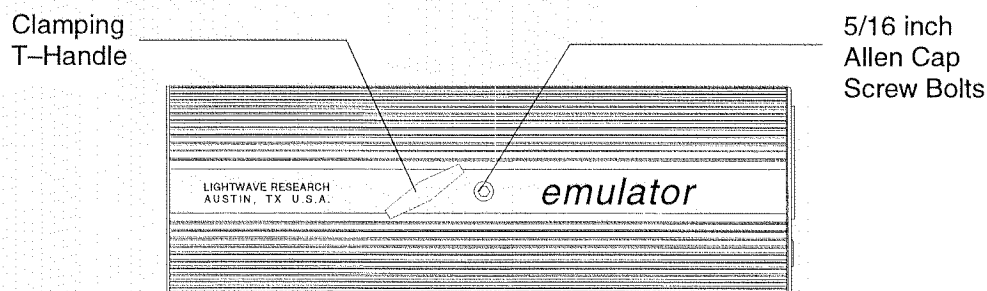


Figure 2.3. emulator Fixture Shipping Configuration

### Setting the emulator Fixture Voltage

The emulator fixture is factory set to customer requirements. Typically, in the U.S. it is 120 volts and in some environments, 208/240 volts. International installations are typically 100 and 240 volts. Normally, the factory setting is correct for your use. However, if you need to change the fixture’s input voltage refer to the procedure in this section. Otherwise, proceed to the *Assembling the Fixture* section.

You can set the fixture to operate at 100, 120, or 230 volts ( $\pm 10$  percent), 50 or 60 Hertz, by changing jumpers on a quick disconnect terminal block within the fixture. You also change the input fuse on the back panel of the fixture to match the voltage setting. Table 2.1 shows the voltage ranges for each setting:

Table 2.1: Voltage Ranges

For Voltage Setting:	The Voltage Range is:
100 Volts	90 to 110 Volts
120 Volts	108 to 13 Volts
230 Volts	207 to 253 Volts

### Changing the Voltage Selection Jumpers

Use this procedure to change the fixture voltage setting and associated fuse.

1. Before you change the jumpers, first disconnect the unit from the power source. That is, turn the power switch to "Off" and unplug the fixture.
2. Next, you remove the fixture's rear panel. Remove the eight 9/64 inch allen head screws securing it to the fixture. Refer to Figure 2.4.

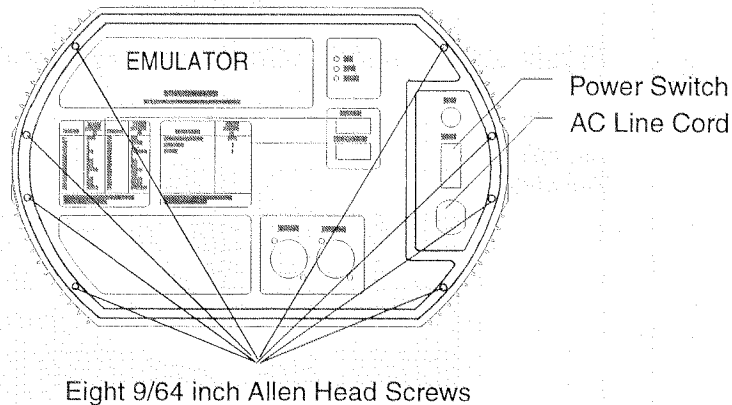
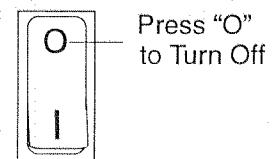


Figure 2.4. emulator Fixture Rear Panel

3. Carefully lower the rear panel out of the way, taking care not to strain the attached wiring harnesses.
4. Mounted just inside the fixture is the power supply printed circuit board. Locate the multi-pin "voltage select jumper block" connector on the lower right side of the circuit board as Figure 2.5 shows.
5. Remove the multi-pin "voltage select jumper block" from the mating circuit board pins. The jumper wires are attached to the block and are removed with it. If the connector is tight, carefully lift up on each side of the connector in equally small amounts. Repeat this process until you can easily remove the connector.

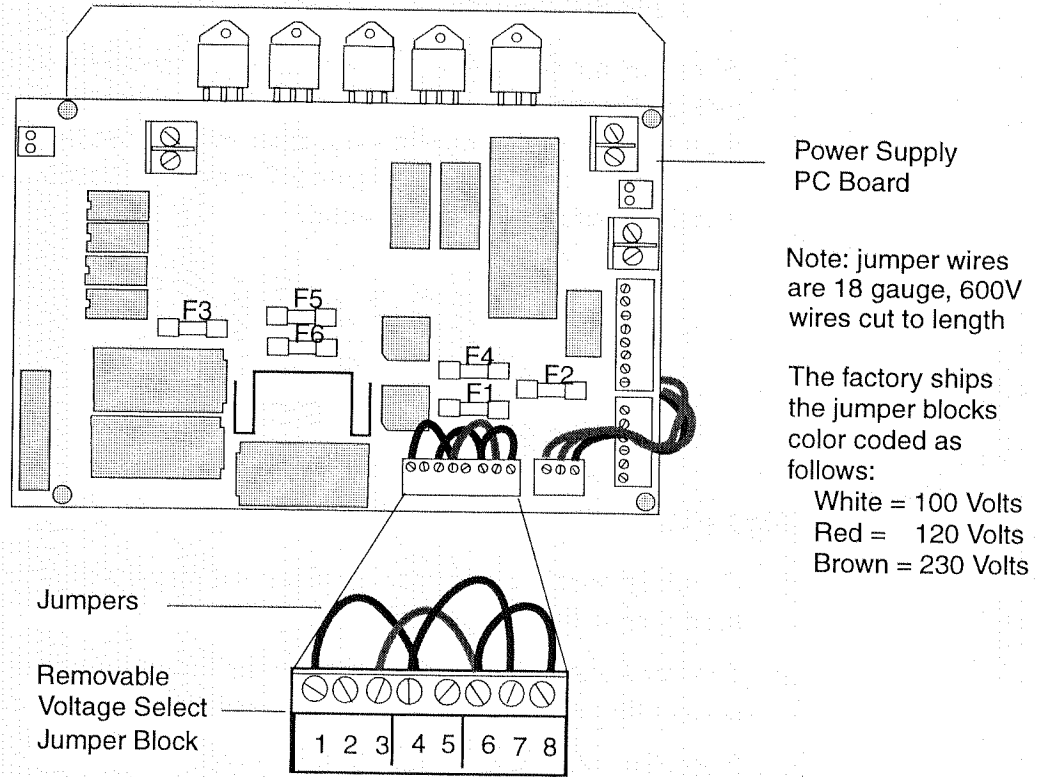


Figure 2.5. Power Supply Board and Voltage Select Jumper Block

- Using a small screwdriver, reconfigure the jumpers according to Table 2.2 and the drawings in Figure 2.6. Also notice in Table 2.2 the fuse size that is associated to each voltage setting.

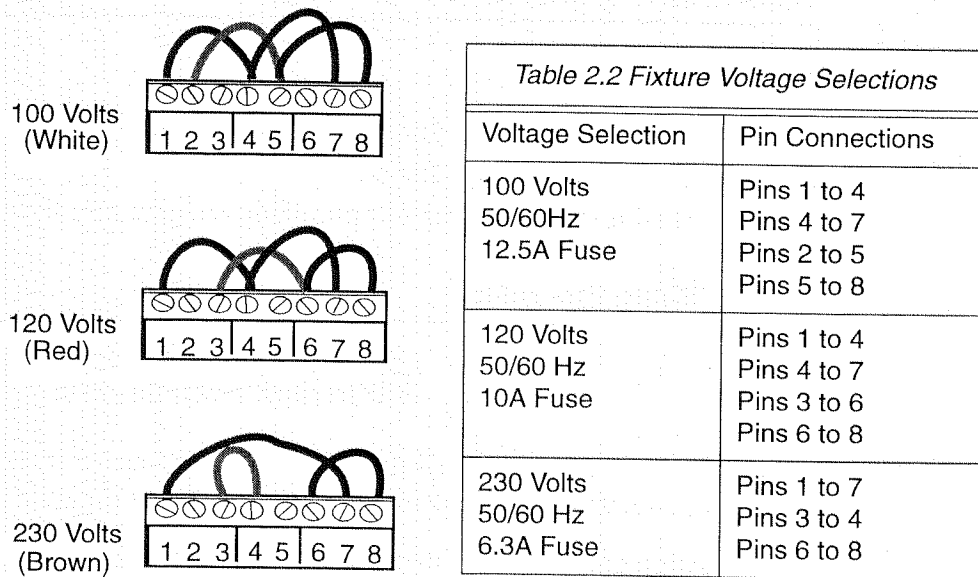


Figure 2.6. Voltage Selection Configurations

**Note:** the orientation of the jumpers is left to right, one through eight as Figure 2.6 shows.

7. When you are satisfied with your jumper connections, install the jumper block back on the mating circuit board pins. Be sure that the eight circuit board pins align with the eight holes in the jumper block. Push the connector until firmly seated on the circuit board. Figure 2.7 shows the circuit board labeling for the associated jumper block connector.

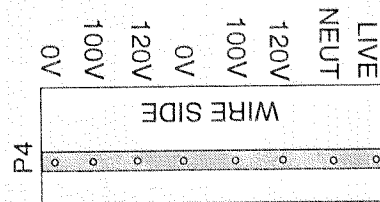


Figure 2.7. Printed Circuit Board Labeling for Mating Jumper Block

8. Carefully raise the rear panel in place and fasten with the eight 9/64 inch allen head screws that you removed in step 2.
9. The last thing you must do is replace the fixture's rear panel fuse with the correct fuse size to match the voltage as listed in Table 2.2.

**Note:** The replacement fuse must be a type "FST," 250V, time lag fuse of correct value from Table 2.2.

This completes the procedure on changing the voltage jumpers. Continue with the *Assembling the Fixture* section.

## **Assembling the *emulator* Fixture**

---

In this section you:

- Install the yoke on the fixture
- Install the xenon lamp in the fixture
- Perform the important step of optimizing the emulator fixture.

### **Attaching the Yoke**

---

**You will need . . .**

- **5/16 inch allen wrench**

1. First, remove the two 8 mm (5/16 in) allen cap screw bolts and the two clamping T-handles from the fixture. Refer to Figure 2.8.
2. Align the mounting holes on the yoke with those on the fixture.

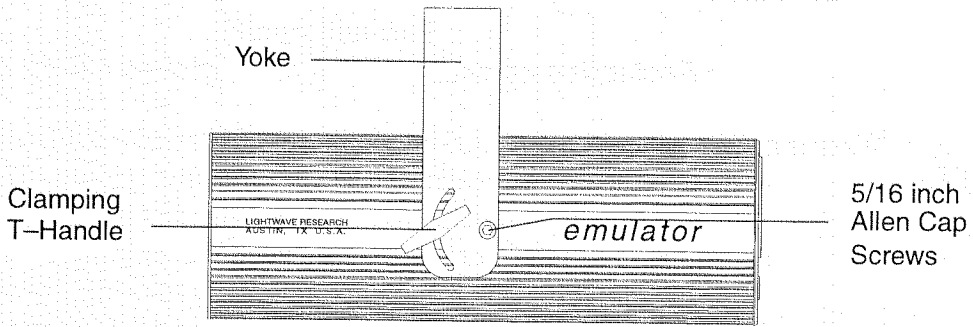


Figure 2.8. emulator Fixture — Side View

3. Insert the 5/16 inch allen cap screw bolts through the round holes on the yoke. Then, insert the clamping T- handles into the slotted curved cut outs on the yoke.
4. Tighten the 5/16 inch allen cap screw bolts with your allen wrench.

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 13 mm (.5 inch) mounting holes. They provide two different ways to mount the fixture. The three holes are spaced 86 mm (3.4 inch) apart. Refer to Figure 2.9. 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.

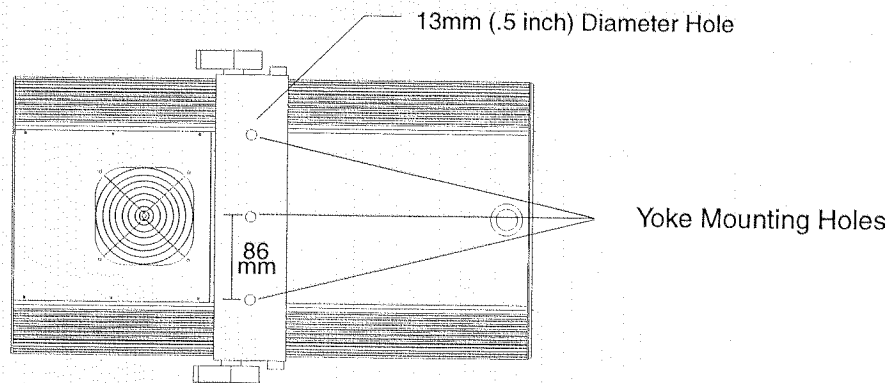


Figure 2.9. emulator Fixture — Top View

## Installing the Xenon Lamp

You will need . . .

• **Protective eyewear** • **Protective gloves** • **Wire Cutters**



**Warning:** Whenever you are working on or near the *emulator* Fixture's xenon Lamp, wear protective eyewear and clean protective gloves. The xenon lamp is pressurized, therefore, there is a possibility that it may shatter. When power is applied to the fixture, the unshielded 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, and so forth 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, carefully clean it with an alcohol wipe.

1. Loosen the thumbscrew on the top door of the fixture. Refer to Figure 2.10. If you have already installed the yoke, you may need to push it back (down) toward the rear of the fixture to provide clearance. Then, remove the top door. You now have access to the *lamp base* and *lamp retaining screw*. Refer to Figure 2.11.

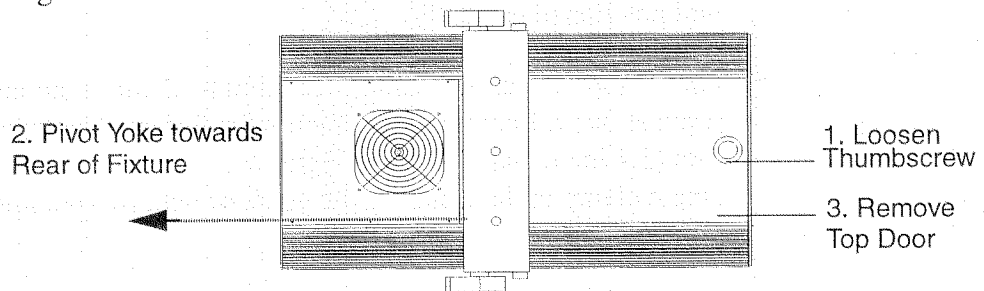


Figure 2.10. *emulator* Fixture — Top View

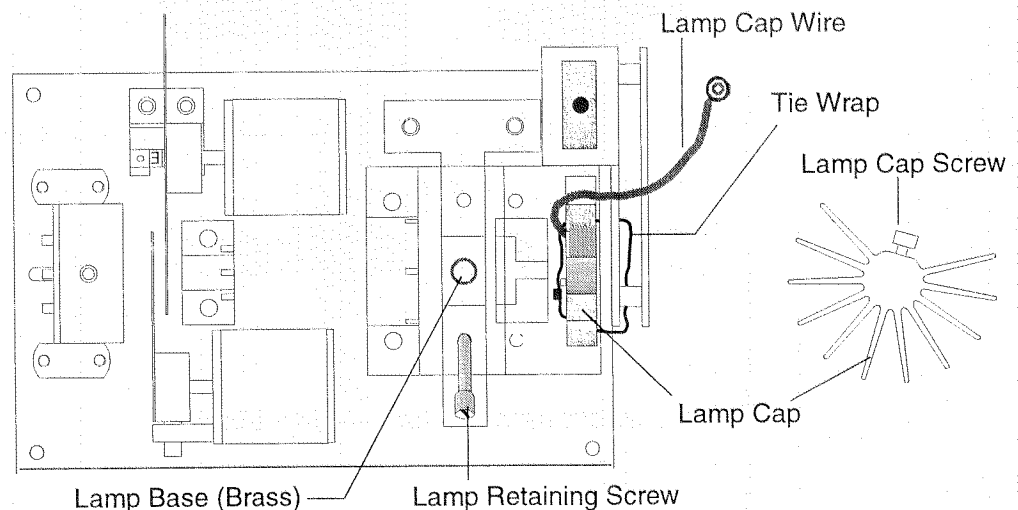


Figure 2.11. Inside the *emulator* Fixture



2. Locate the *lamp base*, *lamp retaining screw*, and *lamp cap*. Refer to Figure 2.11.
3. Carefully cut the *plastic tie-wrap* with wire cutters. The tie-wrap secures the *lamp cap* during shipping. Refer to Figure 2.11.
4. The *lamp cap* is attached to the fixture by the *lamp cap wire*. Refer to Figure 2.9. Set the *lamp cap* up out of the way so it is not blocking the *lamp base*.
5. Open the box containing the xenon lamp. The lamp is contained in a protective plastic tube. **Do not** open the plastic tube yet.
6. **Put on your protective eyewear and protective gloves.** Always wear protective gloves and protective eyewear when handling the xenon lamp during this installation and in any future adjustments.
7. Carefully remove the xenon lamp from its protective plastic tube.
8. Locate the *lamp nipple* on the xenon lamp. Refer to Figure 2.12.
9. Position the *lamp nipple* so that it is at a 90° angle to the *Emission Window* on the front panel of the fixture. Refer to Figure 2.13. Proper placement of the lamp ensures that the lamp nipple does not obstruct or distort the light output of the xenon lamp.

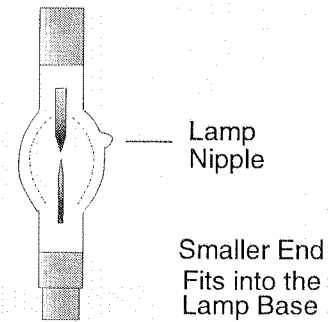


Figure 2.12. Xenon Lamp

10. Loosen the *lamp retaining screw* and insert the smaller end of the xenon lamp into the *lamp base*. The *lamp base* is made out of brass. Refer to Figure 2.13.

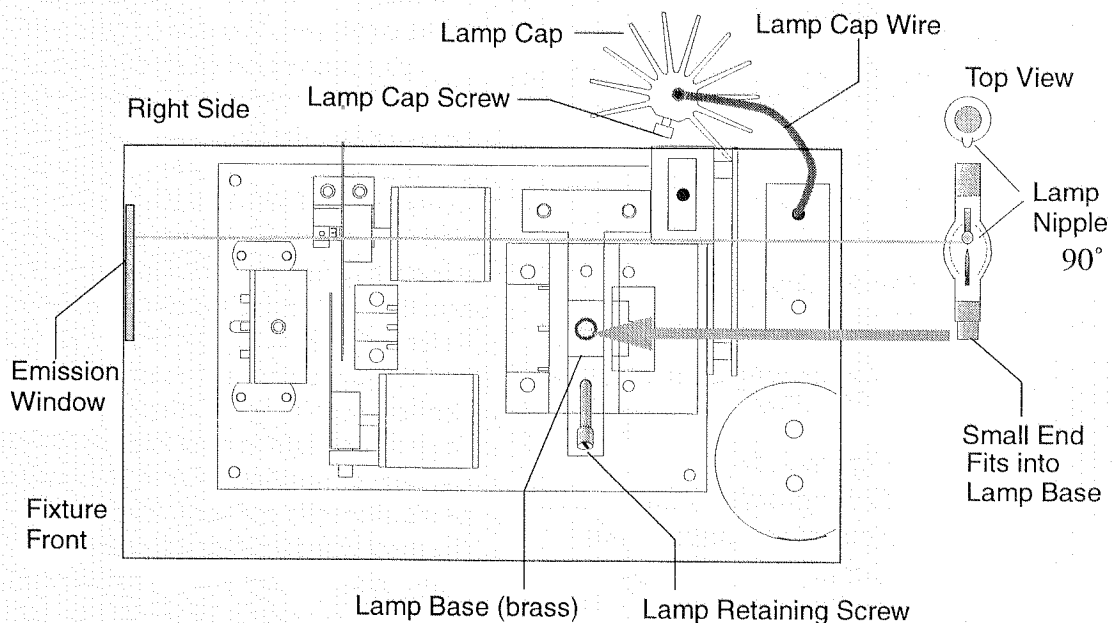


Figure 2.13. Positioning the Xenon Lamp

11. Holding the xenon lamp in place, tighten the *lamp retaining screw* by hand so that it fits securely. Refer to Figure 2.13. If you have access to a torque measuring screwdriver you can safely tighten the lamp retaining screw to 10 inch pounds without crushing the end of the lamp. If you over tighten the retaining screw the lamp becomes misaligned in the socket and is then difficult to focus.
12. Loosen the *lamp cap screw*. Refer to Figure 2.13. Place the *lamp cap* on top of the xenon lamp. Position the *lamp cap* so that the *lamp cap screw* aligns with the *lamp retaining screw*. That is, on the same side of the fixture. Refer to Figure 2.13. Tighten the *lamp cap screw* finger-tight. If you have access to a torque measuring screwdriver you can safely tighten this screw to 6 inch pounds.

**Note:** If you find it difficult to view the Pinhole Aperture when you optimize the fixture later in this section, you may have the *lamp cap* positioned so that the fin closest to the lamp cap screw is blocking the viewing path. Align the *lamp cap* on the lamp in the same orientation as shown in Figure 2.13.

13. Replace the top door and tighten the thumb screw. Do not remove your protective eyewear or protective gloves until the top door is in place.

## The Optimization Process: Why It Makes a Big Difference

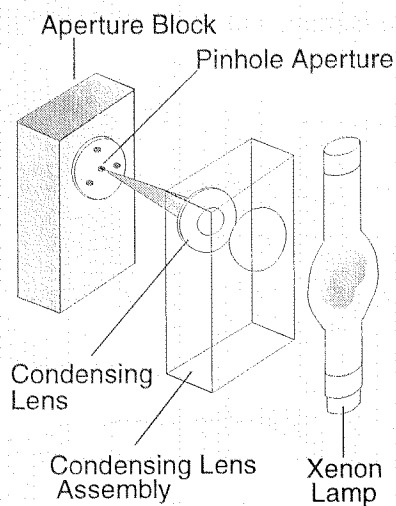


Figure 2.14.  
Orthographic View of the  
emulator Optical Train—  
Detail of the Pinhole  
Aperture.

The xenon lamp used in the *emulator* Fixture 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”, similar to a welder’s arc, must be positioned correctly in front of the condenser. You achieve this correct positioning through a process called *Optimization*. This is accomplished by turning the three adjustment *t-screws* located under the lamp base to create the brightest possible point of light over the pinhole aperture. Refer to Figures 2.14 and 2.15. 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. Refer to Figure 2.15. 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* Fixture.** If you feel you are having difficulty with the optimization process, or would like further assistance, please contact your High End System Dealer or HES Service at (512) 837-3063).

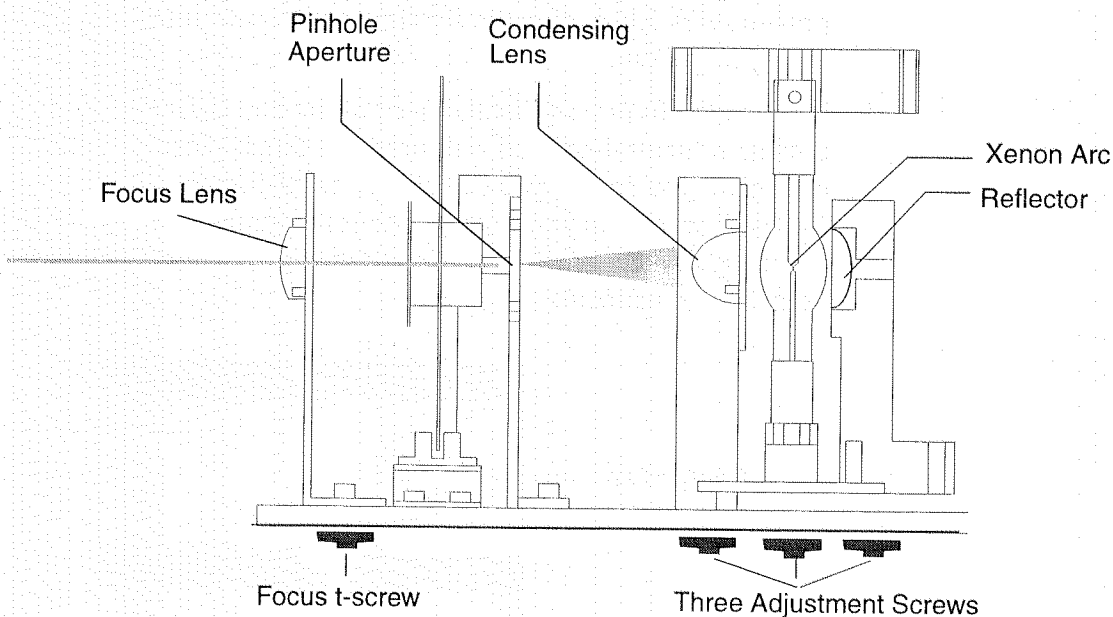


Figure 2.15. emulator Optics – Side View

### Optimizing the emulator Fixture

1. Before you optimize the emulator Fixture, you must first install the xenon lamp. If you have not installed the xenon lamp, do so now; refer back to the previous “Installing the xenon lamp.” section. Also locate the electrical outlet that you will be using for the fixture.
2. Ensure that the top door is secured by checking the tightness of the thumbscrew. **Never remove the top door when the lamp is on.**
3. Suspend the emulator Fixture from its yoke where it will be used or prop the fixture up on 2 sturdy objects. Place one supporting object at each end of the fixture, leaving enough room so that you can easily remove the bottom door to access the underside of the fixture. Refer to Figures 2.16 and 2.17. Be careful not to block the cooling fan if you are propping the fixture up rather than hanging it.

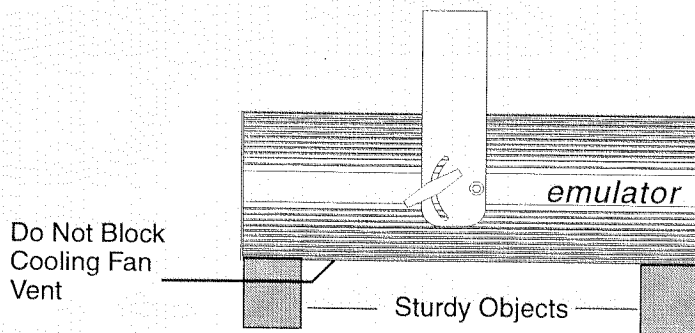


Figure 2.16. Supporting emulator Fixture for Optimization

4. Ensure the power switch on the rear panel is in the Off position (O). Then, plug the fixture's power cord into the electrical outlet.
5. Position the fixture so that the front of the unit is facing a white or neutral-colored wall or object that is close enough to you so that you can clearly see the lamp output. This allows you to rough focus the output on a wall or object when you strike the lamp in a following step. You can then immediately see the effects of your fine-adjustments.

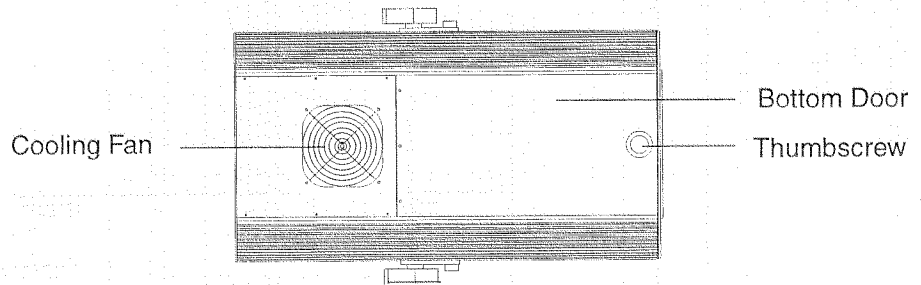
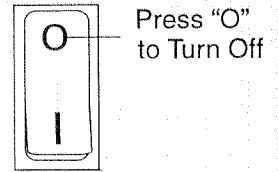


Figure 2.17. emulator Fixture – Bottom View

6. Locate the *personality DIP switches* on the rear panel of the fixture. Refer to Figure 2.18. Place the fixture in “Set Up” mode by pushing personality DIP Switch 2 to the “On” (up) position. Ensure all of the remaining personality DIP switches are in the “Off” (down) position. Refer to Figure 2.18.
7. Remove the bottom door by loosening the thumbscrew, and then, slide the door off. The door is connected to the fixture by a safety strap. You can unclip the door from the safety strap or leave connected for this procedure.
8. Locate the power switch on the rear panel of the fixture. Turn power “On” by pressing the “I” side of the switch. Refer to Figure 2.18.

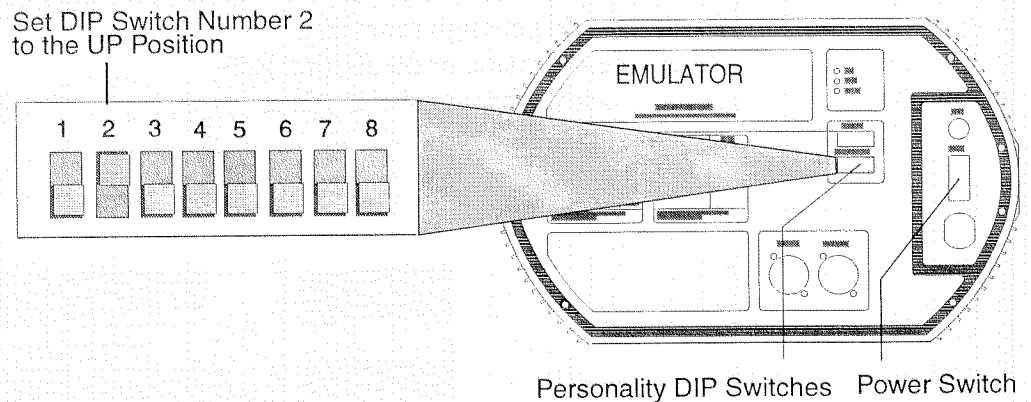
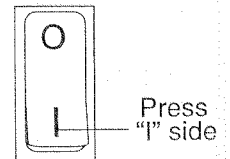


Figure 2.18. emulator Fixture Set Up Mode

9. Locate the three adjustment t-screws on the underside of the fixture beneath the lamp base. Refer to Figure 2.19.

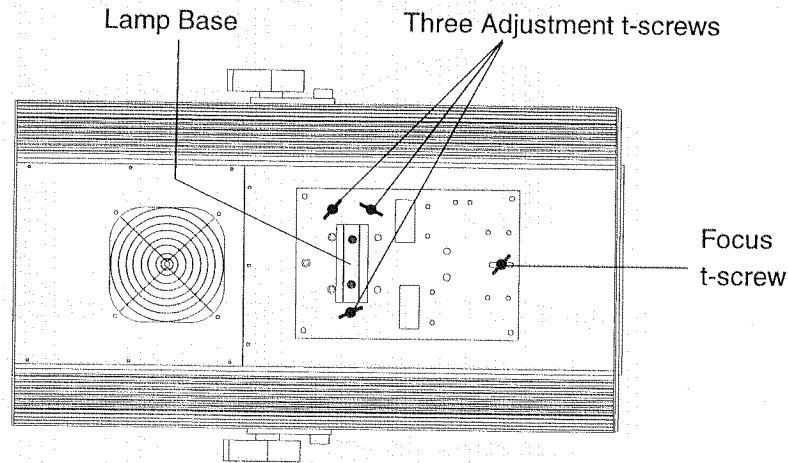


Figure 2.19. emulator Fixture Underside with Door Removed

10. From the top side of the fixture, **with top door installed**, look through the dark lamp alignment window towards the pinhole aperture (follow the path of the pinhole sighting line). Refer to Figure 2.20.

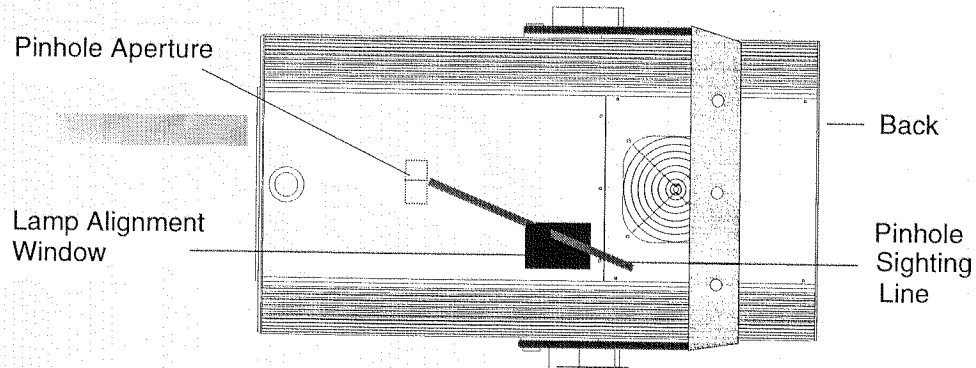


Figure 2.20. Viewing Pinhole through Lamp Alignment Window

11. While looking into the lamp alignment window, turn each of the three adjustment t-screws, noting how they affect the light shining on the pinhole aperture. You will notice that the adjustment of these t-screws is interactive, in that when one is adjusted, it changes how the other two behave.

Adjust the three t-screws until you get the smallest, brightest, most concentrated point of light over the pinhole aperture. The results of a good optimization process looks similar to the ideal pattern shown in Figure 2.21. The brightest point of light is directly over the pinhole aperture. Notice that the pinhole is in the concentrated area of the light pattern and that the light pattern forms two “wings” above the concentrated area.

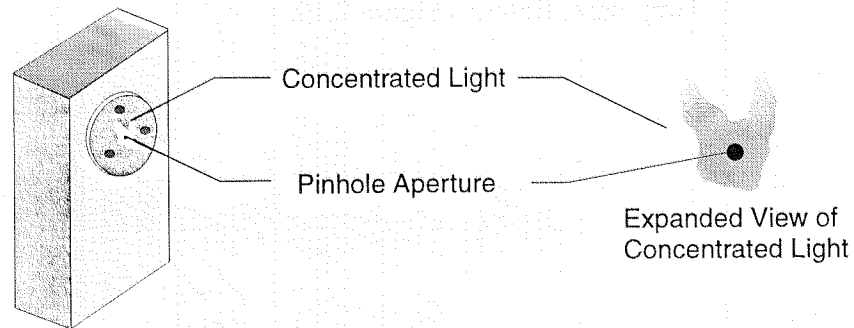
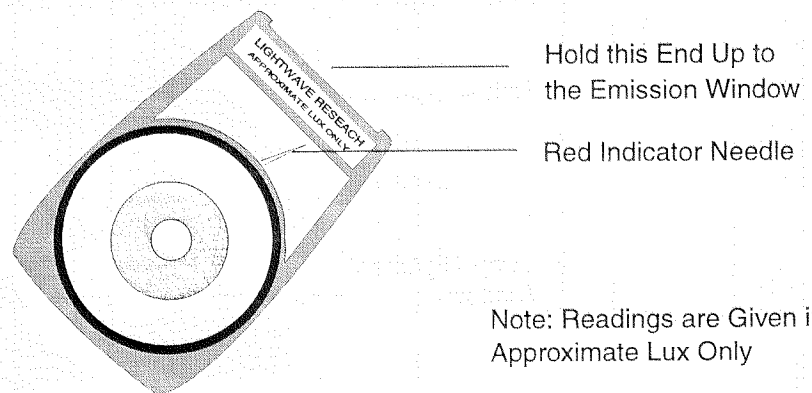


Figure 2.21. Optimized Light Pattern on Pinhole Aperture

Now that the light is concentrated on the pinhole aperture, observe the light beam hitting the wall or object where you focused it. It should be strong and even across the beam.

12. Use the light meter supplied with the *emulator* Controller or your own light meter to obtain the maximum output from the fixture. Refer to Figure 2.22.



Note: Readings are Given in Approximate Lux Only

Figure 2.22. L-158 Light Meter

On the supplied light meter, you only use the red indicator needle to see the change in the output of the fixture. The dial calibrations on the light meter are not used.

Holding the light meter up to the *Emission Window*, note the reading shown by the red indication needle on the meter. Refer to Figure 2.23. 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 at that point.

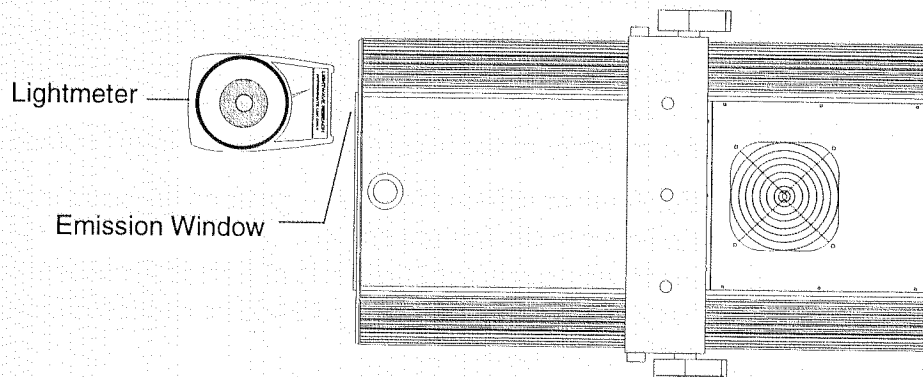


Figure 2.23. Positioning Lightmeter to Check Output

13. Next, locate the *focus t-screw* on the underside of the fixture towards the front of the unit. Refer to Figure 2.24.
14. Then, with the light beam shining on a nearby wall or other flat horizontal object, turn the *focus t-screw* while watching the circle of light emitting from the fixture. Adjust the focus t-screw until the circle of light has a sharp edge.

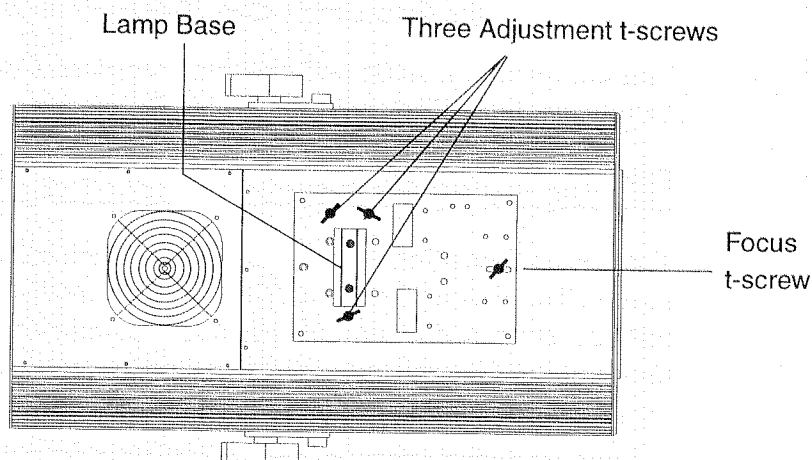


Figure 2.24. emulator Fixture Bottom Side — Locating Focus T-Screw

If you have focused the fixture on a wall or object that is near to you for ease of viewing during optimization, you will need to re-focus the fixture for the desired effect (floor viewing, screen viewing, aerial viewing, and so on) after you hang it for use in your operation. This concept is the same as changing the focal point on a camera when your subject moves.

After you hang the fixture, perform the following focusing procedure that is applicable for you installation:

**For aerial viewing** — you must focus the beam so that it appears “in focus” to the viewer. This procedure requires two people, one to focus the fixture and one to stand in the place of the viewer. The viewer gives directions to the focuser for adjusting the focus of the beam. The beam is not focused directly on the viewer, but at some point between the fixture and the viewer. This makes the majority of the beam appear to be aerially “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.

15. You have successfully optimized the fixture when:

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

**Important Notes:** To obtain maximum lamp brightness over the life of the lamp repeat the lamp optimization procedure after 30 hours of lamp use. This is due to the initial burn-in of the lamp electrodes.

Although not mandatory, to obtain maximum lamp life do not operate the fixture more than 30 degrees above or below the horizontal plane.

This completes the lamp optimization procedure. Continue with the next section, *Setting emulator Fixture Personality DIP Switches*.

## **Setting *emulator* Fixture Personality DIP Switches**

---

There is an 8-position “Personality” DIP switch located on the rear panel of the fixture. These switches change the operating mode of the fixture. They are used for testing, set up, and control of specialized parameters. Refer to Section 3, *Setting Up the emulator* Controller, to set the controller switches.

### **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 responds in different ways. Note that a switch is “On” in the up position and “Off” in the down position.

#### **No Switches On: Normal Mode**

Personality DIP Switch

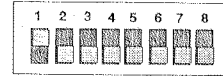


All switches are in the “off” position, the fixture operates in a normal manner under the control of the *emulator* Controller.



### Switch 1: Self-Test

Personality DIP Switch



Use Switch 1 to activate the built-in self testing function. To enable, set Switch 1 “On” and turn on fixture power. The test loops until you set Switch 1 “off”.

**Switch 1 On** – an internal self-diagnostic routine tests each function of the fixture. The fixture displays the software version number at the beginning of the self-test (via lamp output). You do not need a controller to run self-test.

**Switch 1 Off** – This is the normal operating mode. Note that Switch 1 on the fixture overrides the controller. Switch number 1 on the fixture also overrides Switch 2 on the fixture (Set Up Mode.). Tests includes: shutter dimming and speed, colors and color speed, mirror pan and tilt operation, and pattern operation.

### Switch 2: Set-up Mode

Personality DIP Switch



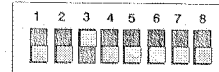
Use Switch 2 to set up and adjust the lamp after installation.

**Switch 2 On** – 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.

**Switch 2 Off** – In normal operation this switch must be in the “Off” position. Note: Switch 2 on the fixture (Set-up Mode) overrides the functions of the controller.

### Switch 3: High Mode

Personality DIP Switch



Use Switch 3 to put the fixture in high mode.

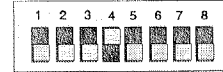
**Note:** If you start the fixture from a *cold* state allow the lamp to warm up for approximately 15 minutes before switching to High mode. Otherwise, the software installed in the fixture does not allow you to use high mode until the lamp has been on for two minutes. If high mode is selected before the lamp has been on for two minutes, the fixture waits until the two minutes has elapsed then automatically engages the high mode.

**Switch 3 On** – sets the fixture to high mode. The fixture emits 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.

**Switch 3 Off** – This is the normal mode of operation.

**Switch 4: Horizontal Mirror Image**

Personality DIP Switch



Use Switch 4 to produce a horizontal mirror image of the normal scan patterns. For example, if you program a fixture to display an alphanumeric pattern, in this case, an R, turn on DIP Switch 4 to display this pattern's horizontal mirror image. Refer to Figure 2.25. Some patterns, such as a circle, will not be affected by turning on switch number four. To test the mirror image effect, 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 are reversed as shown in Figure 2.25.

**Switch 4 On** – Turn this switch On to enable the horizontal mirror image effect.

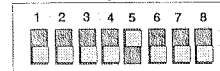
**Switch 4 Off** – This is the normal operating mode.



Figure 2.25. Horizontal Mirror Image Display

**Switch 5: Vertical Mirror Image**

Personality DIP Switch



Use Switch 5 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, turn on DIP Switch 5 to display this pattern's vertical mirror image. Refer to Figure 2.26. Some patterns, such as a circle, will not be affected by turning on Switch 5.

To test the vertical mirror image effect, 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 are inverted as shown in Figure 2.26.

**Switch 5 On** – Turn this switch On to enable the vertical mirror image effect.

**Switch 5 Off** – This is the normal operating mode.



Figure 2.26. Vertical Mirror Image Display

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

Switches 6, 7, and 8 have no function assigned to them at this time. They are for future expansion.

**Setting *emulator* Fixture Address DIP Switches**

During operation you select one or more fixtures by pressing Address keys on the controller’s Address/Preset Keypad. In order for the controller to find the fixture when you press a key, the fixture must be set to the corresponding Address number (1 to 24). For example, when you press Address key 4 on the controller, the controller selects fixture 4. Therefore, you must assign a unique address to each fixture that corresponds to one of the 24 Address keys on the controller. You do this by setting DIP switches on the fixture’s rear panel. Refer to Figure 2.27.

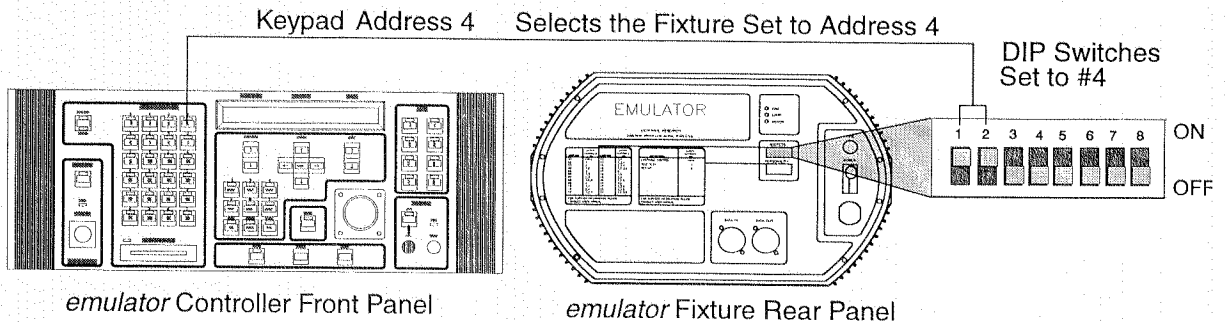


Figure 2.27. Setting *emulator* Fixture DIP Switches

An address table is printed on the back of the fixture that shows the DIP switch settings for the 24 Addresses. These *emulator* Fixture address DIP switch settings are also listed in Table 2.1.

<i>Table 2.1 Fixture Address DIP Switches</i>	
For This Address #	Set These DIP Switches ON (Up)
01	none
02	1
03	2
04	1 and 2
05	3
06	1 and 3
07	2 and 3
08	1, 2, and 3
09	4
10	1 and 4
11	2 and 4
12	1, 2, and 4
13	3 and 4
14	1, 3, and 4
15	2, 3, and 4
16	1, 2, 3, and 4
17	5
18	1 and 5
19	2 and 5
20	1, 2, and 5
21	3 and 5
22	1, 3, and 5
23	2, 3, and 5
24	1, 2, 3, and 5

This completes the *Setting the emulator Fixture Address DIP Switches* section and Chapter 2. Continue with Chapter 3, *emulator Controller Set Up and Review*.