ES-1™

Architectural Luminaire
User Manual

High End Systems, Inc.
2217 West Braker Lane
Austin, Texas U.S.A.

P/N 60600140 Version 1.0

For the latest product updates and information not contained in this manual, visit the High End Systems Product Support page at:
http://info.highend.com/service/prodsupt.html

Declaration of Conformity
according to ISO/IEC Guide 22 and EN45104

Manufacturer's name: Lightwave Research

Manufacturer's address: 2217 West Braker Lane
                                 Austin, Texas 78758
                                 U.S.A.

Distributor's name: High End Systems, Inc.

Distributor's address: 2217 West Braker Lane
                                 Austin, Texas 78758
                                 U.S.A.

Declares that the product

Product Name: ES-1

Product Number: ES-1

Product Options: All

conforms to the following EEC directives:

73/23/EEC, as amended by 93/68/EEC

89/336/EEC, as amended by 92/31/EEC and 93/68/EEC

Equipment referred to in this declaration of conformity first manufactured in 1998 in compliance with the following standards:

Safety: EN 60598-1 : 1993
                         EN 60598-2-17 : 1989
                            A1-A3 : 1993

EMC: EN 55022, 1987 Class A ITE
                         IEC 801-2, 1991 Level 2 (4/8 kV)
                         IEC 801-3, 1991 Draft 5 Level 2 (3 V/m)
                         IEC 801-4, 1988 Level 2 (1 kV/0.5 kV)

U.S.A., October 18, 1999   Kenneth Hansen, Compliance Engineer

IMPORTANT SAFETY INFORMATION

Instructions pertaining to continued protection against fire, electric shock, exposure to excessive ultraviolet (UV) radiation, and injury to persons are found in Appendix D.

Please read all instructions prior to assembling, mounting, and operating this equipment.

IMPORTANT: INFORMATIONS DE SÉCURITÉ

Les instructions se rapportant à la protection permanente contre les incendies, l'électrocution, l'exposition à un rayonnement ultraviolet (UV) excessif et aux blessures corporelles se trouvent dans l'Annexe D.

Veuillez lire toutes les instructions avant d'assembler, de monter ou d'utiliser cet équipement.

WICHTIGE SICHERHEITSHINWEISE

Sicherheitsanleitungen zum Schutz gegen Feuer, elektrischen Schlag, übermäßige UV-Strahlung und Verletzung von Personen finden Sie in Anhang D.

Vor der Montage, dem Zusammenbau und der Inbetriebnahme dieses Geräts alle Anleitungen sorgfältig durchlesen.

INFORMAZIONI IMPORTANTI DI SICUREZZA

Le istruzioni sulla protezione da incendi, folgorazione, esposizione eccessiva a raggi ultravioletti (UV) e infortuni sono contenute nell'appendice D.

Si prega di leggere tutte le istruzioni prima di assemblare, montare e azionare l'apparecchiatura.

INFORMACION IMPORTANTE DE SEGURIDAD

En el Apéndice D de este manual se encuentran instrucciones sobre protección continua contra incendios, descarga eléctrica, exposición excesiva a radiación ultravioleta (UV) y lesiones personales.

Lea, por favor, todas las instrucciones antes del ensamblaje, montaje y operación de este equipo.

FCC Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warranty Information

Limited Warranty

Unless otherwise stated, your product is covered by a two year parts and labor limited warranty. Dichroic filters and Lithopatterns® are not guaranteed against breakage or scratches to coating. 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 an Item Under Warranty for Repair

It is necessary to obtain a Return Material Authorization Number (RMA#) from your dealer/point of purchase BEFORE any units are returned for repair. The manufacturer will make the final determination as to whether or not the unit is covered by warranty. Lamps are covered by the lamp manufacturer's warranty.

Any Product unit or parts returned to High End Systems must be packaged in a suitable manner to ensure the protection of such Product unit or parts, and such package shall be clearly and prominently marked to indicate that the package contains returned Product units or parts and with a Return Material Authorization (RMA#) number. Accompany all returned Product units or parts with a written explanation of the alleged problem or malfunction.

Please note: Freight Damage Claims are invalid for fixtures shipped in non-factory boxes and packing materials. Ship returned items to 2227 Braker Lane, Austin, Texas 78758.

Freight

All shipping will be paid by the purchaser. Items under warranty 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. HIGH END SYSTEMS, INC. MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY PRODUCT, AND HIGH END SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. HIGH END SHALL NOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGE, INCLUDING LOST PROFITS, SUSTAINED OR INCURRED IN CONNECTION WITH ANY PRODUCT OR CAUSED BY PRODUCT DEFECTS OR THE PARTIAL OR TOTAL FAILURE OF ANY PRODUCT REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR OTHERWISE, AND WHETHER OR NOT SUCH DAMAGE WAS FORESEEN OR UNFORESEEN.

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

Product Modification Warning

High End Systems products are designed and manufactured to meet the requirements of United States and International safety regulations. Modifications to the product could affect safety and render the product non-compliant to relevant safety standards.

Mise En Garde Contre La Modification Du Produit

Les produits High End Systems sont conçus et fabriqués conformément aux exigences des règlements internationaux de sécurité. Toute modification du produit peut entraîner sa non conformité aux normes de sécurité en vigueur.

Produktmodifikationswarnung

Design und Herstellung von High End Systems entsprechen den Anforderungen der U.S. Amerikanischen und internationalen Sicherheitsvorschriften. Abänderungen dieses Produktes können dessen Sicherheit beeinträchtigen und unter Umständen gegen die diesbezüglichen Sicherheitsnormen verstoßen.

Avvertenza Sulla Modifica Del Prodotto

I prodotti di High End Systems sono stati progettati e fabbricati per soddisfare i requisiti delle normative di sicurezza statunitensi ed internazionali. Qualsiasi modifica al prodotto potrebbe pregiudicare la sicurezza e rendere il prodotto non conforme agli standard di sicurezza pertinenti.

Advertencia De Modificación Del Producto

Los productos de High End Systems están diseñados y fabricados para cumplir los requisitos de las reglamentaciones de seguridad de los Estados Unidos e internacionales. Las modificaciones al producto podrían afectar la seguridad y dejar al producto fuera de conformidad con las normas de seguridad relevantes.

Contacting High End Systems, Inc.

U.S. and the Americas:

Sales Department:

High End Systems, Inc.
2217 West Braker Lane
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2227 West Braker Lane
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Table of Contents

List of Figures

List of Tables

Introduction

About This Manual

This manual explains how to install and operate your ES-1 fixture, how to troubleshoot problems you might encounter, and how to care for your fixture.

Manual Conventions

This manual uses the following conventions:

- a menu button will look like: press the <ENTER> button
- an alpha-numeric display item on the front panel will look like: S E T menu

Caution and Warning Symbols

The following international symbols appear in margins throughout this manual to highlight caution and warning messages.

Caution: This symbol appears adjacent to Caution messages. Ignoring these messages could result in damage to equipment.

Warning: This symbol appears adjacent to High Voltage and Hazard messages. Ignoring these messages could result in serious personal injury.

This symbol indicates that the minimum distance to a lighted object is 1 meter.

This symbol indicates that eye protection is required.

This symbol indicates a hot surface.

This symbol indicates an explosion hazard.

This symbol indicates a fire hazard.

ES-1 Feature Overview

USITT DMX-512 control	Full control over all operating parameters of ES-1 is achieved via 20 channels of DMX-512 protocol. This includes 16-bit accuracy for gobo indexing and 8-bit accuracy for all other parameters. All parameters are controlled by a built-in Motorola® 68340 microprocessor.
Color capabilities	Each of the two color wheels support five dichroic glass filters plus open. Custom color filters may be ordered from High End Systems and are easily installed. These dichroic filters are interchangeable with EC-1, Studio Spot 575™ Studio Color® 575, and Cyberlight®.
Rotating lithos and rotating effects	ES-1 can project up to 35 combination patterns using 10 rotating litho/effects (plus two open) located on two independent wheels. Each wheel can be independently indexed and rotated in either direction at variable speeds.
Custom 575 watt discharge lamps	ES-1 utilizes a custom MSD 575 lamp which provides a color temperature of 5600 K and enhanced lamp life.
Special effect functions	Special effect functions provide color spins, random color combinations, random gobos, or MSpeed to control the color and litho wheels. The 'blink' function quickly strobes the dimming system during color and/or litho changes.
Factory macros	Complicated looks can be quickly programmed using one of the 26 factory-programmed macros. Each macro modifies a specific set of constructs to produce a unique effect, while allowing the user to retain control of all other constructs. Sequences can be created by using an additional variable speed random macro.
Frost	A variable frost mechanism provides infinite beam diffusion. Thus the hard edge beam is easily softened to create a wash effect. Frost effects include variable periodic, random periodic, variable ramp/snap, and random ramp/snap strobes.
Dimming	A smooth mechanical dimming system provides seamless dimming without affecting the beam shape or the color temperature output.
Iris	An independent iris can remotely manipulate the beam diameter. Iris effects include variable periodic, random periodic, variable ramp/snap, and random ramp/snap strobes.
Focus	The variable remote focus lens can precisely focus on either litho/effect wheel at any distance.

Lenses	The standard lens provides an 18° beam angles. Optional 13° and 30° lenses are available for narrow and wide field projection. All lenses feature advanced aberration correction. The aberration correction eliminates chromatic shifts, image distortion, spherical astigmatism, and provides an impeccably flat focus field.
Strobing	The dimming system provides instant blackout, variable and random speed strobes, variable and random ramp/snap effects, and the blinking function. Additionally, ES-1 can dim while strobing.
Internal preset scene memory	Up to 16 scenes can be programmed for playback without a controller. Scenes can be programmed from the front panel or 'captured' from DMX data. You can playback data in stand-alone mode or synchronize playback with up to 32 fixtures.
L.E.D. display	A full function 15-segment four character alpha-numeric display allows the user to easily program all functions of the fixture. A full set of diagnostic functions are available through the menu system. ES-1 can also serve as a DMX tester to view channel values and DMX errors. The display can be remotely turned on, off, or dimmed via DMX.
L.E.D. status indicators	Five L.E.D. indicators visually provide the status of the lamp power supply, motor power supply, and data.
Mounting	ES-1 can be mounted on a foundation you build using the *EC-1 Installation Guide*, or on a pole using the High End Systems Pole Mount Kit.
Stepper motors	All motors are digitally controlled steppers. They provide precision control, high torque, smooth movement, near quiet performance, and very long life.
Fixture shutdown, lamp control, and homing	Fixture shutdown, lamp on/off, and homing can be accessed remotely via DMX. You can also turn the lamp on or off and home the fixture with the front panel menu system.
Power factor correction	ES-1 is fully power factor corrected to optimize the light source's efficiency and deliver maximized power economy.
Ease of maintenance	ES-1 has been designed for the professional user. ES-1 is constructed on the solid premise of Studio Spot 575. Changing the lamp is quick and convenient.
Software updates	Operating software can be uploaded from the Lightwave Research Upload Dongle, the Status Cue® lighting console, or from another fixture, thus keeping the fixtures constantly updated with the latest version. The latest software version is available through the High End Systems World Wide Web Site.

Safety	The lamp cover is secured through its wiring harness for additional safety. Multi-point grounding is provided throughout for complete assurance of safe operation. The fixture and all electronics comply with current UL, ETL, C-ETL, CE, FCC, CSA, and EMC standards for professional lighting fixtures.

Specifications

Mechanical

Height: 767.9 mm (30.24 in.)
Width: 501.6 mm (19.75 in.)
Depth: 285.5 mm (11.24 in.)
Weight: 71.67 kg (158 lbs.)

For additional dimensions, see Figure Intro-1.
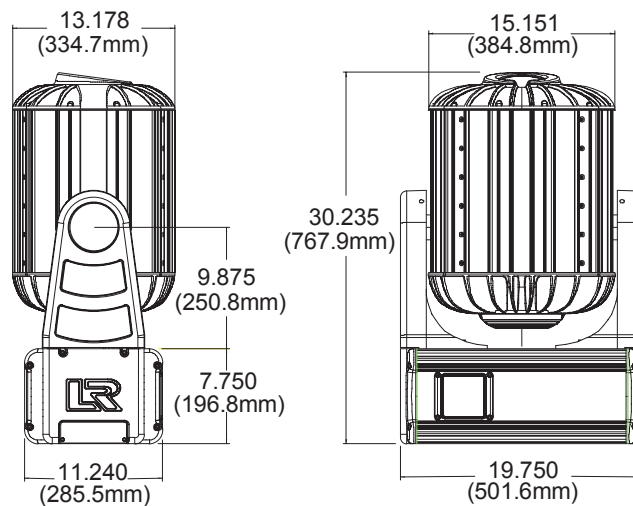
Figure Intro-1. ES-1 dimensions

Electrical

Factory setting:	277VAC, 60 Hz
Voltage rating:	100V, 120V, 230V, 277V
Power consumption:	7.0 A @ 100V 5.8 A @ 120V 3.0 A @230V 2.5 A @ 277V
Rated power consumption:	700W
Rated frequency:	50/60 Hz

Power factor: 100V, 50 Hz: 0.85
                                 120V, 60 Hz: 0.96
                                 230V, 50 Hz: 0.87
                                 277V, 60 Hz: 0.94

Maximum winding temperature, Tw: 180° C (356° F)

Maximum capacitor temperature, Tc: 85° C (185° F)

Environmental

Ingress Protection: IP 66
E.P.A. (Effective Projected Area):   3.2 sq. ft.
Maximum ambient temperature, Ta: 40° C (104° F)
Minimum distance to lighted object: 1.0 meter (3.28 feet)
Minimum distance to flammable objects: 1.0 meter (3.28 feet)

WARNING: 1) class I equipment - For continued protection against electric shock, connect this equipment to an earthed (grounded) power source only.

2) do not mount on a flammable surface.

Cable and Connector Specifications

DMX data cables:

Belden® 9841 or equivalent (meets specifications for EIA RS-485 applications) with the following characteristics:

- 2-conductor twisted pair plus a shield
- maximum capacitance between conductors - 30 pF/ft.
- maximum capacitance between conductor and shield - 55 pF/ft.
- maximum resistance of 20 Ω / 1000 ft.
- nominal impedance 100-140Ω

DMX data connectors: 3-pin male and female XLR connectors

DMX data terminators: Male XLR connector with 120 ohm terminator

Optical System

Dichroic Glass

Diameter   44.323 mm ±0.25 (1.745 in. ±0.010)
Thickness   1.778 mm ±0.25 (0.070 in. ±0.010)

Note: *the dichroic glass specifications for ES-1 are identical to Studio Spot 575, Studio Color 575, Cyberlight, Cyberlight CX, and Cyberlight SV.*

Effect Glass

Diameter:	36.322 mm ±0.25 (1.430 in. ±0.010
Image area:	31.750 mm ±0.25 (1.250 in. ±0.010)
Thickness:	3.175 mm ±0.25 (0.125 in. ±0.010)

Note: *the effect glass specifications for ES-1 are identical to Studio Spot 575, Technobeam, Technopro, and Technoray.*

LithoPatterns

Resolution:	3300 d.p.i.
Diameter:	36.449 mm ± 0.15 (1.435 in. ±0.006)
Image area:	31.750 mm ±0.25 (1.250 in. ±0.010)
Thickness:	1.778 mm ±0.25 (0.070 in. ±0.010)

Note: *use the above specifications for metal gobos.*

Lenses

Table Intro-1. Lens specifications

Lens	Minimum Focal Distance	Effective Focal Length	F-Stop	Elements
13°	1 M - ∞	140 mm	1:2	4
18°	1 M - ∞	100 mm	1:1.6	4
30°	1 M - ∞	60 mm	1:1.8	5

Note: *to determine which lens best suits your application, refer to "Calculating Beam Diameters" on page C-6.*

1m **WARNING: risk of fire. Never light objects closer than 1 M.**

Lamps

Lamp type:	Philips® MSD 575
MSD 575 color temperature:	5600 Kelvin

WARNING: use only M Series, GX 9.5 Base, 575 watt, metal halide type lamp.

Note: *the above lamp was specifically designed for use in ES-1 and EC-1. Mixing lamp types will result in undesirable color points between fixtures.*

Optional Accessories

Cables and Connectors

10-foot heavy duty data cable with Neutrik XLRs	55050005
25-foot heavy duty data cable with Neutrik XLRs	55050006
50-foot heavy duty data cable with Neutrik XLRs	55050007
100-foot heavy duty data cable with Neutrik XLRs	55050008
Male XLR terminator	90404039
Female XLR terminator	Call*
Neutrik 5/3 pin and 3/5 pin XLR convertor set	55050015

Controllers and Upload Devices

Status Cue® Lighting Console	22020002
Lightwave Research Upload Dongle	26040002

Factory-Installed Dichroic Filters

Aqua	80510171
CTO	80510246
Cyan	80510244
Light Cyan	80510245
Indigo	80510248
Magenta	80510242
Pink	80510243
Yellow	80510247

Note: *custom colors are available from High End Systems. Contact your authorized dealer or High End Systems for ordering information.*

Lenses

13° narrow field lens	80160029
18° standard field lens (factory installed)	80160030
30° wide field lens	80160031

Literature

ES-1 User's Manual	60600101
EC-1 and ES-1 Installation Guide	60600125

Mounting Hardware

Mounting Feet	(included with ES-1)
Pole Mount Kit	Call*

*Note: *For more information about optional accessories, contact your High End Systems dealer/distributor, High End Systems sales, or visit the High End Systems web site. For contact information, see "Contacting High End Systems, Inc." on page Intro-vi.*

Factory-Installed LithoPatterns and Effects

Cones	39141255
Space Steppers	39141251
Dashing	39141253
Bright Stars	39141252
Teather Wall	39141254
Happy Dais	39141157
Pickup Sticks	39141108
Lava (cyan)	39142030
Lava (magenta)	39142031
Lenticular Effect Glass	39144001
Five Facet Prism	99090035

Note: *additional effects glass and custom LithoPatterns® are available from High End Systems. A complete catalogue is available on the High End Systems web site. Contact your authorized dealer or distributor for ordering information. The cyan and magenta Lava lithos are combined to make up the Lava litho.*

Lamps

Philips MSD 575 lamp	55030050

Chapter 1
Installation and Setup

Unpacking ES-1

In this section you will unpack your ES-1 and verify that it arrived complete and without any damage.

Save the shipping materials. **Do not discard** the shipping carton and packing materials. The carton and packing materials are specifically designed to protect the fixture 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. If you return your ES-1 in a non-factory shipping carton or with non-factory packing materials, you will be billed for the materials.

Note: *before returning anything to the factory, be sure to call your High End Systems dealer/distributor for a Return Material Authorization (RMA) number. High End Systems cannot accept any goods shipped without an RMA number. Refer to "Contacting High End Systems, Inc." on page vi.*

Inspecting the Contents

Carefully unpack the shipping carton and inspect the contents for damage. If any of the items listed below are missing or damaged, notify both the shipping agent and your sales agent immediately. The shipping carton contains the following items:

- ES-1 fixture
- Philips MSD 575 lamp installed in the fixture
- two mounting "feet"
- eight 3/8" socket cap screws
- eight 3/8" split lock washers
- *ES-1 User Manual*
- *EC-1 Installation Guide**

*Note: *the instructions in the EC-1 Installation Guide also apply to the ES-1 fixture.*

Registering Your Product

It is extremely important that you register your ES-1 with High End Systems. To register your fixture, have your serial number(s) handy and call toll free at 888-696-5711 or register on-line at http://info.highend.com/service/service.html.

Identifying Front Panel Components

The ES-1 front panel contains a display panel protected by a plastic covering (see Figure 1-1). To access this display panel, use a 5/32″ allen wrench to remove the four screws in the display covering.
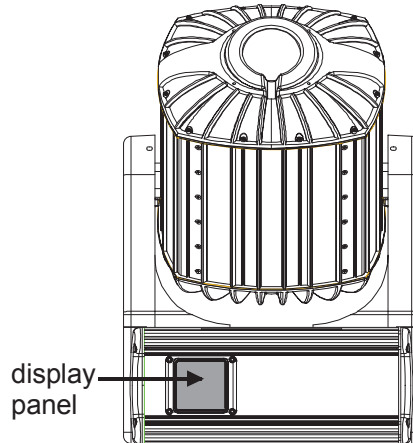
Figure 1-1. ES-1 display panel location

The display panel has five status LEDs (Light Emitting Diode), an alpha-numeric display, and four menu navigation buttons (see Figure 1-2).
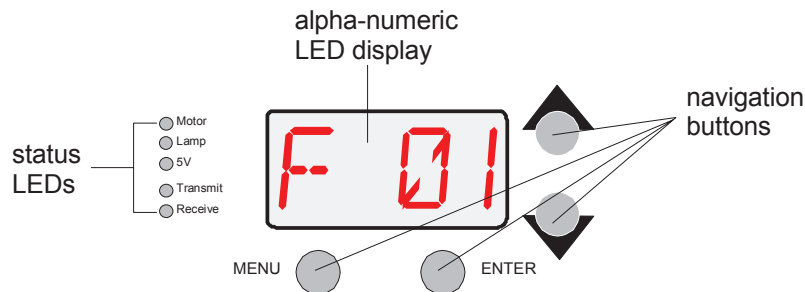
Figure 1-2. Display panel functionality

Under normal circumstances, the alpha-numeric display cycles between displaying the fixture's software version ("Vxxx"), the fixture name (either "ES1" for ES-1 fixtures or "EC1" for EC-1 fixtures), and the fixture's address (either "F xx" for fixture number or "Cxxx" for DMX start channel). However, if you are experiencing problems with your fixture, the status LEDs and/or alpha-numeric display can also provide insight on where the problem is originating. For more information on error messages, see "Display Error Messages" on page A-2 or "Status LEDs" on page A-5.

Identifying Side Panel Components

Located on the side panel are connectors for the fixture's power cord and Data In/Data Out connectors (see Figure 1-3). You will use these connectors to link the fixture to a power source, a controller and/or other fixtures.

If you choose, you can fit user-supplied conduit for the data and power cords directly to the ES-1 side panel. For more information, see the *EC-1 Installation Guide* shipped with this manual. *Note that the instructions in the EC-1 Installation Guide also apply to the ES-1 fixture.*

Data In   Data Out   power
connector   connector   connector
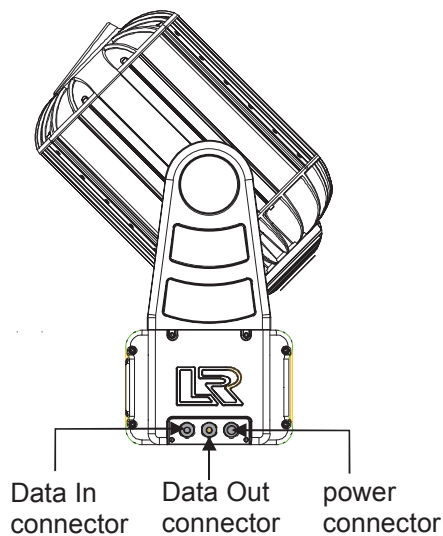
Figure 1-3. ES-1 side panel

Before Beginning Installation

Before you begin the installation read the following safety precautions:

- Disconnect the fixture from power before changing the lamp.
- Allow the unit to cool for at least five minutes before accessing the lamp.
- Wear protective gloves and goggles when working inside the unit.

Installation Requirements

1. ES-1 must be installed in accordance with local and national building and electrical codes.

2. ES-1 must be mounted on a site that provides adequate drainage so that the fixture is *never* immersed in standing water.

3. ES-1 must be properly secured with recommended mounting hardware when mounted on a wall or ceiling (see the *EC-1 Installation Guide* shipped with the fixture). *Note that the instructions in the EC-1 Installation Guide also apply to the ES-1 fixture.*

Setting the Fixture Voltage

The ES-1 fixture voltage is factory-set to 277 volts, 60 Hertz. If your power source voltage differs, you must change the fixture input voltage to match your power source.

ES-1 has a selectable input voltage that allows you to choose 100V or 230V at 50 Hertz or 100V, 120V, 208V, 230V, or 277V at 60 Hertz. The voltage range for each setting is ± 10 percent. For example, if you have a 240 volt power source, use the 230 volt input setting.

⚠ **Caution:**   **this fixture must be serviced by qualified personnel. The information listed in this section is intended to assist qualified personnel only.**

⚡ **Warning:**   **be sure to match the voltage selection jumper to your power source** *prior* **to operating this equipment.** *Do not set the voltage selection jumper with the equipment plugged in.*

You will need:

- 5/32″ allen wrench
- torque wrench
- small flat head screwdriver

To change the fixture's voltage/frequency setting:

1. Electrically isolate the fixture.

2. Using a 5/32″ allen wrench, unscrew the eight side panel screws and remove the fixture's side panel. Remove only the side panel nearest the fixture's display panel to access the power supply board (see Figure 1-4).

3. Locate the power supply board tray and ballast tray inside the fixture (see Figure 1-5). These trays are connected to each other by internal wiring. Therefore, to move one tray, you must move *both* trays at the same time.

open this side panel →

display panel
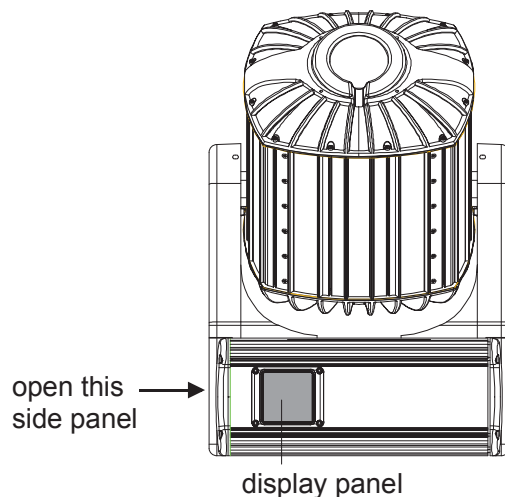
Figure 1-4. Remove the side panel

4. Slide the power supply board tray *and* ballast tray out of the fixture about two inches.

ballast tray

power supply
board tray   logic board tray
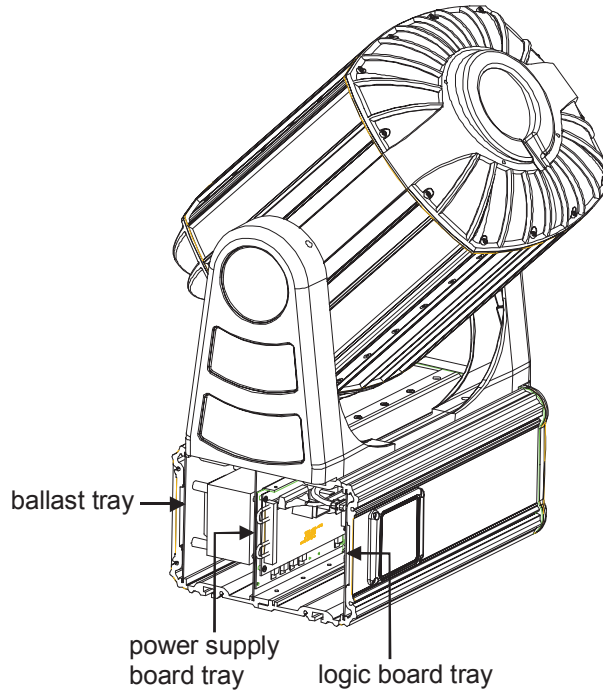
Figure 1-5. Identify internal components

Note: *if any of the wires inside the fixture prevent the trays from sliding, carefully move the wires out of the way. Do not force the trays from their position; this may disconnect internal wiring.*

5. Locate the voltage/frequency jumpers on the power supply board (see Figure 1-6).

jumpers

voltage select jumper block
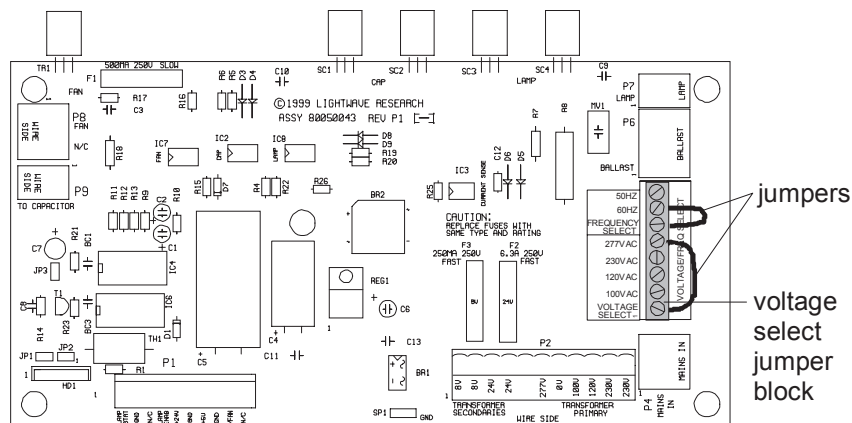
Figure 1-6. Power supply board

The jumper ends connected to the pins marked "Frequency Select" and "Volt Select" should *always* remain connected. To change the frequency or voltage, move the other end of the appropriate jumper to a new voltage or frequency pin (see Figure 1-7).

100V, 60 Hz | **120V, 60 Hz** | **230V, 60 Hz** | **277V, 60 Hz**

50 Hz / 60 Hz / Freq. Select / 277 VAC / 230 VAC / 120 VAC / 100 VAC / Volt Select

100V, 50 Hz | **120V, 50 Hz** | **230V, 50 Hz** | **277V, 50 Hz**

50 Hz / 60 Hz / Freq. Select / 277 VAC / 230 VAC / 120 VAC / 100 VAC / Volt Select
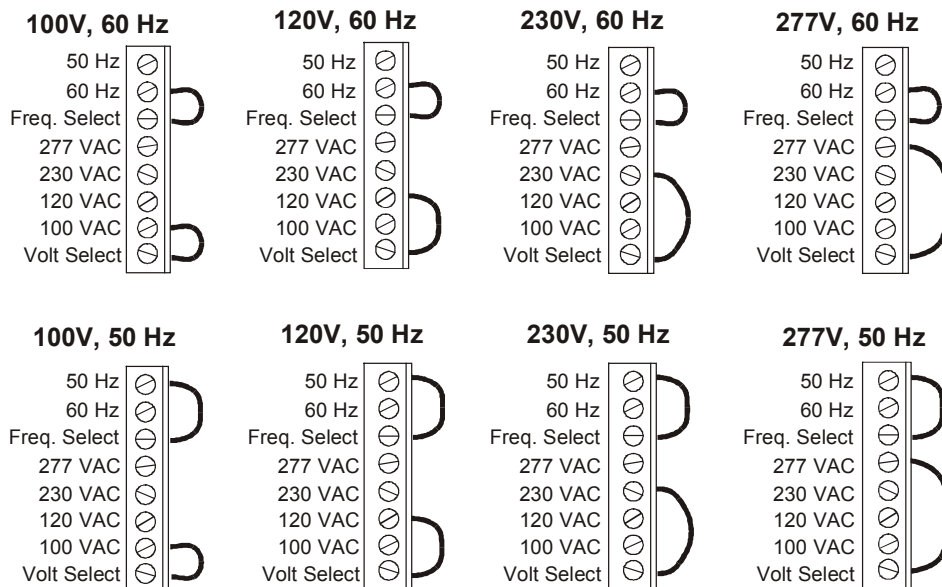
Figure 1-7. Voltage/frequency jumper combinations

6. To move a jumper, loosen the screw that secures the jumper end in the voltage/frequency pin. Remove the jumper end and reinsert it in the desired voltage/frequency pin. After you move the jumper, tighten its corresponding screw to secure the jumper to the pin.

7. When you have successfully changed the voltage and/ or frequency, carefully slide the ballast tray and power supply board tray inside the fixture.

8. Replace the side panel and install the eight side panel screws removed in step 2. Make sure the rubber gasket used to seal the side panel is aligned and seated correctly when replacing the side panel (see Figure 1-8).
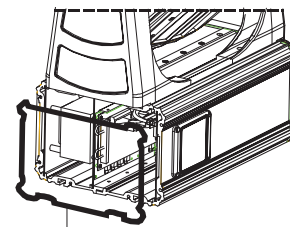
rubber gasket

Figure 1-8. Side panel rubber gasket

Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.

Mounting the Fixture

If you choose to mount your ES-1 fixture on a pole, contact High End Systems to obtain a pole mounting kit (see "Optional Accessories" on page Intro-7).

The information in the following subsections provides instructions for mounting ES-1 on the foundation you prepared for each fixture following the instructions in the *EC-1 Installation Guide* shipped with the fixture. *Note that the instructions in the EC-1 Installation Guide also apply to the ES-1 fixture.*

ES-1 can be mounted in any orientation on a foundation built on the wall, ceiling, or ground. ES-1 comes with four T-bars installed in the bottom panel (see Figure 1-9). If you use mounting hardware other than the mounting feet provided, you can move and secure the T-bars in a variety of positions to accommodate the mounting hardware you use.
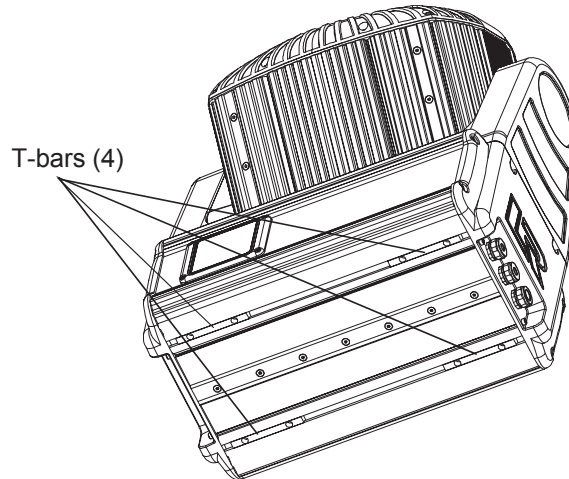
Figure 1-9. T-bar location

Note: *because there are a variety of conceivable lighting designs, you should consider the procedure below as a suggested guideline only. High End Systems, Inc. cannot make specific recommendations for your particular lighting design or venue.*
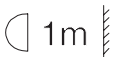
WARNINGS: 1) do not mount on a flammable surface.

2) maintain a minimum distance of 1.0 meter (3.28 feet) from combustible materials.

3) maintain a minimum distance of 1.0 meter (3.28 feet) from lighted object. This means the fixture must be positioned at least 1 meter away from the object it is illuminating.

Verify the foundation or mounting point will handle the weight of the devices you are mounting. The ES-1 fixture weight is listed in "Specifications" on page Intro-4.

Attaching the Mounting Feet

If you choose to mount ES-1 using the mounting feet provided, follow the instructions below.

You will need: (The items listed below are shipped with ES-1.)

- two mounting "feet"
- eight 3/8" socket cap screws
- eight 3/8" split lock washers

To attach the two mounting feet to the fixture:

1. Locate the four T-bars installed on the bottom panel of the fixture (see Figure 1-9).

2. Place the mounting feet on the bottom panel of the fixture and line up the screw holes in the feet with the screw holes in the T-bars (see Figure 1-10).

mounting feet (2)

split lock washers (8)

3/8" socket cap screws (8)
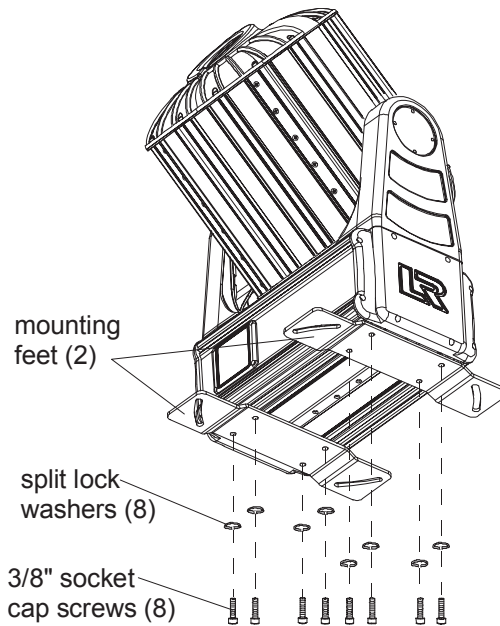
Figure 1-10. Install the mounting

3. Place the eight split lock washers on the aligned screw holes on the mounting feet and secure the feet to the T-bars with the eight 3/8″ screws (see Figure 1-10).

Securing the Fixture to the Prepared Foundation

You will need: (The items listed below are NOT shipped with ES-1.)

*   four 3/8″ NC stainless steel or plated carbon steel hex nuts rated SAE grade 5 or higher
*   four 3/8″ fender washers

1. Mount the slots of the mounting feet over the studs in the foundation you constructed following the instructions in the *EC-1 Installation Guide*. *Note that the instructions in the EC-1 Installation Guide also apply to the ES-1 fixture.*

    The mounting feet slots provide 17° of pan. Position ES-1 at the desired pan angle.

tilt screws (4)

mounting
feet
slots (4)

3/8" hex nut (4)

3/8" fender
washer (4)

mounting
studs (4)

25" minimum
diameter
foundation
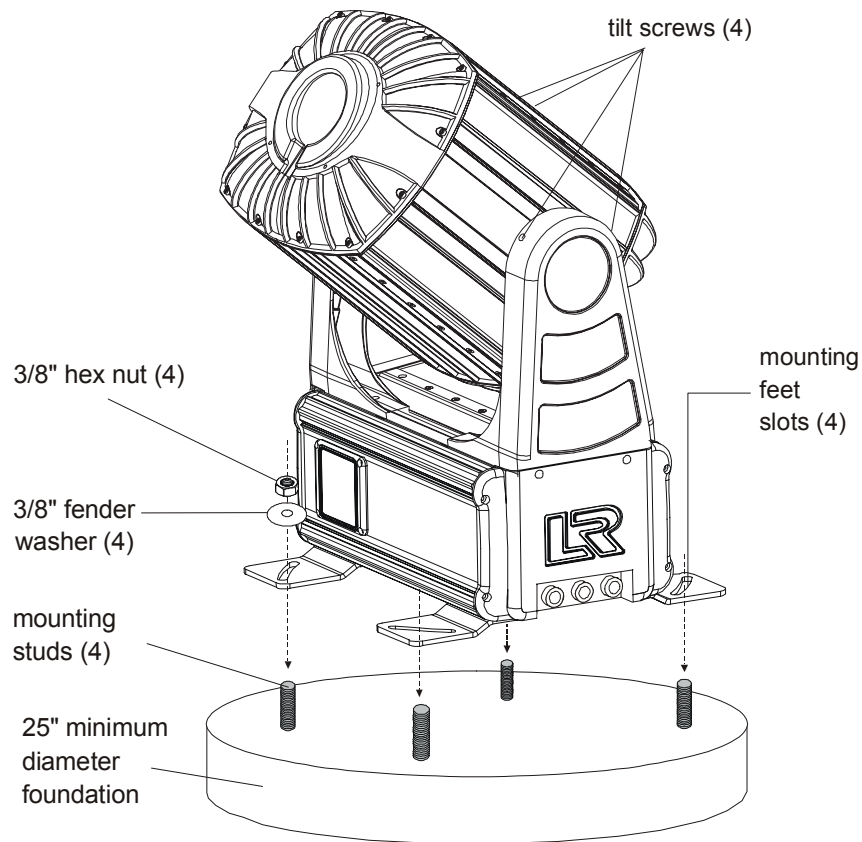
Figure 1-11. Secure ES-1 to the prepared foundation

2. When the ES-1 is positioned correctly, place a 3/8″ extra large fender
    washer and a 3/8″ hex nut over each of the four studs in the foundation
    and tighten securely (see Figure 1-11).

3. Loosen the tilt screws using a 5/32 allen wrench and adjust the tilt angle
    to the desired position, then re-tighten securely (see Figure 1-11).

Obtaining Data Cabling and Terminators

To link a fixture to a controller or other fixtures, you must obtain data cabling.
You can either purchase cabling from High End Systems or construct your own
cabling. For more information, see "Optional Accessories" on page Intro-7 or
"Constructing Cabling" below.

The last fixture in a link must have a 120 ohm, 1/4 watt (minimum) terminator
attached to its Data Out connector. You can either purchase terminators from
High End Systems or construct your own terminators. For more information, see
"Optional Accessories" on page Intro-7 or "Constructing Terminators" on page
1-10.

Constructing Cabling

High End Systems recommends you use data-grade cable. Data-grade cable is designed to carry a higher-quality signal with less susceptibility to electromagnetic interference. Data-grade cables must be Belden® 9841 or equivalent (meets specifications for EIA RS-485 applications) with the following characteristics:

- 2-conductor twisted pair plus a shield
- maximum capacitance between conductors - 30 pF/ft.
- maximum capacitance between conductor and shield - 55 pF/ft.
- maximum resistance of 20Ω /1000 ft.
- nominal impedance 100-140Ω

Cable Connectors

If you construct cabling, you must use cable connectors with a male 3-pin XLR connector on one end and a female 3-pin XLR connector on the other end. Pin one is the common (cable shield), pin two is the data complement (negative), and pin three is the data true (positive) (see Figure 1-12).
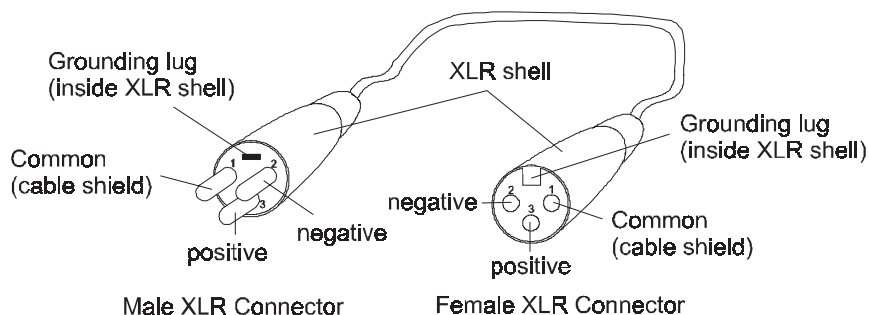
Figure 1-12. XLR 3-pin connectors

You should test each cable with a voltage/ohm meter (VOM) to verify correct polarity and to make sure that the negative and positive pins are not grounded or shorted to the shield or to each other. Also, make sure that pin 1 is shielded.

Caution: do not connect anything to the ground lug on the XLR connectors. Do not connect or allow contact between the common (cable shield) and the fixture's chassis ground. Grounding the common could cause a ground loop and/or erratic behavior.

Constructing Terminators

You must terminate the *last* fixture in the link by placing a male XLR connector with a 120 ohm terminator in the fixture's female Data Out connector. For synchronized playback, you must also terminate the *first*

fixture in the link by placing a female XLR connector with a 120 ohm terminator in the fixture's male Data In connector.

You can construct a terminator by following the instructions below:

1. Obtain a three-pin XLR connector.

2. Disassemble the connector.

3. Solder a 120 ohm resistor, minimum of 1/4 watt, between pins 2 and 3 (see Figure 1-13).

4. Reassemble the XLR connector.

Male XLR terminator   Female XLR Terminator
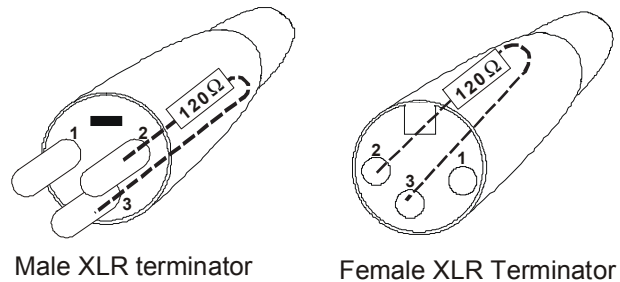
Figure 1-13. Male and female terminator

Linking the Fixtures

You may connect up to 25 uniquely addressed fixtures for use with a DMX controller or up to 32 fixtures for synchronized playback of the on-board memory preset scenes.

Note: *controllers, serial data distributors, data line optoisolators, and any fixtures using the RS-422 DMX standard of serial communications (including Dataflash® AF1000 xenon strobes, Intellabeam® fixtures, and Emulator® fixtures) block software uploads or crossloads on a link. Therefore, make sure you put all of these devices after the ES-1 fixtures on the link. If you cannot move these devices after ES-1 fixtures on the link, remember to remove or bypass these devices when you want to perform software uploads or crossloads.*

You will need:

• suitable length of DMX data cabling*
• suitable number of terminators*

*Note: *for more information, see "Obtaining Data Cabling and Terminators" on page 1-9.*

To link a fixture to a controller and/or to other fixtures:

1. Connect the male XLR connector on the data cable to the controller's Data Out connector.

2. If you plan to control fixtures in stand-alone mode (without a controller), connect the male XLR connector on the data cable to the Data Out connector to the master fixture (i.e. the fixture addressed at DMX start channel 1 or fixture number 1).

3. Connect the female XLR connector *of the same data cable* to the first (or next) fixture's Data In connector.

4. Continue using this method to connect all of the ES-1 fixtures on the link (see Figure 1-14).
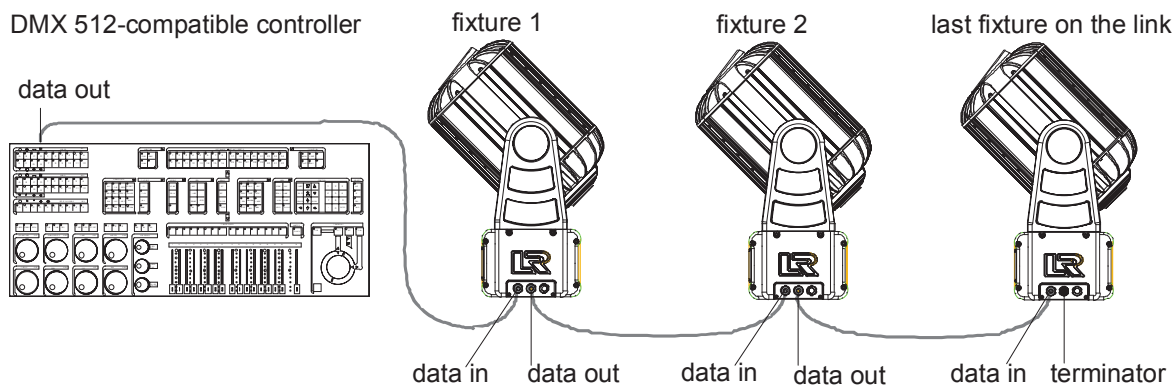
Figure 1-14. Linking the fixtures

5. Place a male 120 ohm terminator in the female Data Out connector of the last device in the link.*

*Note: *if you are linking fixtures without a controller for synchronized playback, you should install a terminator on the master fixture's Data In connector as well as the last fixture's Data Out connector.*

Branch Mains Power Connections

WARNING: class 1 equipment: This equipment must be earthed.

ES-1 is shipped without a power cord cap attached. You can either wire the line cord for permanent connection to a power source or install a power cord cap and connect ES-1 to a standard electrical outlet (for indoor installations). For more information on ES-1 power requirements and on fitting user-supplied conduit or weatherized cabling directly to the ES-1 side panel connectors, see the *EC-1 Installation Guide* (p/n 60600125) shipped with the fixture. *Note that the instructions in the EC-1 Installation Guide also apply to the ES-1 fixture.*

If you choose to install a power cord cap, the type of cap you need depends on the location and country in which ES-1 will be used. You should use a power cord cap with the correct voltage rating for 13 amps or more. Contact a local authority if you are unsure which type of power cord cap you need.

Install a power cord cap or permanently connect the cord to a power source in accordance with the following code:

- green and yellow - earth
- blue - neutral
- brown - live

Important Power Cord Information - U.K. Only

In the United Kingdom, the colours of the cores in the mains lead of this equipment may not correspond with the coloured markings identifying the terminals in your plug.

Proceed as follows:

- The core which is coloured green and yellow must be connected to the terminal in the plug which is marked with the letter "E" or by the earth symbol ⏚, or coloured green or green and yellow.
- The core which is coloured blue must be connected to the terminal which is marked with the letter "N" or coloured black.
- The core which is coloured brown must be connected to the terminal which is marked with the letter "L" or coloured red.

VIGTIG FIKKER HEDS INFORMATION - DANMARK

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt! Lederne med gul/groen isolation maa kun tilsluttes en klemme maerket

⏚   eller   ⏚

Powering Up the Fixture

ES-1 does not have a power switch. To power up the fixture, simply connect it to an appropriately-rated power source (see "Branch Mains Power Connections" on page 1-12). You can also remotely power up or shutdown the fixture via a DMX controller (see "Control Channel" on page 2-6). However, it is very important that you electrically isolate the fixture before performing certain procedures as shown in this manual.

Homing the Fixture

When you connect ES-1 to an appropriately-rated power source, the fixture automatically begins its homing procedure to verify that the major functions of the fixture (color wheels, iris, and shutter) are working properly. During the homing process, you will hear clattering sounds as the wheels, iris, and shutter seek their home position. ES-1 also homes when you power up the fixture via a DMX controller (see "Remote Homing" on page 2-7). To manually home ES-1 via the on-board menu system, see "Homing the Fixture (HOME)" on page 3-13.

Selecting a Control Method

You must select a control method for each ES-1 fixture: either a DMX start channel (recommended) or a fixture number (for a link with fixtures that all use the same number of DMX channels in their channel range).

Note: *once you choose a control method, you should use that same control method for all the fixtures on a link.*

Channel Range

There are 512 available channels on each DMX link. These 512 channels are divided among *all* the devices in a particular link. The number of channels each fixture requires is called the fixture's channel range.

Each ES-1 fixture reserves a block of 20 contiguous channels. Therefore, you can control up to 25 ES-1 fixtures (512 DMX channels available / 20 channels used by ES-1 = 25.6 fixtures per link).

You must assign a *unique* fixture address to each fixture that you want to respond *independently* to controller commands. The fixture's channel range must not overlap any other device's channel range on the link. When two devices on the same DMX link have overlapping channel ranges, one or both devices will be disabled or behave erratically.

Note: *if you want two or more fixtures to respond to controller commands in exactly the same way, the fixtures must be the same type (for example, two ES-1 fixtures) and must share the **entire** channel range.*

DMX Start Channel Control Method

If you plan to combine different types of devices that use different numbers of channels on one DMX link, you should use the DMX start channel control method. Using the DMX start channel method allows you to assign an explicit start channel to each fixture, so no DMX channels are wasted. For more information, see "Wasted DMX Channels" on page 1-16.

To select the DMX start channel control method:

AddR 1. Press and hold the <Menu> button until "ADDR" appears on the LED display.

SET 2. Using the <Up> and <Down> arrow buttons, scroll to the "SET" menu and press the <Enter> button to select the "SET" menu.

CHNL 3. Using the <Up> and <Down> arrow buttons, scroll to the "CHNL" menu and press the <Enter> button to select the "CHNL" menu.

dMX 4. Using the <Up> and <Down> arrow buttons, scroll to the "DMX" option and press the <Enter> button to select the "DMX" option.

Note: *you must select a control method for each ES-1 fixture on the link.*

Fixture Number Control Method

When you use the fixture number control method, each fixture "thinks" all other devices on the link use the *same number* of DMX channels that it uses.

Therefore, using the fixture number control method is a good idea *only* if you plan to link fixtures that all use the same number of DMX channels. For example, assign fixture numbers if you have a link that *only* controls ES-1 fixtures (or other devices that use 20 DMX channels). Otherwise, you may waste DMX channels (see "Wasted DMX Channels" on page 1-16).

To select the fixture number control method:

AddR 1. Press and hold the <Menu> button until "ADDR" appears on the LED display.

`SET` 2. Using the <Up> and <Down> arrow buttons, scroll to the "SET" menu and press the <Enter> button to select the "SET" menu.

`CHNL` 3. Using the <Up> and <Down> arrow buttons, scroll to the "CHNL" menu and press the <Enter> button to select the "CHNL" menu.

`AddR` 4. Using the <Up> and <Down> arrow buttons, scroll to the "ADDR" option and press the <Enter> button to select the "ADDR" option.

Note: *you must select a control method for each ES-1 fixture on the link.*

Assigning a Fixture Address

The fixture's address identifies each unique fixture's channel range on the DMX link. After you have selected a control method, you must assign a DMX start channel or fixture number to each fixture:

- If you chose the DMX start channel control method for the fixture, you must assign each fixture a DMX start channel.
- If you chose the fixture number control method, you must assign each fixture a fixture number.

Determining the Unique DMX Start Channel

The DMX start channel is the first channel available to a fixture in its channel range. To determine each fixture's DMX start channel in a link, you must know the number of channels used by each fixture (ES-1 uses 20 channels in its channel range).

Knowing that the first fixture on the link will use DMX start channel 1, you can determine the DMX start channel for each successive fixture by adding the number of DMX channels used by the fixture to the fixture's DMX start channel. For example, in Table 1-1, 20 (channels used by the ES-1) + 1 (DMX start channel for the first fixture) = 21 (DMX start channel for the next fixture on the link).

Table 1-1. Example: Determining the DMX Start Channel

Fixture location on the link*	Fixture name	Number of DMX channels used per fixture	DMX start channel	Channel range used
First	ES-1	20 channels	C001	1-20
Second	EC-1	12 channels	C021	21-32
Third	EC-1	12 channels	C033	33-44
Fourth	Other Device (14 channels)	14 channels	C045	45-58
Fifth	ES-1	20 channels	C059	59-78

*Note: *the fixture location on the link does not have to comply with this example. The fixtures can be addressed in any order on the link.*

To assign a unique DMX start channel for the fixture:

1

Installation and Setup

`AddR` 1. Press and hold the <Menu> button until "ADDR" appears on the LED display.

2. Press the <Enter> button to enter the "ADDR" menu.

`C001`
to
`C512` 3. Using the <Up> and <Down> arrow buttons, scroll to the desired DMX start channel and press the <Enter> button to select the desired DMX start channel.

Determining the Unique Fixture Number

The fixture number is a number you assign that represents each unique fixture on the link. If you are using one DMX link to control fixtures which all use the same number of DMX channels (as recommended), you can assign fixture numbers in ascending order (see Table 1-2).

Table 1-2. Example: Determining the Unique Fixture Number

Fixture location on the link	Fixture name	Number of DMX channels used per fixture	Fixture number	Channel range used
First	ES-1	20 channels	F 01	1-20
Second	ES-1	20 channels	F 02	21-40
Third	ES-1	20 channels	F 03	41-60
Fourth	Other device (20 channels)	20 channels	F 04	61-80

To assign a unique fixture number to your fixture:

`AddR` 1. Press and hold the <Menu> button until "ADDR" appears on the LED display.

`F 01` 2. Press the <Enter> button to enter the "ADDR" menu.
to
`F 25` 3. Using the <Up> and <Down> arrow buttons, scroll to the desired fixture number and press the <Enter> button.

Wasted DMX Channels

If you mix different types of devices (which use different numbers of channel ranges) on the same DMX link and assign *fixture numbers* (instead of DMX start channels) to these devices, you would waste DMX channels.

For example, in Table 1-3, if you assigned fixture number 2 (F 02) to the EC-1 fixture, it would assume that all other fixtures on the link are also using 12 DMX channels, so it will erroneously try to receive channel 13 as the first channel in its channel range. This would create channel overlapping because fixture number 1 (ES-1) is already using channel 13 in its 20-channel range.

In this example, to prevent overlapping channels, you must assign fixture number 3 (F 03) to the EC-1, even though it is physically the second fixture on the DMX

link. While this would prevent overlapping channels, it would result in wasted channels that could not be used (see Table 1-3).

Table 1-3. Example of Wasted DMX Channels

Fixture location on the link	Fixture name	Number of DMX channels used per fixture	Fixture number: DMX channel range used (to prevent overlapping)	Resulting channels wasted
First	ES-1	20 channels	**F 01** : 01-20	
Second	EC-1	12 channels	**F 03** : 25-36	4 channels wasted (21-24)
Third	ES-1	20 channels	**F 05** : 41-60	4 channels wasted (37-40)
Fourth	ES-1	20 channels	**F 07** : 61-80	

Therefore, if you choose to assign fixture numbers to different types of devices (and/or protocols) on the same DMX link, refer to "DMX Start Channels" on page C-4, which shows the channel ranges reserved for ES-1 fixtures. This table will help you determine the next available DMX start channel/fixture number for successive ES-1 fixtures on the link.

Controlling ES-1 With DMX

ES-1 may be controlled by 8- or 16-bit DMX controllers. Chapter 2 discusses ES-1 operation with its protocol in detail. Use Table 1-4 to control ES-1 via DMX.

Note: *ES-1's protocol, software, and documentation are subject to change. Visit the High End Systems web site for the latest updates.*

Table 1-4. ES-1 Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
		Full Speeds			
		Indexed	0-31	0-12	0-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	16-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink-indexed	112-127	44-49	70-7F
1	Color Wheel 1 Function	MSpeed Controlled			
		Indexed	128-159	50-62	80-9F
		Forward spin	160-175	63-68	A0-AF
		Reverse spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF
		Random	224-239	88-93	E0-EF
		Blink-indexed	240-255	94-100	F0-FF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
		Indexed Mode			
		Color 1	0-19	0-7	0-13
		Color 1 and 2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2 and 3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3 and 4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4 and 5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5 and 6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6 and 1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		Continuously Variable Mode			
		Color 1	0	0	0
		Color 2	43	16	2B
		Color 3	85	33	55
		Color 4	128	50	80
		Color 5	170	66	AA
		Color 6	213	83	D5
2	Color Wheel 1 Position	Color 1	255	100	FF
		Continuously Variable Forward Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		Continuously Variable Reverse Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
		Combined Mode			
		Color 1	0-6	0-2	0-6
		Color 2	7-13	3-5	7-0D
		Color 3	14-20	6-7	0E-14
		Color 4	21-27	8-10	15-1B
		Color 5	28-34	11-13	1C-22
		Color 6	35-41	14-16	23-29

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
		Color 7	42-47	17-18	2A-2F
		Color 8	48-54	19-21	30-36
		Color 9	55-61	22-23	37-3D
		Color 10	62-68	24-26	3E-44
		Color 11	69-75	27-29	45-4B
		Color 12	76-82	30-32	4C-52
		Color 13	83-89	33-34	53-59
		Color 14	90-96	35-37	5A-60
		Color 15	97-103	38-40	61-67
		Color 16	104-110	41-42	68-6E
		Color 17	111-117	43-45	6F-75
		Color 18	118-124	46-48	76-7C
		Color 19	125-130	49-50	7D-82
		Color 20	131-137	51-53	83-89
		Color 21	138-144	54-56	8A-90
		Color 22	145-151	57-58	91-97
		Color 23	152-158	59-61	98-9E
		Color 24	159-165	61-64	9F-A5
		Color 25	166-172	65-67	A6-AC
		Color 26	173-179	68-69	AD-B3
		Color 27	180-186	70-72	B4-BA
2	Color Wheel 1 Position	Color 28	187-193	73-75	BB-C1
		Color 29	194-200	76-78	C2-C8
		Color 30	201-207	79-80	C9-CF
		Color 31	208-213	81-83	D0-D2
		Color 32	214-220	84-85	D3-D9
		Color 33	221-227	86-88	DA-E3
		Color 34	228-234	89-91	E4-EA
		Color 35	235-241	92-94	EB-F1
		Color 36	242-248	95-96	F2-F8
		Color 1	249-255	97-100	F9-FF
		Combined Continuous Mode			
		Color 1	0	0	0
		Color 2	8	3	8
		Color 3	15	5	0F
		Color 4	22	8	16
		Color 5	29	11	1D
		Color 6	36	14	24
		Color 7	43	16	2B
		Color 8	50	19	32
		Color 9	57	22	39
		Color 10	64	25	40
		Color 11	72	28	48

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
2	Color Wheel 1 Position	Color 12	79	30	4F
		Color 13	86	33	56
		Color 14	93	36	5D
		Color 15	100	39	64
		Color 16	107	41	6B
		Color 17	114	44	72
		Color 18	121	47	79
		Color 19	128	50	80
		Color 20	136	53	88
		Color 21	143	55	8F
		Color 22	150	58	96
		Color 23	157	61	9D
		Color 24	164	64	A4
		Color 25	171	66	AB
		Color 26	178	69	B2
		Color 27	185	72	B9
		Color 28	193	75	C1
		Color 29	200	78	C8
		Color 30	207	80	CF
		Color 31	214	83	D3
		Color 32	221	86	DA
		Color 33	228	89	E4
		Color 34	235	91	EB
		Color 35	242	94	F2
		Color 36	249	97	F9
3	Color Wheel 2 Function	Full Speeds			
		Combined Operation	0-15	0-5	0-F
		Indexed	16-31	6-12	10-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	19-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink (indexed)	112-127	44-49	70-7F
		MSpeed Controlled			
		Indexed	128-159	50-62	80-9F
		Forward spin	160-175	63-68	A0-AF
		Reverse spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
3	Color Wheel 2 Function	Random	224-239	88-93	E0-EF
		Blink (indexed)	240-255	94-100	F0-FF
4	Color Wheel 2 Position	Indexed Mode			
		Color 1	0-19	0-7	0-13
		Color 1/2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2/3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3/4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4/5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5/6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6/1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		Continuously Variable Mode			
		Color 1	0	0	0
		Color 2	43	16	2B
		Color 3	85	33	55
		Color 4	128	50	80
		Color 5	170	66	AA
		Color 6	213	83	D5
		Color 1	255	100	FF
		Continuously Variable Forward Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		Continuously Variable Reverse Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
5	Litho Wheel 1 Function	Full Speed			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
5	Litho Wheel 1 Function	Scan	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel (indexed)	96-111	38-42	60-6F
		Blink aperture (indexed)	112-127	43-49	70-7F
		MSpeed Controlled			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Scan	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel (indexed)	224-239	88-93	E0-EF
		Blink aperture (indexed)	240-255	94-100	F0-FF
6	Litho Wheel 1 Position	Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
7	Litho Wheel 1 Rotation High Byte	Indexed Mode	0-255	0-100	0-FF
		Variable Forward Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate forward slowest	4	2	4
		Rotate forward fastest	225	100	FF
		Variable Reverse Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate reverse slowest	4	2	4
		Rotate reverse fastest	225	100	FF
		Continuously Variable Wheel Spin Mode			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		Scan Mode			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
8	Litho Wheel 1 Rotation Low Byte	Indexed Mode	0-255	0-100	0-FF
9	Litho Wheel 2 Function	Full Speed			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Scan	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel (indexed)	96-111	38-42	60-6F
		Blink aperture (indexed)	112-127	43-49	70-7F
		MSpeed Controlled			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Scan	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel (indexed)	224-239	88-93	E0-EF
		Blink aperture (indexed)	240-255	94-100	F0-FF
10	Litho Wheel 2 Position	Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
11	Litho Wheel 2 rotation High Byte	Indexed Mode	0-255	0-100	0-FF
		Variable Forward Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate forward slowest	4	2	4
		Rotate forward fastest	225	100	FF
		Variable Reverse Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate reverse slowest	4	2	4
		Rotate reverse fastest	225	100	FF
		Continuously Variable Wheel Spin Mode			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		Scan Mode			

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
11	Litho Wheel 2 rotation High Byte	Scan slowest	0	0	0
		Scan fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
12	Litho Wheel 2 Rotation Low Byte	Indexed Mode	0-255	0-100	0-FF
13	Frost	No frost	0	0	0
		Variable frost	1-127	1-49	1-7F
		Full frost	128-143	50-55	80-8F
		Periodic frost strobes	144-159	56-62	90-9F
		Random frost strobes	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BF
		Snap open/ ramp shut	192-207	75-80	C0-CF
		Random ramp/ snap	208-223	81-87	D0-DF
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	FO-FF
14	Focus	Focus image closer	0	0	0
		Focus image farther	256	100	FF
15	Iris	Closed	0	0	0
		Variable	1-127	1-49	1-7F
		Open	128-143	50-55	80-8F
		Periodic strobes	144-159	56-62	90-9F
		Random strobes	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BE
		Snap open/ ramp shut	192-207	75-80	BF-CF
		Random ramp/ snap	208-223	81-87	DD-DC
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	FO-FF
16	Shutter	Closed	0-31	0-12	0-1F
		Periodic strobes	32-63	13-24	20-3F
		Random strobes	64-95	25-37	40-5F
		Ramp open/ snap shut	96-127	38-49	60-7F
		Snap open/ ramp shut	128-159	50-62	80-9F
		Random ramp open/ snap shut	160-191	63-74	A0-BF
		Random snap open/ ramp shut	192-223	75-87	C0-DF
		Open	224-255	88-100	E0-FF
17	Dim	Closed	0	0	0
		Open	255	100	FF
18	MSpeed	Controller crossfade	0-3	0-1	0-3
		longest (252.7 sec.)	4	2	4
		shortest (0.15 sec.)	255	100	FF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
19	Factory Macros	No macro	0-7	0-2	0-7
		Macro 1	8-15	3-5	8-0F
		Macro 2	16-23	6-9	10-17
		Macro 3	24-31	10-12	18-1F
		Macro 4	32-39	13-15	20-27
		Macro 5	40-47	16-18	28-2F
		Macro 6	48-55	19-21	30-37
		Macro 7	56-63	22-24	38-3F
		Macro 8	64-71	25-27	40-47
		Macro 9	72-79	28-30	48-4F
		Macro 10	80-87	31-34	50-57
		Macro 11	88-95	35-37	58-5F
		Macro 12	96-103	38-40	60-67
		Macro 13	104-111	41-43	68-6F
		Macro 14	112-119	44-46	70-77
		Macro 15	120-127	47-49	78-7F
		Macro 16	128-135	50-52	80-87
		Macro 17	136-143	53-55	88-8F
		Macro 18	144-151	56-59	90-97
		Macro 19	152-159	60-62	98-9F
		Macro 20	160-167	63-65	A0-A7
		Macro 21	168-175	66-68	A8-AF
		Macro 22	176-183	69-71	B0-B7
		Macro 23	184-191	72-74	B8-BF
		Macro 24	192-199	75-77	C0-C7
		Macro 25	200-207	78-80	C8-CF
		Macro 26	208-215	81-84	DD-D4
		Variable speed random macros	216-247	85-96	D5-F7
		No macro	248-255	97-100	F8-FF
20	Control[1]	Safe	0-9	0-3	0-9
		Disable MSpeed for pan and tilt *Note: this menu item has no functionality for ES-1 fixtures*	10-19	4-7	OA-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
		Reserved	131-255	51-100	83-FF

[1] Note: DMX channel 16 (shutter) must be closed to access the control channel.

Chapter 2
Operation

Color Functions

Color functions determine how each color wheel moves. Each color function can run at *full speed* or *MSpeed*.

Color functions are controlled by DMX channel 1 for color wheel 1 and channel 3 for color wheel 2. To simplify programming, you can use combined mode. In combined mode, set channel 3 to combined mode (0-15) and use channel 3 to assign the color function to both wheels simultaneously.

See Table 2-1 for the available color functions and descriptions.

Table 2-1. Color Functions

Function	Description
Indexed	Allows the color wheel(s) to take the quickest path and snap to whole and half colors.
Forward spin	Allows variable speed forward spins.
Reverse spin	Allows variable speed reverse spins.
Continuous	Allows the wheel to rotate continually for one complete revolution (0-360°). Combined continuous mode rotates both wheels to allow all 36 positions to be reached.
Fast scan	Allows fast scans between whole and half colors.
Slow scan	Allows slow scans between whole and half colors.
Random	Allows variable speed random color selection.
Blink-indexed[1]	Allows the dim flags to quickly close during color change. The flags will instantly reopen when the next programmed position is reached.

[1] Long crossfade and MSpeed times could result in undesirable effects as there will be no light output.

Note: *combined mode will not allow colors to be combined with the aqua or indigo positions because they do not mix.*

Color Wheel Positioning

Color wheel positioning controls the movement of the colors wheels. Color wheel positioning is controlled by DMX channel 2 for color wheel 1 and channel 4 for wheel 2 (unless combined mode is used). See "Color Combinations" on page C-5 for a list of combined colors with the factory color wheels.

The factory color wheels contain the following dichroic colors:

Color Wheel 1

- Position 1- white (open)
- Position 2- yellow
- Position 3- full CTO (color temperature orange)
- Position 4- aqua
- Position 5- pink
- Position 6- magenta

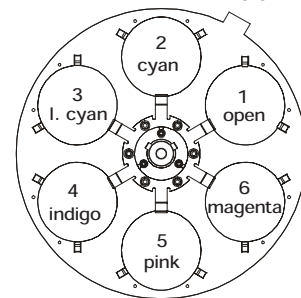Note: *color wheel 1 is physically located closest to the lamp.*
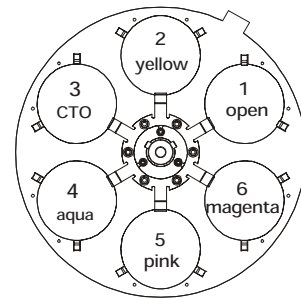
Color Wheel 2

- Position 1- white (open)
- Position 2- cyan
- Position 3- light cyan
- Position 4- indigo
- Position 5- pink
- Position 6- magenta

color wheel 1 (lower)

color wheel 2 (upper)

Litho Functions

Litho functions determine how each litho wheel moves. Each litho function can run at *full speed* or *MSpeed*.

Litho functions are controlled by DMX channel 5 for litho wheel 1 and channel 9 for wheel 2.

See Table 2-2 for the available litho functions and descriptions.

Table 2-2. Litho Functions

Function	Description
Indexed	Allows the litho wheel to be indexed (rotated) to the proper orientation.
Forward rotate	Allows variable forward rotation of the litho.
Reverse rotate	Allows variable reverse rotation of the litho.
Wheel spin	Allows variable forward and reverse rotation of the litho wheel.
Indexed scan	Allows variable speed scans between adjoining litho positions.
Random	Allows random litho selection at variable speeds.
Blink wheel[1]	Allows the shutter to quickly close during a litho change. The shutter will reopen when the wheel has reached its destination.
Blink aperture[1]	Allows the shutter to quickly close when a litho is indexed. The shutter will reopen when the litho has reached its destination.

[1] Long crossfade and MSpeed times could result in undesirable effects as there will be no light output.

Litho Wheel Positioning

Litho wheel positioning controls the aperture to aperture (indexed) movement for each litho wheel. However, if a litho function is set for wheel spin or random, litho wheel positioning will not override these functions.

Litho wheel positioning is controlled with DMX channel 6 for litho wheel 1 and channel 10 for wheel 2.

The factory litho wheels contain the following patterns and effects:
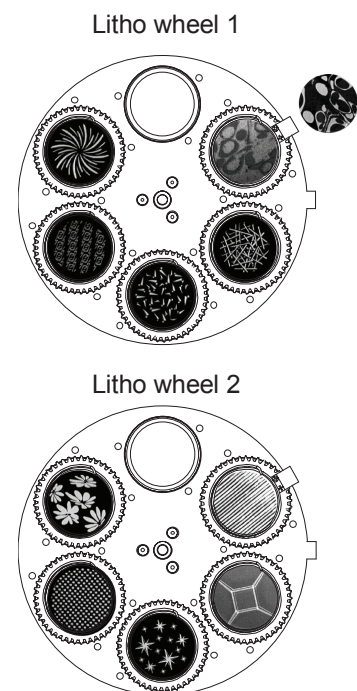
Litho Wheel 1
Litho wheel 1

* Position 1- open
* Position 2- Lava (cyan and magenta)*
* Position 3- Pick Up Sticks
* Position 4- Cones
* Position 5- Space Steppers
* Position 6- Dashing

*Note: *the cyan and magenta Lava lithos are combined to make up the Lava litho.*

Litho Wheel 2
Litho wheel 2

* Position 1- open
* Position 2- Lenticular effect glass
* Position 3- Five Facet Prism
* Position 4- Bright Stars
* Position 5- Teather Wall
* Position 6- Happy Dias

Note: *litho wheel spin and random mode speeds are controlled by the litho rotation channel. Litho wheel 1 is located closest to the lamp.*

Litho Rotation

Litho rotation uses 16-bit resolution for precise positioning. Litho rotation moves the lithos and moves the wheel in wheel spin and random modes.

Litho rotation for wheel 1 is controlled by DMX channel 7 for coarse positioning (high byte) and channel 8 for fine positioning (low byte). Litho rotation for wheel 2 is controlled by DMX channel 11 for coarse positioning (high byte) and channel 12 for fine positioning (low byte).

See Table 2-3 for the available rotation options and descriptions.

Note: *the litho rotation channels also control wheel spin, litho scan, and random litho functions.*

Table 2-3. Litho Rotation

Option	Description
Indexed	Indexes the litho from 0-360°.
Forward rotate	Stops or rotates the litho clockwise (projected view) at variable speeds.
Reverse rotate	Stops or rotates the litho counter-clockwise (projected view) at variable speeds.
Wheel spin	Stops or spins the litho wheel in either direction at variable speeds.
Scan	Scans between two lithos at variable speeds.
Random	Randomly switches between lithos at variable speeds.

Frost

Frost effects are achieved with two frost flags. The frost system provides infinite beam diffusion, variable and random frost strobing, and variable and random ramp/snap effects.

Frost is controlled by DMX channel 13. See Table 2-4 for the available frost functions and descriptions.

Table 2-4. Frost Functions

Function	Description
No Frost	Removes the frost flags from the optical path.
Variable	Allows variable diffusion.
Full Frost	Allows variable full diffusion.
Periodic strobe	Allows variable strobing of the frost flags.
Random frost strobe	Allows random strobing of the frost flags.
Ramp open and snap shut	Allows the system to ramp open at variable speeds and snap shut at full speed.
Snap open and ramp shut	Allows the system snap open at full speed and ramp shut at variable speeds.
Random ramp open and snap shut	Allows the system to ramp open at random speeds and snap shut at full speed.
Random snap open and ramp shut	Allows the system to snap open at full speed and ramp shut random speeds.

Focus

The variable focus mechanism physically moves the lens assembly. This allows both litho wheels to be brought in or out of focus from 1 meter to infinity. Due to the short focal distance between litho wheels, patterns can be easily morphed. Additionally, combination patterns can be created by mixing patterns and/or effects. Focus is controlled by DMX channel 14.

Iris

The precision iris manipulates the beam diameter. Additionally, the iris offers strobing, random strobing, and ramp/snap effects.

The iris is controlled by DMX channel 15. See Table 2-5 for iris functions and descriptions.

Table 2-5. Iris Functions

Function	Description
Variable	Allows variable beam diameter.
Variable strobe	Allows variable strobing of the beam diameter.
Random strobe	Allows random strobing of the beam diameter.
Ramp open and snap shut	Allows the system to ramp open at variable speeds and snap shut at full speed.
Snap open and ramp shut	Allows the system to snap open at full speed and ramp shut at variable speeds.
Random ramp open and snap shut	Allows the system to ramp open at random speeds and snap shut at full speed.
Random snap open and ramp shut	Allows the system to snap open at full speed and ramp shut at random speeds.

Shutter

ES-1 uses the flags in the dimming system to produce instant blackout, variable and random speed strobes, and variable and random ramp/snap strobes. Additionally, ES-1 can dim while strobing.

The strobe system is controlled by DMX channel 16. See Table 2-6 for strobe functions and descriptions.

Table 2-6. Strobe Functions

Function	Description
Open	Opens the strobe system.
Closed	Allows instant blackout.
Variable	Allows variable speed strobing.
Random	Allows random speed strobing.
Ramp open and snap shut	Allows the system to ramp open at variable speeds and snap shut at full speed.
Snap open and ramp shut	Allows the system to snap open at full speed and ramp shut at variable speeds.
Random ramp open and snap shut	Allows the system to ramp open at random speeds and snap shut at full speed.
Random snap open and ramp shut	Allows the system to snap open at full speed and ramp shut at random speeds.

Dimming

ES-1 has full dimming capability without changing the color temperature or the shape of the projection. This is accomplished with dimming flags that are positioned out of the focal length. Dimming is linearly scaled with 256 values to provide smooth and accurate motion. Dimming is controlled by DMX channel 17.

MSpeed

MSpeed (movement speed) is a separate timing construct provided on all automated Lightwave Research fixtures. MSpeed is the amount of time required to complete movement(s) from one position to another. All fixtures that have the same MSpeed value reach their destination at the same time, regardless of the distance traveled. Because MSpeed allows the fixture to control its own movements, the motion will be extremely smooth because it is not dependent on DMX refresh rates.

MSpeed can be selectively applied to color selection, litho selection, and litho rotation. MSpeed is controlled by DMX channel 18. To determine exact MSpeed times, see "Converting DMX Values to MSpeed Times" on page C-1.

Factory Macros

Complicated looks can be quickly programmed by using one of the 26 factory-programmed macros. Additionally, sequences can be created using the variable speed random macro which randomly plays all 26 macros. Each macro modifies a specific set of constructs to produce a unique look, while allowing you to retain control of all other constructs.

When a macro is in use, you will be unable to manipulate the constructs it controls. For example, if you turn on Macro x and it sets Litho wheel 1 to position 5 and rotates it forward at 20 r.p.m., you will be unable to change the litho position, rotational direction (function), and rotational speed.

Macros are controlled by DMX channel 19.

Control Channel

The control channel allows you to access and control special fixture functions using your DMX controller.

The control channel is controlled by DMX channel 20. See the following subsections for control channel parameters.

Remote Display Adjustment

To remotely adjust the alpha-numeric display intensity:

1. Set DMX channel 20 (shutter) to a value of 0 on the appropriate fixture(s). This will unlock channel 20 (control).

2. Set DMX channel 20 to the desired value for at least one second:
   - Off: 20-28
   - Dim: 30-38
   - Bright: 40-48

3. Set DMX channel 16 to any value other than 0.

4. Set DMX channel 20 to 0 (safe).

Note: *to manually adjust the display intensity (using the front panel), see "Setting Display Intensity (DSPL)" on page 3-17.*

Remote Homing

Homing is the process of recalibrating the fixture's mechanical positions. This ensures that fixtures attain the correct positions from DMX data.

To remotely home a fixture:

1. Set DMX channel 16 (shutter) to a value of 0 on the appropriate fixture(s). This will unlock channel 20 (control).

2. Set DMX channel 20 at 60-68 for approximately one second. The display will indicate R S T (reset), strike the lamp if it is off, and the display will indicate H O M E while all motor systems reset. After the fixture has homed, it will return to its programmed position.

3. Set DMX channel 16 to any value other than 0.

4. Set DMX channel 20 to 0 (safe).

Note: *to manually home the fixture (using the front panel), see "Homing the Fixture (HOME)" on page 3-13.*

Remote Lamp Control

If you extinguish the lamp while the fixture is operating, you must allow the lamp to cool for approximately 10 minutes before it can restrike.

To remotely restrike or extinguish the lamp:

1. Set DMX channel 16 (shutter) to a value of 0 on the appropriate fixture(s). This will unlock channel 20 (control).

2. Set DMX channel 20 at 80-88 to restrike the lamp or at 90-98 to extinguish the lamp for at least 3 seconds.

3. Set DMX channel 16 to any value other than 0.

2 Operation

4. Set DMX channel 20 to 0 (safe).

Note: *to manually use the lamp functions (from the front panel), see "Turning the Lamp On and Off (LAMP)" on page 3-14.*

Remote Shutdown

ES-1 can be remotely shutdown via a DMX controller. When a fixture is shutdown, the lamp is extinguished, power to the motor systems is removed, and the front panel display and indicators are turned off. Fixture shutdown allows you to remotely deactivate a fixture or a range of fixtures without manually turning off each breaker. Once a fixture is shutdown, you must home the fixture to bring it back into operation.

To shutdown a fixture, complete the following procedure:

1. Set DMX channel 16 (shutter) to a value of 0 on the appropriate fixture(s). This will unlock channel 20 (control).

2. Set DMX channel 20 to a value of 120-130 (50%) on the appropriate fixture(s). The value must be sent for approximately 3 seconds before the fixture(s) will shutdown.

3. Set DMX channel 16 to any value other than 0.

4. Set DMX channel 20 to 0 (safe).

Chapter 3
Menu System

Overview

ES-1's four navigation buttons on the display panel allow you to navigate through the on-board menu system (see Figure 3-1). As you navigate the menu system, the alpha-numeric display will show the menu items you select from the menu map.

alpha-numeric LED display

F 01

<Up> arrow button: scroll upward through menu items or options

<Down> arrow button: scroll downward through menu items or options

MENU   ENTER

<Menu> button: move back to the previous menu level
(press and hold to enter the menu system)

<Enter> button: select the curent menu item or option
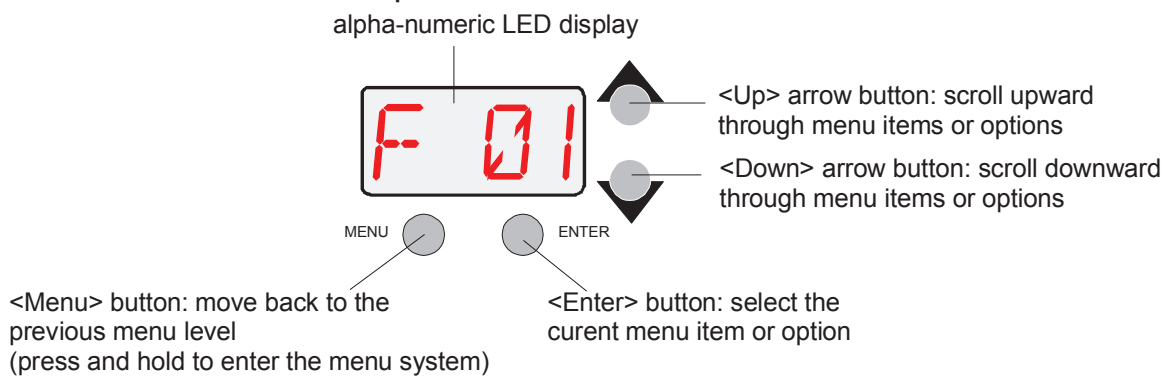
Figure 3-1. Use the <Menu>, <Enter>, <Up>, and <Down> keys to navigate through the menu system

The alpha-numeric display will flash when a new option is *selected* (by pressing the <Up> and <Down> arrow buttons), and will stop flashing when a new option is *entered* (by pressing the <Enter> button).

Note: *if you do not press the <Enter> button, the new option you selected will not be stored.*

Pressing the <Menu> button returns you to the previous option or menu *without changing* the value of an option.

Accessing the Menu System

To access the menu system, press and hold the <Menu> key until "ADDR" appears on the LED display. The menu system is protected against inadvertent menu changes by requiring the <Menu> button to be held for a few seconds before allowing entry to the menus.

To exit the menu system, you must keep pressing the <Menu> button to back out of each menu level until "MENU" appears on the LED display. "MENU" will be replaced, after a few seconds, with the default alternating display of the fixture's software version and the fixture number/DMX start channel.

Note*: the words "AUTO" and "LOCK" will appear briefly on the display after "MENU." As mentioned above, the fixture's software is "locking" the display after you have accessed the menu system.*

Menu Navigation

ES-1 uses the same menu system found in Studio Spot fixtures, which have pan and tilt movement. Because ES-1 does not have pan or tilt motion, the pan/tilt-related menu items listed in this menu map have no functionality.

Table 3-7. Menu Map

Level 1	Level 2	Level 3	Level 4	Level 5	Description
ADDR	Fxx/Cxxx				set fixture address by fixture number or DMX start channel
INFO	LAMP				view lamp status
	L/HR				view lamp hours and minutes
	L/ST				view lamp strikes
	VER				view software version
	L/RS				reset lamp hours and strikes
	F/HR				view total hours and minutes the fixture has been on
	F/RS				reset fixture hours
	TEMP	CURR			view current internal temperature (C)
		MINT			view minimum internal temperature (C)
		MAXT			view maximum internal temperature (C)
		RST			reset temperature
	DMX	FIXT	ERRS		view DMX errors
			CNTL		view control channel value
			MACR		view macro value
			MSPD		view MSpeed value
			DIM		view dim value
			SHUT		view shutter value
			IRIS		view iris value
			FCUS		view focus value
			FRST		view frost value
			LR2L		view litho wheel 2 rotational value (low byte)
			LR2H		view litho wheel 2 rotational value (high byte)
			LT2		view litho wheel 2 aperture position value
			LTC2		view litho wheel 2 control (function) channel value
			LR1L		view litho wheel 1 rotational value (low byte)
			LR1H		view litho wheel 1 rotational value (high byte)
			LT1		view litho wheel 1 aperture position value
			LTC1		view litho wheel 1 control (function) channel value
			CO2		view color wheel 2 position value
			CO2C		view color wheel 2 control (function) channel value
			CO1		view color wheel 1 position value

Table 3-7. Menu Map (Continued)

Level 1	Level 2	Level 3	Level 4	Level 5	Description
INFO	DMX	FIXT	CO1C		view color wheel 1 control (function) channel value
			TLTL		*this menu item has no functionality*
			TLTH		*this menu item has no functionality*
			PANL		*this menu item has no functionality*
			PANH		*this menu item has no functionality*
			STRT		view start code
			OV		view overrun errors
			FE		view framing errors
			SRCE		view the number of data source values in the FIXT submenu
		DATA	C001 - C512		view data on the selected DMX channel
	SENS	PPOS			*this menu item has no functionality*
		TPOS			*this menu item has no functionality*
		SENP			*this menu item has no functionality*
		SENT			*this menu item has no functionality*
		COL			check for color wheel homing tabs on the sensor (homed)
		LT1			check for litho wheel 1 homing tab on the sensor (homed)
		LT2			check for the litho wheel 2 homing tab on the sensor
		SVCC			view sensor power
TEST	HOME				home the fixture
	S/UP				place the fixture in setup position for servicing (production homing)
	SELF	ALL			run each self-test twice and repeat until stopped
		PAN			*this menu item has no functionality*
		TILT			*this menu item has no functionality*
		CO1			test color wheel 1
		CO2			test color wheel 2
		LT1			test litho wheel 1
		LT2			test litho wheel 2
		FRST			test frost
		FCUS			test focus
		IRIS			test iris
		SHUT			test shutter
		DIM			test dimmer
	DISP				test display
	BOOT				replace the current boot code with the new code when the display indicates BOOT DIFF
	LAMP	LON			turn the lamp on
		LOFF			turn the lamp off

3

Menu System

Table 3-7. Menu Map (Continued)

Level 1	Level 2	Level 3	Level 4	Level 5	Description
TEST	LAMP	STAT			view lamp status
MODE	TYPE	ES-1			set the fixture type to ES-1
		EC-1			set the fixture type to EC-1
	XLD				crossload fixture software
SET	FACT				return fixture to factory defaults
	CHNL	ADDR			address fixtures by fixture number mode (F01 - F 21)
		DMX			address fixture by DMX start channel mode (C001 - C512)
	DSPL	ON			turn the display on
		OFF			turn the display off
		DIM			dim the display
	D/IN				invert the alpha-numeric display orientation
	P/IN				*this menu item has no functionality*
	T/IN				*this menu item has no functionality*
	SWAP				*this menu item has no functionality*
	S/DN	5 MN			set shutdown for 5 minutes
		10 MN			set shutdown for 10 minutes
	PCAL				*this menu item has no functionality*
	TCAL				*this menu item has no functionality*
PRST	PLAY	ON			start playback
		OFF			stop playback
		SCN			display which scene is playing
	EDIT	SN01-SN16	SHUT	CLSD	closed
				OPEN	open
				P 01 - P 32	periodic (variable) strobe slowest to fastest
				R 01 - R 32	random strobe slowest to fastest
				RS01 - RS32	ramp open and snap shut strobe slowest to fastest
				SR01 - SR32	snap open and ramp shut strobe slowest to fastest
				NR01 - NR32	random ramp open and snap shut strobe slowest to fastest
				NS01 - NS32	random snap open and ramp shut strobe slowest to fastest
			DIM	D000 - D255	no output (D000) to full output (D255)
			PAN	-185 - +185	*this menu item has no functionality*
			TILT	-112 - +112	*this menu item has no functionality*
			CO1C	IDX	index mode
				FSP	forward spin mode

Table 3-7. Menu Map (Continued)

Level 1	Level 2	Level 3	Level 4	Level 5	Description
PRST	EDIT	SN01 - SN16	CO1C	RSP	reverse spin mode
				CON	continuous mode
				FSC	fast scan mode
				SSC	slow scan mode
				RND	random color mode
				BLK	indexed blink mode
				MIDX	index mode with MSpeed
				MFSP	forward spin mode with MSpeed
				MRSP	reverse spin mode with MSpeed
				MCON	continuous mode with MSpeed
				MFSC	fast scan mode with MSpeed
				MSSC	slow scan mode with MSpeed
				MRND	random color mode with MSpeed
				MBLK	indexed blink mode with MSpeed
			CO1	C1 - C6	full colors 1 to 6 (indexed mode)
				HC1 - HC6	half-colors 1 to 6 (indexed mode)
				F000 - F255	forward spin stop to fastest (forward spin mode)
				R000 - R255	reverse spin stop to fastest (reverse spin mode)
				D000 - D358	position in degrees (continuous mode)
				FC1 - FC12	position with half colors (fast scan mode)
				MC1 - MC12	position with half colors (scan set by MSpeed mode)
				N000 - N255	random colors slowest to fastest (random color mode)
				B1 - B6	full color blink (indexed blink mode)
				HB1 - HB6	half-color blink (indexed blink mode)
				C1 - C36	colors 1 to 36 (combined mode) (indexed mode)
				B1 - B36	colors 1 to 36 (combined mode) (indexed blink mode)
			CO2C	CMBD	combined mode (see CO1C for additional modes
			CO2		color wheel 2 position (see CO1 for positions)
			LTC1	IDX	indexed mode
				FSP	forward litho rotate mode
				RSP	reverse litho rotate mode
				WSP	wheel spin mode

3

Menu System

Table 3-7. Menu Map (Continued)

Level 1	Level 2	Level 3	Level 4	Level 5	Description
PRST	EDIT	SN01 - SN16	LTC1	FSC	scan mode
				RND	random mode
				BKW	blink wheel mode (during litho to litho change)
				BKA	blink aperture mode (during index change)
				MIDX	indexed mode with MSpeed
				MFSP	forward litho rotate mode with MSpeed
				MRSP	reverse litho rotate mode with MSpeed
				MWSP	wheel spin mode with MSpeed
				MFSC	fast scan mode with MSpeed
				MRND	random mode with MSpeed
				MBKW	blink wheel mode (during litho to litho change) with MSpeed
				MBKA	blink aperture mode (during index change) with MSpeed
			LT1	L1 - L6	litho selection (indexed modes)
				LF1 - LF6	litho selection (forward rotate modes)
				LR1 - LR6	litho selection (reverse rotate modes)
				SC1 - SC8	litho selection (scan modes)
				BW1 - BW8	litho selection (blink wheel modes)
				BA1 - BA8	litho selection (blink aperture modes)
			LTR1	D000 - D358	litho position (indexed modes)
				F000 - F255	forward spin rotation speed stop to fastest (forward rotate modes)
				R000 - R255	reverse spin rotation speed stop to fastest (reverse rotate modes)
				S000 - S255	fast scan speed stop to fastest
				N000 - N255	random speed stop to fastest (random modes)
				WF01 - WF99	litho wheel spin speed forward slowest to fastest
				WR01 - WR99	litho wheel spin speed reverse slowest to fastest
			LTC2		litho wheel 2 function menu (see LTC1)
			LT2		litho wheel 2 position menu (see LT1)
			LTR2		litho wheel 2 rotation menu (see LTR2)
			FRST	OPEN	open (no frost)

Table 3-7. Menu Map (Continued)

Level 1	Level 2	Level 3	Level 4	Level 5	Description
PRST	EDIT	SN01 - SN16	FRST	F001 - F127	variable frost
				P1 - P15	periodic (variable) strobe
				R1 - R15	random strobe
				RS1 - RS15	ramp open and snap shut strobe
				SR1 - SR15	snap open and ramp shut strobe
				NR1 - NR15	random ramp open and snap shut strobe
				NS1 - NS15	random snap open and ramp shut strobe
			FCUS	0- 255	focusing
			IRIS	OPEN	open
				F001 - F127	variable iris
				P1 - P15	periodic (variable) strobe
				R1 - R15	random strobe
				RS1 - RS15	ramp open and snap shut strobe
				SR1 - SR15	snap open and ramp shut strobe
				NR1 - NR15	random ramp open and snap shut strobe
				NS1 - NS15	random snap open and ramp shut strobe
			SHUT	CLSD	closed
				OPEN	open
				P1 - P30	periodic strobe
				N1 - N30	random strobe
				RS1 - RS30	ramp open and snap shut strobe
				SR1 - SR30	snap open and ramp shut strobe
				NR1 - NR30	random ramp open and snap shut strobe
				NS1 - NS30	random snap open and ramp shut strobe
			DIM	D000 - D255	dimming
			MSPD	DIS	disable MSpeed for controller crossfading

Table 3-7. Menu Map (Continued)

Level 1	Level 2	Level 3	Level 4	Level 5	Description
PRST	EDIT	SN01 - SN16	MSPD	0.15	fastest MSpeed
				252.7	slowest MSpeed
			MACR	MR01 - MR26	macro 1 to macro 26
			XFAD	X0.1 - X9.9	increments of 0.1
				X10 - X166	increments of 1.0
			DLAY	X0.1 - X9.9	increments of 0.1
				X10 - X166	increments of 1.0
			TIME	SEC	set time by seconds
				MIN	set time by minutes
				HOUR	set time by hour
			ZERO	OK?	zero scene (resets the scene to its null setting)
	COPY	FROM	F 01- F 16		select the scene to copy from (source scene)
		TO	T 01- T 16		select the scene to paste to (destination scene)
	CAPT	SN01- SN16			set the scene to capture DMX data to (destination scene)

Address Menu (ADDR)

ES-1 can be addressed by fixture number or DMX start channel. To change the way ES-1 is addressed, see "Addressing By DMX Start Channel or Fixture Number Mode (CHNL)" on page 3-16.

To address ES-1:

`AddR`   1. Press and hold <MENU> until the display changes to A d d R .

2. Press <ENTER> to edit the A d d R field.

3. Using the up and down arrow buttons, scroll to the desired fixture number or DMX start channel.

4. Press <ENTER> to store the desired fixture number or DMX start channel.

Information Menu (INFO)

Use the following subsections to use the functions contained within the I N F 0 menu.

Viewing Lamp Status (LAMP)

To view the lamp status:

`AddR`   1. Hold <MENU> until the display changes to A d d R .

`INFO` 2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>. The display will indicate L A M P.

`LAMP` 3. Press <ENTER> to view the lamp status. The fixture will display one of the following:

- O N - the lamp is on
- O F F - the lamp is off
- S T R K - the lamp is attempting to strike

Viewing Lamp Hours (L/HR)

To view the number of hours the lamp has been on since this option was reset:

`AddR` 1. Hold <MENU> until the display changes to A d d R .

`INFO` 2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>.

`L/HR` 3. Using the up and down buttons, scroll to the L / H R field and press <ENTER> to view the lamp hours.

Note: *if the display indicates O V E R , the counter has rolled over 9999 hours.*

Viewing Lamp Strikes (L/ST)

To view the number of times the lamp has attempted to strike:

`AddR` 1. Hold <MENU> until the display changes to A d d R .

`INFO` 2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>.

`L/ST` 3. Using the up and down buttons, scroll to the L / S T field and press <ENTER>. The fixture will display the number of times the lamp has attempted to strike.

Note: *lamp strikes are automatically reset when the lamp hours are reset. "Resetting Lamp Hours (L/RS)" on page 3-10. If the display indicates O V E R , the counter has rolled over 9999 strikes.*

Viewing the Current Software Version (VER)

To view the current software version:

`AddR` 1. Hold <MENU> until the display changes to A d d R .

`INFO` 2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>.

`VER` 3. Using the up and down buttons, scroll to the V E R field and press <ENTER>. The fixture will display the current software version.

Note: *the software version is also displayed when you exit the menu system (see "Identifying Front Panel Components" on page 1-2).*

Resetting Lamp Hours (L/RS)

To reset lamp hours and lamp strikes:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`INFO`

2. Using the up and down buttons, scroll to the I N F O field and press <ENTER> .

`L/RS`

3. Using the up and down buttons, scroll to the L / R S field and hold <ENTER> until the fixture resets the lamp hours to 0 0 0 0 .

Viewing Fixture Hours (F/HR)

To view the number of hours the fixture has been on since this option was reset:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`INFO`

2. Using the up and down buttons, scroll to the I N F O field and press <ENTER> .

`F/HR`

3. Using the up and down buttons, scroll to the F / H R field and press <ENTER> . The fixture will display the number of fixture hours.

Note: *the display will indicate H x x x for hours and M x x for minutes until H 9 9 9 . When fixture hours exceed 999, the display will no longer indicate minutes, instead it will use all four digits to display hours. If the display indicates O V E R , the counter has rolled over 9999 hours.*

Resetting Fixture Hours (F/RS)

To reset fixture hours:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`INFO`

2. Using the up and down buttons, scroll to the I N F O field and press the <ENTER> button.

`F/RS`

3. Using the up and down buttons, scroll to the F / R S field and hold down <ENTER> until the fixture resets the fixture hours to 0 0 0 0 .

Viewing the Current Internal Temperature (CURR)

To view the fixture's current internal temperature:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`INFO`

2. Using the up and down buttons, scroll to the I N F O field and press <ENTER> .

`TEMP`

3. Using the up and down buttons, scroll to the T E M P field and press <ENTER> .

CURR 4. Using the up and down buttons, scroll to the C U R R field and press < ENTER > .

5. The fixture will display the current internal temperature in C (degrees centigrade).

Viewing the Minimum Internal Temperature (MINT)

To view the fixture's minimum internal temperature (lowest ambient at power on) since this option was reset:

AddR 1. Hold < MENU > until the display changes to A d d R .

INFO 2. Using the up and down buttons, scroll to the I N F O field and press < ENTER > .

TEMP 3. Using the up and down buttons, scroll to the T E M P field and press < ENTER > .

MINT 4. Using the up and down buttons, scroll to the M I N T field and press < ENTER > .

5. The fixture will display the minimum internal temperature in C (degrees centigrade).

Viewing the Maximum Internal Temperature (MAXT)

To view the fixture's maximum internal temperature since this option was reset:

AddR 1. Hold < MENU > until the display changes to A d d R .

INFO 2. Using the up and down buttons, scroll to the I N F O field and press < ENTER > .

TEMP 3. Using the up and down buttons, scroll to the T E M P field and press < ENTER > .

MAXT 4. Using the up and down buttons, scroll to the M A X T field and press <ENTER>.

5. The fixture will display the maximum internal temperature in C (degrees centigrade).

Resetting Temperature Readings (RST)

To reset the minimum and maximum temperature readings:

AddR 1. Hold < MENU > until the display changes to A d d R .

INFO 2. Using the up and down buttons, scroll to the I N F O field and press < ENTER > .

TEMP 3. Using the up and down buttons, scroll to the T E M P field and press < ENTER > .

RST 4. Using the up and down buttons, scroll to the R S T field and press < ENTER > .

Viewing DMX Errors and Construct Values (FIXT)

DMX errors and individual construct values can be viewed by name. This feature is provided for advanced users to troubleshoot fixtures. See "FIXT" on page 3-2 for a complete listing of the fields and descriptions.

To view any item listed above:

`AddR`
1. Hold <MENU> until the display changes to A d d R .

`INFO`
2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>.

`dMX`
3. Using the up and down buttons, scroll to the d M X field and press <ENTER>.

`FIxT`
4. Using the up and down buttons, scroll to the F I X T field and press <ENTER>.

5. Using the up and down buttons, scroll to desired field and press <ENTER> to view its value (in decimal form).

Viewing DMX Data by Channel Number (DATA)

ES-1 provides a built-in DMX viewer. To view DMX data by channel:

`AddR`
1. Hold <MENU> until the display changes to A d d R .

`INFO`
2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>.

`dMX`
3. Using the up and down buttons, scroll to the d M X field and press <ENTER>.

`dATA`
4. Using the up and down buttons, scroll to the d A T A field and press <ENTER>.

`C001`
to
`CS12`
5. Using the up and down buttons, scroll to desired channel (C 0 0 1 - C 5 1 2) and press <ENTER> to view the DMX value (in decimal form).

Viewing Sensor Data (SENS)

Sensor data is provided for advanced users to troubleshoot fixtures. See "SENS" on page 3-3 for a complete list of the fields and descriptions.

To view supplemental fixture data:

`AddR`
1. Hold <MENU> until the display changes to A d d R .

`INFO`
2. Using the up and down buttons, scroll to the I N F O field and press <ENTER>.

`SENS`
3. Using the up and down buttons, scroll to the S E N S field and press <ENTER>.

4. Using the up and down buttons, scroll to desired field and press <ENTER> to view the sensor information.

Test Menu (TEST)

Use the following subsections to perform the functions contained within the
T E S T menu.

Homing the Fixture (HOME)

To manually home the fixture (using the front panel):

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`TEST`

2. Using the up and down buttons, scroll to the T E S T field and press
   <ENTER>.

`HOME`

3. Using the up and down buttons, scroll to the H O M E field and press
   <ENTER> to home the fixture. The display will indicate R S T (reset)
   and H O M E during the process.

Note: *to home the fixture via a DMX controller, see "Remote Homing" on
page 2-7.*

Moving the Fixture to Setup Position (S/UP)

**Caution: the setup position is used only by service personnel before
maintenance routines.**

To place the fixture in setup position before servicing:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`TEST`

2. Using the up and down buttons, scroll to the T E S T field and press
   <ENTER>.

`S/UP`

3. Using the up and down buttons, scroll to the S / U P   field and press
   <ENTER>. The display will indicate S E T   N O W while the motors are
   electronically locked into place.

4. Perform the appropriate maintenance procedures.

5. Press <MENU> to reset and home the fixture.

Self-Tests (SELF)

ES-1 has a comprehensive set of self-tests to check each mechanical system.
See "SELF" on page 3-3 for a complete list of self-tests and descriptions.

To begin the self-test function:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`TEST`

2. Using the up and down buttons, scroll to the T E S T field and press
   <ENTER>.

`SELF`

3. Using the up and down buttons, scroll to the S E L F field and press
   <ENTER>.

4. Using the up and down buttons, scroll to the desired test and press <ENTER>. The fixture will perform the desired test(s).

5. To exit the test in progress, press <MENU>.

Testing the Alpha-Numeric Display (DISP)

To perform a self-test of the alpha-numeric display:

`AddR`
1. Hold <MENU> until the display changes to A d d R .

`TEST`
2. Using the up and down buttons, scroll to the T E S T field and press <ENTER>.

`dISP`
3. Using the up and down buttons, scroll to the d S P L field and press <ENTER>. The alpha-numeric display will run through a self test

4. Press <MENU> to exit the test.

Note: *the self test will run continuously until you press* <MENU> *to exit.*

Changing Boot Codes (BOOT)

When ES-1 is uploaded, occasionally it is necessary to include a new boot code with the latest software. This is apparent when b O O T d I f f appears in the display. To accept and store the new boot code:

`AddR`
1. Hold <MENU> until the display changes to A d d R .

`TEST`
2. Using the up and down buttons, scroll to the T E S T field and press <ENTER>.

`bOOT`
3. Using the up and down buttons, scroll to the b O O T field and press <ENTER>. The fixture will display d O N E , R S T , and home.

⚠ **Caution: do not remove power from the fixture during the above procedure.**

Turning the Lamp On and Off (LAMP)

To turn the lamp on or off:

`AddR`
1. Hold <MENU> until the display changes to A d d R .

`TEST`
2. Using the up and down buttons, scroll to the T E S T field and press <ENTER>.

`LAMP`
3. Using the up and down buttons, scroll to the L A M P field and press <ENTER>.

`L ON`
or
`LOFF`
or
`STAT`
4. Using the up and down buttons, scroll to L O N to turn the lamp on, L O F F to turn the lamp off, or S T A T to view the lamp status. Press <ENTER> to select the desired option.

5. If you chose to view the lamp status, the alpha-numeric display will list one of the following:
   - L O N - the lamp is on
   - L O F F - the lamp is off
   - S T R K - the lamp is attempting to strike

Note: *to turn the lamp on and off via a DMX controller, see "Remote Lamp Control" on page 2-7.*

Mode Menu (MODE)

Use the following subsection to perform the functions contained within the M O d E menu.

Crossloading Fixtures (XLD)

ES-1 can crossload software from one fixture to additional ES-1 fixtures on the same link (32 fixtures per link). To crossload software:

6. Disconnect the data cable between the controller and the first fixture.

`AddR` 7. Hold <MENU> on the master fixture (the fixture with the latest software version) until the display changes to A d d R .

`MOdE` 8. Using the up and down buttons, scroll to the M O d E field and press <ENTER>.

`xLd` 9. Using the up and down buttons, scroll to the X L d field and press <ENTER>. The master fixture will upload its software to all connected fixtures on the link. The slave fixtures will display U P L d during the process. After the fixtures have completed the upload, they will reset and home.

Note: *if the fixture(s) take longer than one minute to reset after an upload, turn off the fixture(s) and repeat the procedure. If a new boot code was included with the latest software, you will need to store the boot code on each fixture. See "Changing Boot Codes (BOOT)" on page 3-14.*

Setting the Fixture Type (TYPE)

Use this menu item to change the fixture type to either ES-1 or EC-1. All fixtures are shipped from the factory set to the correct fixture type. However, if the fixture's logic board is replaced, you must ensure the new board is set to the correct fixture type.

To set the fixture type:

`AddR` 1. Hold <MENU> until the display changes to A d d R .

`MOdE` 2. Using the up and down buttons, scroll to the M O d E field and press <ENTER>.

3

Menu System

`TYPE`

3. Using the up and down buttons, scroll to the T Y P E field and press <ENTER>.

`EC1`
or
`ES1`

4. Using the up and down buttons, choose "ES1" for ES-1 fixtures or "EC1" for EC-1 fixtures and press <ENTER>.

Set Menu (SET)

Use the following subsections to perform the functions contained within the S E T menu.

Reverting to the Factory Defaults (FACT)

ES-1 fixtures are shipped from High End Systems with the following factory defaults:

- addressing by fixture number mode
- five minute fixture shutdown time
- display on (bright)

To revert to the factory defaults:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`SET`

2. Using the up and down buttons, scroll to the S E T field and press <ENTER>. The display will indicate F A C T .

`FACT`

3. Press <ENTER> again to enter the field.

4. Using the up and down buttons, scroll to the O N field and press <ENTER>. The fixture will return to the factory default listed above and home the fixture.

Addressing By DMX Start Channel or Fixture Number Mode (CHNL)

To change the addressing method to a DMX start channel or a fixture number mode:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`SET`

2. Using the up and down buttons, scroll to the S E T field and press <ENTER>.

`CHNL`

3. Using the up and down buttons, scroll to the C H N L field and press <ENTER>.

`AddR`
or
`dMX`

4. Using the up and down buttons, select either A d d R (fixture number mode) or d M X (DMX start channel mode) and press <ENTER>.

Setting Display Intensity (DSPL)

To set the display's intensity:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`SET`

2. Using the up and down buttons, scroll to the S E T field and press <ENTER>.

`dSPL`

3. Using the up and down buttons, scroll down to the d S P L field and press <ENTER>.

`ON`
or
`OFF`
or
`dIM`

4. Using the up and down buttons, select either O N , O F F , or d I M and press <ENTER>.

Note*: to set the display intensity via a DMX controller, see "Remote Display Adjustment" on page 2-7.*

Inverting Alpha-Numeric Characters (D/IN)

To invert the orientation of the alpha-numeric characters:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`SET`

2. Using the up and down buttons, scroll to the S E T field and press <ENTER>.

`d/IN`

3. Using the up and down buttons, select d / I N and press <ENTER>.

Setting Fixture Shutdown Time (S/DN)

ES-1 automatically shuts itself down when DMX data is removed. When a shutdown occurs, power is removed from all motors and the lamp is turned off. Once a fixture is shut down, you must home the fixture to bring it back into operation.

To set the length of time before ES-1 shuts down after DMX data is removed:

`AddR`

1. Hold <MENU> until the display changes to A d d R .

`SET`

2. Using the up and down buttons, scroll to the S E T field and press <ENTER>.

`S/dN`

3. Using the up and down buttons, scroll to the S / d N field and press <ENTER>.

`S MN`
or
`10MN`

4. Using the up and down buttons, select 5 M N (5 minutes) or 1 0 M N (10 minutes) and press <ENTER>.

Preset Menu (PRST)

The preset menu (P R S T) allows you to program and playback scenes from ES-1's on-board memory. This information is covered in detail in *Chapter 4 Preset Scenes*.

Chapter 4
Preset Scenes

Overview

Each ES-1 fixture can store and play back up to 16 preset scenes. Scenes can
be played back independently on any fixture without a DMX controller or up to
32 supported fixtures can be synchronized together with a data link.

Understanding Preset Scene Terminology and Concepts

Before you begin using preset scenes, it is important that you read and
understand the following terminology and concepts:

- a scene is a combination of constructs and timing controls.
- a construct is a unique fixture feature—for example, focus, color or
  rotating effects.
- a sequence is two or more scenes that continuously repeat (also known as
  a loop or a chase). Sequences will continue to play back until you turn the
  fixture off or manually stop playback.
- you must create sequences without skipping a scene. The fixture will
  automatically restart the sequence when it encounters the first
  unprogrammed scene.
- each value is permanently stored in memory until you change it (i.e., you
  do not have to 'save' each scene after it is edited).
- if power is removed during playback, when power is reapplied the fixture
  will home and begin playback at the first scene.

Editing Scenes

Editing allows you to create preset scenes by manipulating ES-1's constructs and
timing controls. There are three ways to edit scenes:

- menu system
- copying and pasting an existing scene
- capturing construct data from a DMX controller

Note: *if you capture a scene from a DMX controller, you must use the
         fixture's on-board menu system to edit the timing controls (XFAD,
         DLAY, and MSPD).*

The editing methods are discussed in detail in the following subsections.

Editing with the On-Board Menu System (EDIT)

To edit (program) a scene using the on-board menu system:

`AddR`

1. Press and hold <MENU> until the fixture unlocks the menu system (if necessary).

`PRST`

2. Using the up and down arrow buttons, scroll to the P R S T field and press <ENTER>.

`EdIT`

3. Using the up and down arrow buttons, scroll to the E d I T field and press <ENTER>. S N 0 1 (scene 1) will appear on the display.

`SN01`
to
`SN16`

4. Press <ENTER> to begin with editing scene 1. Optionally, use the up and down arrow keys to select another scene (S N 0 2 - S N 1 6) and press <ENTER>. The first construct will appear on the display.

Note: *during playback, the sequence will restart with scene 1 when the fixture reaches the first unprogrammed scene.*

5. Using the up and down arrow buttons, select the construct to edit and press <ENTER> to view and edit its value. See "Menu Navigation" on page 3-2 for the construct order and explanations.

6. Using the up and down arrow buttons, change the construct to the desired value. The fixture will instantly respond to any changes that are made. Press <ENTER> to store the construct's value.

Note: *you can press <MENU> to back out of the current field and return to the previously programmed value.*

Tip: *to view the fixture's output, open the shutter and increase dim to a visible level.*

7. Repeat step 6 to program additional fixture constructs.

`TIME`

8. Using the up and down arrow keys, scroll to T I M E and press <ENTER>.

9. Using the up and down arrow keys, set the unit of time and press <ENTER>. For additional information, see "Using the Time Parameter" on page 4-3.

`XFAd`
and
`dLAY`
and
`MSPd`

10. Using the procedures outlined in steps 5 and 6, set the values for X F A d (crossfade), d L A Y (delay), and M S P d (MSpeed). See "Using Crossfade, Delay, and MSpeed" on page 4-3 for additional information.

11. Press <MENU> to back out of the current scene. Repeat steps 4 through 10 until all desired scenes have been programmed.

Note: *for additional editing information, see "Step-By-Step Editing Example" on page 4-4.*

Using the Time Parameter

The T I M E parameter determines the unit of time used in each scene for crossfade and delay. Choose from the following options:

- S E C - seconds
- M I N - minutes
- H O U R - hours

Crossfade and delay values can be set from 0.1 to 166. MSpeed values can be set from 0.15 to 252.7.

Using Crossfade, Delay, and MSpeed

Crossfade, delay, and MSpeed are independent timing elements in each preset scene. Crossfade and MSpeed determine the amount of time a construct takes to move from one position (value) to another, while delay is the length of each scene.

MSpeed can be selectively applied to color selection, litho selection, and litho rotation. Crossfade controls the timing for all other constructs. This allows you to program constructs that will reach their destinations at different times within one scene. See Figure 4-1

Tip: *to make circular and ballyhoo motions with fixtures, experiment with setting Delay less than MSpeed.*
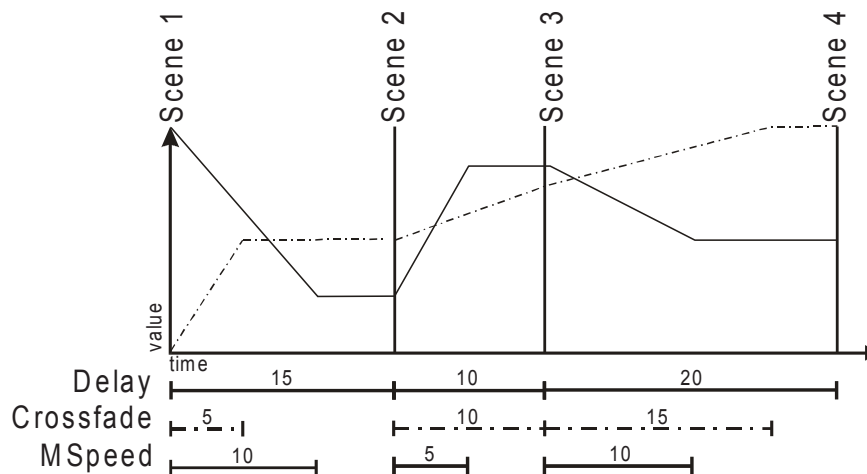
Figure 4-1. Crossfade, Delay, and MSpeed example

Note: *the above figure shows how constructs using crossfade and MSpeed can reach their destination values at different times.*

Step-By-Step Editing Example

In this section, you will create a sample scene that requires editing most of the available constructs:

`AddR`   1. Press and hold < MENU > until the fixture unlocks the menu system (if necessary).

`PRST`   2. Using the up and down arrow buttons, scroll to the P R S T field and press < ENTER >.

`EdIT`   3. Using the up and down arrow buttons, scroll to the E d I T field and press < ENTER >. S C 0 1 (scene 1) will appear on the display.

`SN01`   4. Press < ENTER > to edit scene 1.

`SHUT`   5. Using the up and down arrow buttons, select S H U T (shutter) and press < ENTER >.

`OPEN`   6. Using the up and down arrow buttons, change the construct to O P E N and press < ENTER >.

`dIM`   7. Using the up and down arrow buttons, select d I M and press < ENTER >.

`d255`   8. Using the up and down arrow keys, change the dim value to d 2 5 5 and press < ENTER >.

`C01C`   9. Using the up and down arrow buttons, select C 0 1 C (color wheel 1 function) and press < ENTER >.

`MbLK`   10. Using the up and down arrow keys, select M b L K (MSpeed blink mode) and press < ENTER >.

`C01`   11. Using the up and down arrow keys, select C 0 1 (color wheel one) and press < ENTER >.

`b  4`   12. Using the up and down arrow keys, select b 4 (blink position 4) and press < ENTER >.

`LTC1`   13. Using the up and down arrow keys, select L T C 1 (litho wheel 1 function) and press < ENTER >.

`FSP`   14. Using the up and down arrow keys, select F S P (forward spin) and press < ENTER >.

`LF 6`   15. Using the up and down arrow keys, select L F 6 (litho forward position 6) and press < ENTER >.

`FCUS`   16. Using the up and down arrow keys, select F C U S (focus) and press < ENTER >.

`000`
to
`255`   17. Using the up and down arrow keys, focus the litho from 0 0 0 to 2 5 5 and press < ENTER >.

18. Using the up and down arrow keys, select T I M E and press <ENTER>.

SEC

19. Using the up and down arrow keys, select S E C and press <ENTER>.

dLAY

20. Using the up and down arrow keys, select d L A Y and press <ENTER>.

d 20

21. Using the up and down arrow keys, select d 2 0 and press <ENTER>.

XFAd

22. Using the up and down arrow keys, select X F A d and press <ENTER>.

X 10

23. Using the up and down arrow keys, select X 1 0 and press <ENTER>.

MSPd

24. Using the up and down arrow keys, select M S P d and press <ENTER>.

15.1

25. Using the up and down arrow keys, select 1 5 . 1 and press <ENTER>.

26. Playback the scene 1 (see "Playing Back Scenes in Stand-Alone Mode (PLAY)" on page 4-7).

Copying and Pasting Scenes (COPY)

Scenes are easily copied and pasted between locations. This is beneficial when you only want to modify a few constructs.

To copy and paste a scene:

AddR

1. Press and hold <MENU> until the fixture unlocks the menu system (if necessary).

PRST

2. Using the up and down arrow buttons, scroll to the P R S T field and press <ENTER>.

COPY

FROM

3. Using the up and down arrow buttons, scroll to the C O P Y field and press <ENTER>. F R O M will appear on the display.

F001

4. Press <ENTER> again to select the scene to copy (source scene).

to

F016

5. Using the up and down arrow buttons, select the scene to copy (F 0 0 1 - F 0 1 6) and press <ENTER>. T O will appear in the display.

TO

6. Press <ENTER> again to select the scene to paste to (destination scene).

TO01

to

TO16

7. Using the up and down arrow buttons, select the destination (T 0 0 1 - T 0 1 6) and press <ENTER>. The display will indicate d O N E and return to the C O P Y field.

4

Preset Scenes

Capturing DMX Data Into a Scene (CAPT)

ES-1 can create preset scenes by capturing data from a DMX controller. All constructs can be captured except for T I M E , X F A d , and d L A Y .

To capture DMX data:

1. Check and ensure that the fixture(s) are properly addressed and respond to your controller.

`AddR`

2. Press and hold < MENU > until the fixture unlocks the menu system (if necessary).

`PRST`

3. Using the up and down arrow buttons, scroll to the P R S T field and press < ENTER > .

`CAPT`

4. Using the up and down arrow buttons, scroll to the C A P T field and press < ENTER > . S N 0 1 will appear on the display.

`SN01`
to
`SN16`

5. Using the up and down arrow buttons, select the destination scene. *Do not* press < ENTER > yet.

6. Using your controller, program the desired look(s).

7. Press < ENTER > to capture the DMX data to the selected scene. The display will indicate d O N E .

8. Press < MENU > to back out of the C A P T menu.

`EdIT`

9. Using the up and down arrow keys, scroll to E d I T and press < ENTER > .

`TIME`
and
`XFAd`
and
`dLAY`

10. Edit the T I M E , X F A d , and d L A Y parameters using the fixture's on-board menu system. Refer steps 8 through 10 located in "Editing with the On-Board Menu System (EDIT)" on page 4-2 for assistance.

11. Repeat steps 3 through 9 of this procedure for additional fixtures and scenes.

Re-Initializing a Scene (ZERO)

Scenes are quickly reset to their blank (nullified) factory settings with the menu system.

To reset a scene:

`AddR`

1. Press and hold < MENU > until the fixture unlocks the menu system (if necessary).

`PRST`

2. Using the up and down arrow buttons, scroll to the P R S T field and press < ENTER > .

`EdIT`

3. Using the up and down arrow buttons, scroll to the E d I T field and press < ENTER > . S N 0 1 (scene 1) will appear on the display.

`SN01`
to
`SN16`

4. Using the up and down arrow buttons, scroll the scene to reset (S N 0 1 - S N 1 6) and press < ENTER > .

`ZERO` 5. Using the up and down arrow buttons, scroll to the Z E R O field and press < ENTER >. O K ? will appear on the display.

`OK?` 6. Press < ENTER > to reset the selected scene.

Playing Back Scenes in Stand-Alone Mode (PLAY)

Scenes can be played back on each fixture without a controller through the menu system.

Note: *if a fixture is connected to a DMX link, the fixture will not respond to data while it is in playback mode.*

To playback scenes in stand-alone mode:

`AddR` 1. Press and hold < MENU > until the fixture unlocks the menu system (if necessary).

`PRST` 2. Using the up and down arrow buttons, scroll to the P R S T field and press < ENTER >.

`PLAY` 3. Using the up and down arrow buttons, scroll to the P L A Y field and press < ENTER >. O F F will appear on the display.

`ON` 4. Using the up and down arrow buttons, scroll to the O N field and press < ENTER >. The display will indicate P R S T with a dot in the lower right-hand corner to indicate you are in playback mode and the programmed scenes will begin playback. When playback finishes playing scene 16 or it comes to the first blank scene, the sequence will loop and restart at scene 1.

Determining the Active Scene

To determine the active scene during playback:

`AddR` 1. Press and hold < MENU > until the fixture unlocks the menu system (if necessary).

`PRST` 2. Using the up and down arrow buttons, scroll to the P R S T field and press < ENTER >.

`PLAY` 3. Using the up and down arrow buttons, scroll to the P L A Y field and press < ENTER >. O F F will appear on the display.

`SCN` 4. Using the up and down arrow buttons, scroll to the S C N field and press < ENTER >. The display will indicate the scene that is playing.

Synchronizing Preset Playback

ES-1 provides synchronized playback for up to 32 supported fixtures. Supported fixtures include:

- ES-1
- EC-1
- Studio Spot 575
- Studio Color 575
- Studio Spot 250
- Studio Color 250
- Technobeam®
- Technopro™
- Technoray™

Note: *you should not connect more than 32 fixtures per link for synchronized playback.*

Synchronized playback is accomplished by a proprietary time code signal generated by the master fixture and sent to the slave fixtures via DMX cables. The time code signal is similar to SMPTE and uses a 30 frame per second clock (non-drop frame).

The master fixture determines the total sequence length from the sum of its delay times. When the master fixture reaches the end of its last scene, all fixtures will restart at scene 1 and the clocks will be reset to zero. Thus playback is not dependent on the number of programmed scenes or the sequence length of the slave fixtures.

If the sequence length of slave fixture(s) is less than the master's, the slave fixture(s) will repeat their sequence until the master fixture resets the clock (slave 1 in Figure 1-2). If a slave fixture's sequence is longer than the master's, the slave fixture will restart its sequence before it has completed its entire sequence (slave 2 in Figure 1-2).
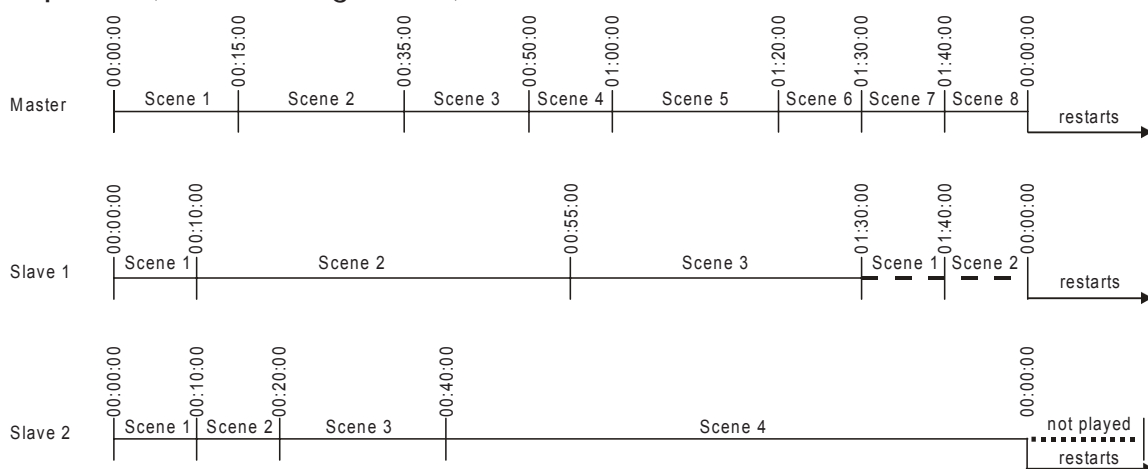
Figure 1-2. Synchronized playback example

Connecting Fixtures for Synchronized Playback

To connect and address fixtures for synchronized playback:

1. Assign one fixture as the master fixture by assigning it a unique DMX start channel 1 or fixture number 1 (see "Assigning a Fixture Address" on page 1-15).

    Make sure no other fixture on the link is assigned DMX start channel 1 or fixture number 1.

2. Link the fixtures you want to synchronize to the master fixture (see "Linking the Fixtures" on page 1-11).

    Make sure you terminate both the first and last fixture in the link and that there are no DMX controllers on the link.

3. Set preset playback on for all fixtures on the link (see "Playing Back Scenes in Stand-Alone Mode (PLAY)" on page 4-7).

Note: *if the master fixture is turned on after the slaves, it may take up to one sequence for all fixtures to synchronize.*

4

Preset Scenes

Appendix A
Troubleshooting and Maintenance

Overview

This appendix provides directions for troubleshooting problems that may be preventing you from operating ES-1 properly. It also includes instructions for properly maintaining your fixture.

If you need additional help, or if the problem you are experiencing is not listed in this chapter, contact High End Systems customer service in one of the ways shown in "Contacting High End Systems, Inc." on page vi.

If you need to return your fixture for warranty or non-warranty service, please follow the procedures outlined in "Returning an Item Under Warranty for Repair" on page iv.

WARNINGS: **1) this fixture must be serviced by qualified personnel. The information listed in this cahpter is intended to assist qualified personnel *only*.**

2) High Voltage! Touching internal electrical components can result in electric shock!

3) disconnect the fixture from power before servicing.

4) equipment surfaces can reach 140° C (284° F). Allow the fixture to cool for five minutes before touching any surface.

5) always wear hand and eye protection when servicing the fixture.

Troubleshooting

This section provides information on diagnosing and solving operational problems. If a solution to your problem cannot be found in the following subsections, contact your authorized dealer or High End Systems customer support (see "Contacting High End Systems, Inc." on page vi).

Display Error Messages

The ES-1 menu system provides a comprehensive listing of error messages when problems occur. Use the following tables to identify, solve, or report errors to a qualified service technician.

Table A-1. Display Error Messages

Display Message	Problem	Explanation	Solution
A d d R L O S T	EEPROM was unreadable	fixture was unable to recover fixture address	refer to qualified service personnel
A d d R O V E R	stored address exceeds 21 fixture limit	fixture was addressed in a different channel configuration	set a valid fixture address
b O O T d I F F	boot code difference	new boot code does not match old boot code	store new boot code. Refer to "Changing Boot Codes (BOOT)" on page 3-14
C O O L	the lamp is too hot to strike	lamp must cool before it can restrike	the fixture will restrike the lamp as soon as it cools
E M E M E R R	EEPROM errors	data is not readable from the EEPROM for various fields	refer to qualified service personnel
E R S E F L S H	flash ROM could not be erased during an upload	bad flash ROM	refer to qualified service personnel
F M E M E R R	Flash ROM error	read/write error from flash ROM	refer to qualified service personnel
F P G A E R R	Field Programmable Gate Array error	read/write error from FPGA	refer to qualified service personnel
I d E R R	ID or unique number error	• error reading ID • error reading unique fixture number	refer to qualified service personnel
L A M P O U T E R R	lamp has extinguished during operation	dead lamp	replace lamp, refer to "Replacing the Lamp" on page A-7
L A M P T O U T E R R	lamp time-out error	• lamp too hot to restrike • dead lamp • ignitor error	• allow time for the lamp to cool and restrike the lamp • replace lamp, refer to "Replacing the Lamp" on page A-7 • refer to qualified service personnel
L I N K b U S Y	other data present on the link during a crossload	controller is connected to the link	disconnect controller
L I N K E M T Y	no fixtures were found to crossload to	additional ES-1 fixtures are not connected to the master during a crossload	connect additional fixtures check cabling

Table A-1. Display Error Messages (Continued)

Display Message	Problem	Explanation	Solution
L I N K E R R	link error	• bad cable(s) • output from previous fixture is bad • bad comm board	• test and replace cable(s) as necessary • test by bypassing previous fixture • refer to qualified service personnel
O V E R	counter value is over out of range	lamp strikes, lamp hours, or fixture hours have exceeded 9999	Reset the menu item that has rolled out of ranged (see "Resetting Lamp Hours (L/RS)" on page 3-10, or "Resetting Fixture Hours (F/RS)" on page 3-10)
O V E R T E M P	logic board is over rated its temperature	temperature exceeds limit for safe operation and the board has shutdown	• reduce ambient temperature and move significant heat sources • refer to qualified service personnel
P R G M T I M E	fixture failed to upload within allotted time	complete data was not received	• try to upload again • refer to qualified service personnel
S V C C E R R	sensor power error	• bad board • loose cable	refer to qualified service personnel
S E N 1 E R R	litho wheel 1 sensor	• problem with litho wheel 1 tab • problem with litho wheel 1 motor • bad sensor 1	• check to ensure tab crosses sensor • test litho wheel • refer to qualified service personnel
S E N 2 E R R	litho wheel 2 sensor	• problem with litho wheel 2 tab • problem with litho wheel 2 motor • bad sensor 2	• check to ensure tab crosses sensor • test litho wheel • refer to qualified service personnel
S E N C E R R	color wheel sensor	• problem with a color wheel tab • problem with a color wheel motor • bad color sensor	• check to ensure each tab crosses sensor • test color wheel • refer to qualified service personnel
T H R M C H I P	microprocessor is over temperature	• ambient temperature is too high • too close to significant heat source (pyrotechnics, etc.)	• reduce ambient temperature • move the fixture or heat source away from each other
U P L D	fixture held in boot mode	• the fixture was disconnected during an upload	• reconnect the fixture and perform the upload again

General Troubleshooting

Use the following table to troubleshoot problems that are not identified by the menu system.

Table A-2. General Troubleshooting

Problem	Probable Cause	Solution
Unit will not turn on	• no power • breaker is turned off • power connectors • power line filter	• connect power • turn breaker on • refer to qualified technician • refer to qualified technician
Unit functions but lamp does not strike	• bad lamp • lamp is too hot from operation (unit turned off and on) • ignitor connection is loose	• replace lamp • leave the unit turned on, when the lamp's temperature drops, it will restrike • refer to qualified technician
Lamp is dimmer than other units	• bad lamp • dirty optics	• replace lamp • dirty optics
Unit will not home properly	• belt(s) is loose • bad sensor(s)	• tighten belt(s) • refer to qualified technician
Color system is not producing the correct color	unit is not homed properly	home the unit
Unit is not responding to controller	• wrong fixture DMX address • bad data cable(s) • link not terminated	• set the address as outlined in "Address Menu (ADDR)" on page A-8 • check and replace data cables as needed • terminate link as outlined in "Linking the Fixtures" on page 1-11
Unit is producing unexpected results	• incorrect DMX starting address on the controller • last fixture is not terminated	• refer to "Assigning a Fixture Address" on page 1-15 • terminate fixture
Display is not functioning	• display is turned off • power connectors are loose • bad logic board	• refer to "Setting Display Intensity (DSPL)" on page 3-17 • refer to qualified technician • refer to qualified technician

Status LEDs

The status LEDs help determine where any problems with your ES-1 may be originating. See for a description of the five status LEDs..

Table A-3. Status LEDs

LED	State	Problem Indicator?	Description
Motor	Solid green	No	The motor power supply is receiving adequate voltage.
	Off	Yes	Fuse or power failure.
Lamp	Solid yellow	No	The lamp power supply is receiving the proper voltage, and the lamp is on.
	Off	Not necessarily*	The lamp is shut down.
	Flashing	Yes	The fixture is unable to strike the lamp.
5V	Solid red	No	The logic board is receiving the required +5 voltage.
	Off	Yes	Fuse or power failure.
Transmit	Solid yellow	No	Fixture is crossloading software to other fixtures on the link.
	Off	Not necessairly†	No DMX data is being transmitted.
Receive	Solid green	No	The fixture is receiving new software from a crossload or upload.
	Off	Not necessairly†	No DMX data is being received.

* - If you shut down the lamp using a remote shutdown command, the lamp and the Lamp LED will shut off. However, if you have bad data cables, no data cables or controller connected to the fixture, or the controller is off, the lamp and its LED will also be off. If correcting these problems does not turn the lamp on, see "General Troubleshooting" on page A-4.

† - Neither the Transmit nor the Receive LED will be on until you have connected the fixture to a DMX-compatible controller with XLR data-grade cabling. If these LEDs remain off even though you have connected the fixture to a controller and are sending DMX commands to the fixture, see "General Troubleshooting" on page A-4.

Software Upload Troubleshooting

This subsection provides information for troubleshooting problems that occur during a software upload.

Table A-4. Upload Troubleshooting

Problem	Probable Cause	Solution
Not all fixtures on link are receiving download	• unit(s) turned off • bad cabling • cable(s) disconnected	• turn on unit(s) • test and replace cable(s) as necessary • reconnect cable(s)
Status Cue displays: **Fixture could not erase flash ROM**	• the XLR cable(s) was disconnected • bad cable(s) • the fixture's electrical circuitry is damaged	• reconnect XLR cable(s) • replace cable(s) • refer to qualified service personnel
Status Cue displays: **WARNING: No response from Fixture xx (Link xx Address xx)**	• Status Cue was configured with a ES-1 at that address, but no fixtures were found there • another fixture type (possibly using RS-422) is connected before ES-1 fixtures • a data distributor is being used	• If there is no fixture at that address, nothing is wrong • check connections • check to ensure fixture is turned on • remove the fixture(s) from the data link or move them after ES-1 fixtures • disconnect the data distributor and reconnect fixtures
Fixture displays: b O O T d I F F	new software also included boot code (normal)	store the new boot code. Refer to "Changing Boot Codes (BOOT)" on page 3-14
Fixtures are not cross-loading	• a controller is connected to the link • a fixture (possibly using RS-4222) is physically connected before ES-1 fixtures that is inhibiting the cross-load	• disconnect the controller and attempt the upload again • remove the fixture(s) from the data link or move them after ES-1 fixtures

Onboard Self-Tests

ES-1 has on-board self-tests to diagnose problems. If you are experiencing problems that you suspect are mechanical, perform the tests outlined in "Self-Tests (SELF)" on page 3-13.

Testing DMX Data

ES-1 has the ability to view any of the 512 DMX channels on its link. This is a very useful feature to ensure ES-1 and other fixtures are receiving the correct data from your DMX controller. To test individual DMX data by channel, perform the procedures outlined in "Viewing DMX Data by Channel Number (DATA)" on page 3-12. To view DMX errors, overrun errors, framing errors, and start code errors refer to the procedures outlined in "Viewing DMX Errors and Construct Values (FIXT)" on page 3-12.

Maintenance

This section provides information on performing basic maintenance. If other maintenance is required, refer servicing to a qualified technician.

Replacing the Lamp

You will need:

- 5/32″ allen wrench
- torque wrench
- Phillips® MSD 575 metal-halide lamp
- protective gloves
- protective eyewear

Caution: this equipment is designed for use with Philips® M Series, 575 watt, GX 9.5 base, metal halide lamp only. Use of any other type lamp may be hazardous and may void the warranty.

WARNINGS: 1) disconnect power before re-lamping or servicing.

2) an operating, unshielded MSR/MSD lamp emits ultraviolet and visible (UV-vis) radiation which could damage eyes and skin. Whenever you are working on or near an exposed lamp, wear protective eye gear. Never look directly at the lamp while the lamp is on.

3) hot lamp may be an explosion hazard. Do not open for 5 minutes after switching off. Wear eye and hand protection when re-lamping.

To replace the lamp:

1.   Electrically isolate the fixture. If the fixture has been operating, wait at least five minutes for the lamp to cool before handling.

2.   Put on your protective eyewear and gloves.

3.   Tilt the fixture's head to provide access to the lamp cap. You may need to loosen the tilt screws to move the fixture's head (see Figure A-1).
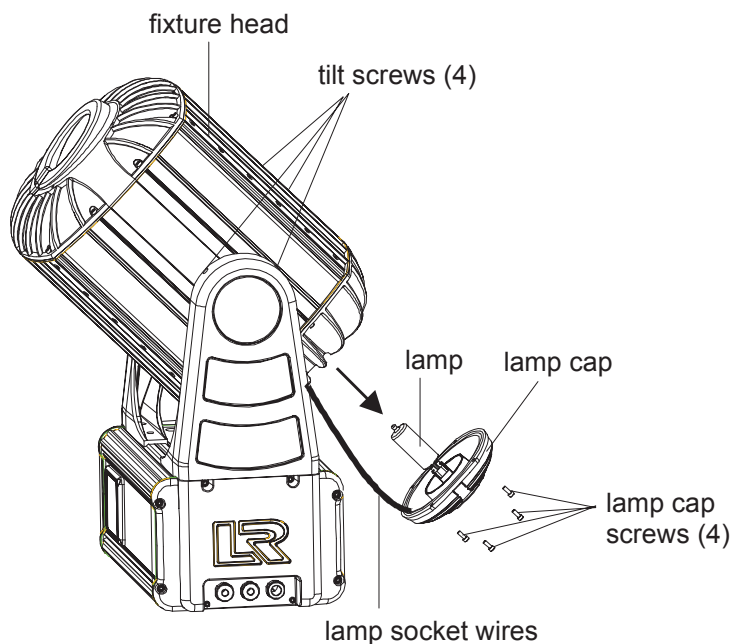
Figure A-1. Removing the lamp cap

4. Using a 5/32" allen wrench, remove the four lamp cap screws (see Figure A-1).

5. Pull the lamp cap and attached lamp straight out of the fixture.

6. The lamp cap is connected to the fixture by lamp socket wires (see Figure A-1). Support the lamp cap while replacing the lamp. *Do not allow the lamp socket wires to support the weight of the lamp cap*.

7. Hold the existing lamp by its ceramic base and carefully pull the lamp up and out of the lamp socket (see Figure A-2).

Caution: do not squeeze the lamp glass when removing or installing the lamp. Lamp glass may shatter.

8. Holding the new lamp by its ceramic base, align the base pins to the socket (see Figure A-2) and carefully press the lamp into the socket until the lamp is firmly seated.
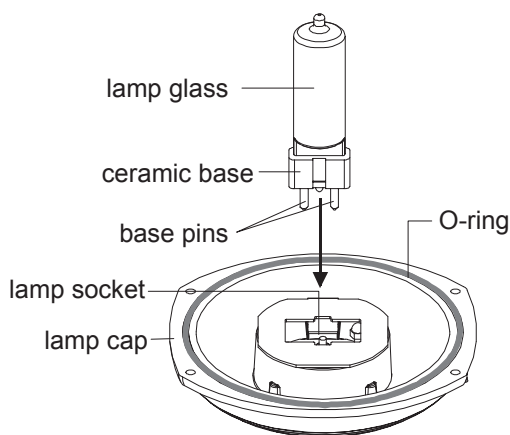
Figure A-2. Installing the lamp

Warning: do not touch the lamp glass with bare fingers. The oils from your skin can damage the lamp and cause it to explode. If the lamp is

accidentally touched, clean it immediately with a soft cloth and isopropyl alcohol ((CH$_3$)$_2$CHOH). An alcohol cloth is provided with each lamp.

9.   Locate the O-ring in the outer groove of the lamp cap (see Figure A-2). Be sure to replace this O-ring if it slips out of the groove during this procedure. *If the O-ring is not replaced correctly, the weather resistance of the fixture will be compromised.*

10. Reinsert the lamp assembly into the fixture head. Make sure you do not crimp the lamp socket wires while replacing the lamp cap.

11. Insert the four socket cap screws in the lamp cap and tighten securely. *Tighten the screws to a torque setting between 36-48 in. lb. (4 -5 N-m) to achieve a weather-resistant seal.*

12. Reset the fixture's lamp hours to zero (see "Resetting Lamp Hours (L/ RS)" on page 3-10) and optimize the lamp (see below).

Optimizing the Lamp

When a lamp is replaced, you should optimize the new lamp's position in the optical path. Optimizing the lamp ensures that you will have a flat field across the entire beam diameter.

To optimize the lamp, you will need the following items:

*   #2 phillips-head screwdriver
*   7/64 allen wrench

To optimize the lamp:

1. Mount the fixture in an orientation so that it may be squarely projected onto a smooth white surface no less than 10 feet (3 meters) away.

2. Using a controller or the menu system, focus an open (white) beam on the surface and observe the beam.

3. Using a 7/64 allen wrench, remove the four screws securing the lamp cap cover (see Figure A-3).

4. Using a #2 phillips-head screwdriver, rotate the three lamp adjust screws until you achieve a uniform flat field (see Figure A-4). When the
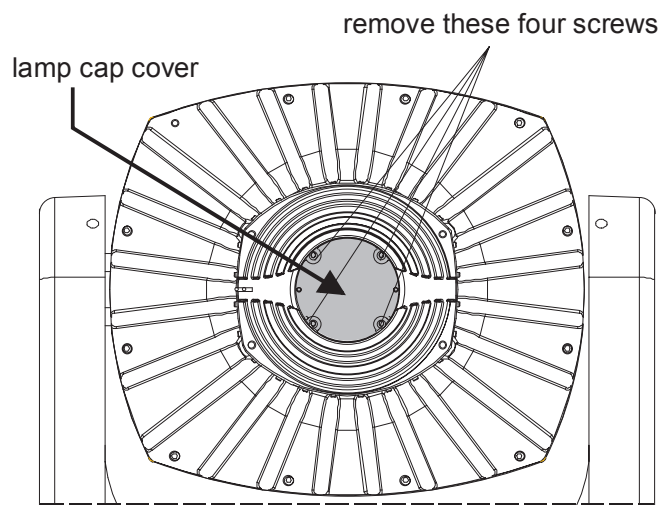
Figure A-3. Lamp cap cover

lamp is correctly optimized, the field will have an even disbursement of light throughout the entire beam diameter.

lamp optimization screws (3)
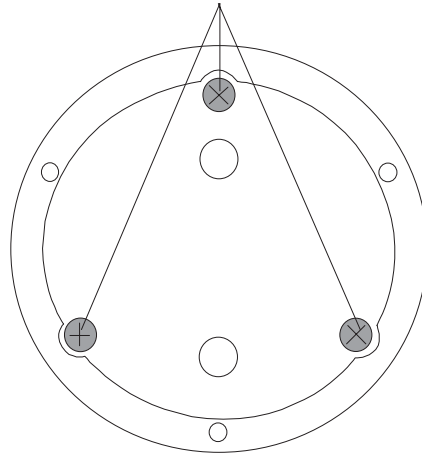
Figure A-4. Lamp Optimization screws

5. When you have successfully optimized the lamp, replace the lamp cap cover and the four lamp cap cover screws. *Tighten the screws to a torque setting between 15 - 20 in. lb. (2 - 3 N-m) to achieve a weather-resistant seal.*

Replacing Power Supply Fuses

You will need:

- replacement fuse(s) (see Table A-5)
- torque wrench
- 5/32" allen wrench

To replace fuse(s) on the power supply board:

1. Electrically isolate the fixture. If the fixture has been operating, allow the fixture to cool before handling.

2. Determine which fuse(s) to replace by referring to Table A-5.

Table A-5. Description and function of ES-1 fuses

Fuse	Type and Rating	Size	Protects	Symptom
F2	6.3 A, 250 V, Fast Blow Only	5mm x 20mm	Logic board and motor supply	No display or motors.
F3	6.3 A, 250 V, Fast Blow Only	5mm x 20mm	Lamp power supply	Lamp won't strike.

3. To access the fuses, use a 5/32" allen wrench to unscrew the side panel's eight screws and remove the fixture's side panel. Remove only the side panel nearest the fixture's alpha-numeric display to gain access to the power supply PCB (see Figure A-5).

open this
side panel →
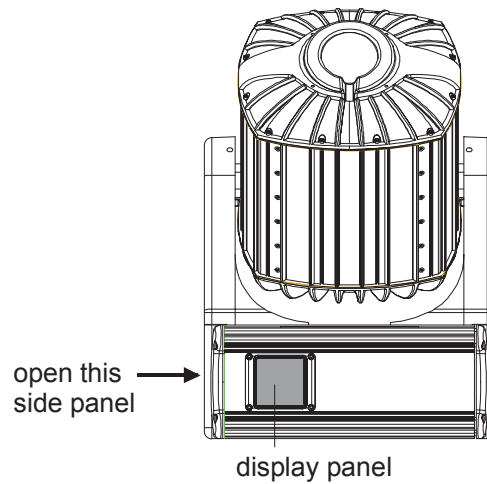
display panel

Figure A-5. Remove the side panel nearest the display panel

4. Locate the power supply board tray and ballast tray inside the fixture (see Figure A-6). These trays are connected to each other by internal wiring. Therefore, to move one tray, you must move *both* trays at the same time.

5. Slide the power supply board tray *and* ballast tray out of the fixture about two inches.

ballast tray →

power supply
board tray   logic board tray
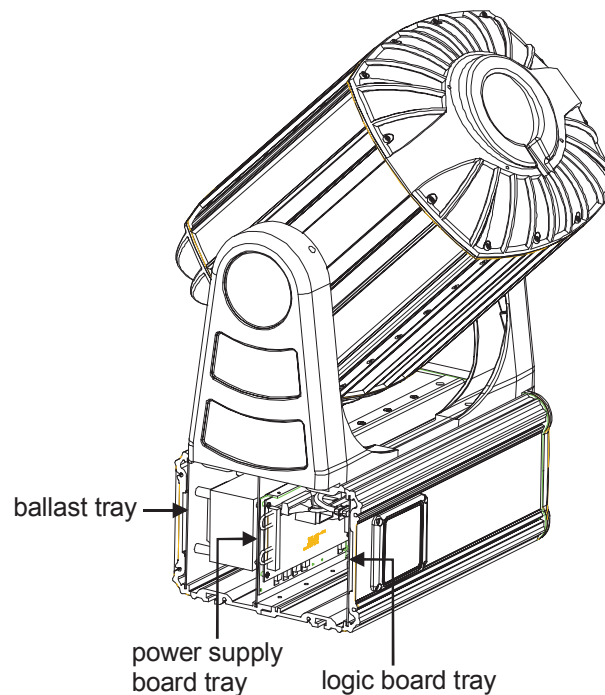
Figure A-6. Identify internal components

Note: *if any of the wires inside the fixture prevent the trays from sliding, carefully move the wires out of the way. Do not force the trays from their position, this may disconnect internal wiring.*

6. Locate the fuse to be replaced (see Figure A-7).

Fuse F3   Fuse F2
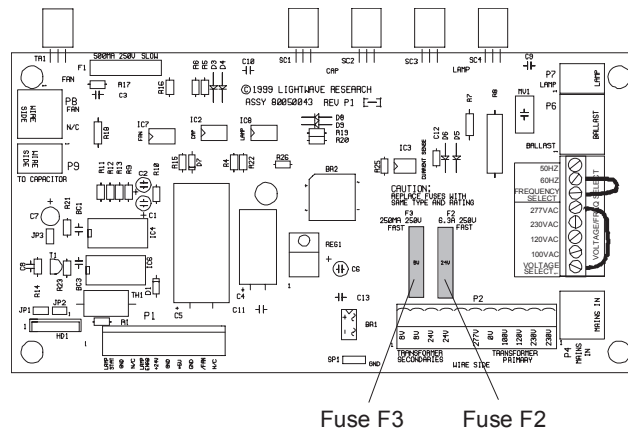
Figure A-7. Fuses on the power supply board

7. Replace the appropriate fuse(s) with a fuse of the same type and rating.

8. After replacing the fuse(s), carefully slide the ballast tray and power supply board tray inside the fixture.

9. Replace the side panel and secure the eight side panel screws removed in step 3. Make sure the rubber gasket used to seal the side panel is aligned and seated correctly when replacing the side panel (see Figure 1-8 on page 1-6).

    Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.

Cleaning ES-1

Caution: equipment surfaces may reach 140° C (284° F). Allow the fixture to cool before handling.

You will need:

- a soft, lint-free cloth
- mild glass cleaning solution
- #2 phillips-head screwdriver
- soapy water

Cleaning the Interior Surfaces

High End Systems recommends that you periodically inspect the reflector located inside the fixture to make sure it is clean. Perform your first inspection after the fixture has been operating about 1,000 hours, and then inspect the reflector every six months.

To inspect the reflector:

1. Follow steps 1-5 in "Dichroic Installation" on page B-3 to remove the front bezel, disconnect the stepper motor, lens, and fan cable, and remove the optical assembly.

2. Using a phillips-head screwdriver, remove the four optical assembly plate screws and remove the optical assembly plate (see Figure A-8).

optical assembly plate

reflector

reflector screws (4)

optical assembly plate screws (4)
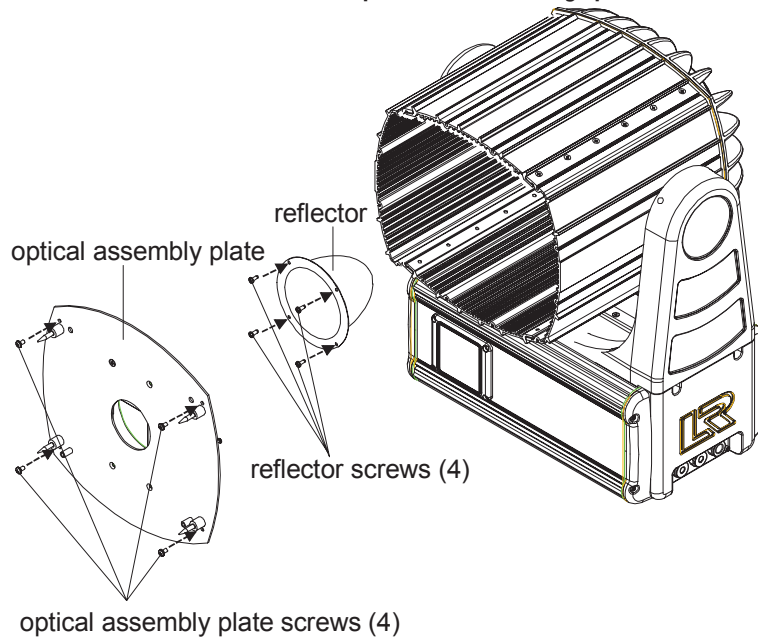
Figure A-8. Remove the optical assembly plate and reflector

3. Remove the four reflector screws and remove the reflector (see Figure A-8). If the reflector is not clean, gently wipe the interior of the reflector with a dry, soft, lint-free cloth.

4. Replace the reflector over the lamp and reinstall the four reflector screws.

5. Replace the optical assembly plate and the reinstall the four optical assembly plate screws.

6. Follow steps 12-15 in "Dichroic Installation" on page B-3 to replace the optical assembly, reconnect the stepper motor drive cable and fan cable, and reinstall the front bezel.

7. *Tighten the front bezel screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.*

**Cleaning the Exterior Surfaces**

How often you clean the outer surfaces of your ES-1 depends on the environment. If your fixture is used in a dusty/rainy environment, you should clean the outside of your fixture every few weeks. A clean fixture

helps maintain performance and reliability, since dust and dirt can accumulate on the outside of the lens window and cause loss of light output, overheating, and/or malfunctions.

To clean the outer surfaces of ES-1:

1. Clear away any accumulations of snow, soil, grass clippings, or leaves around the heatsink area.

2. Clean the window with a soft cloth and soapy water to remove dust and dirt. A lens window clogged with dirt or debris will reduce light output and may pose a hazard to the fixture.

3. After washing away the built-up dust and dirt, clean the lens window with a mild glass cleaning solution.
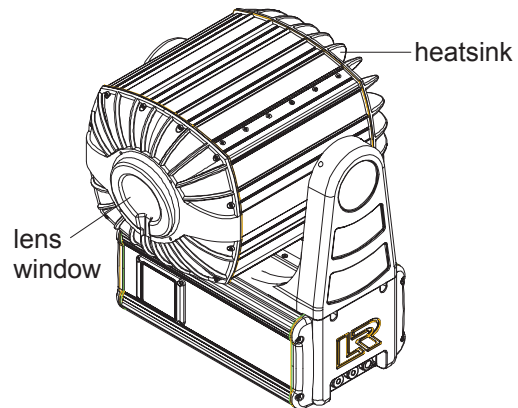
Figure A-9. Location of the heatsink and lens window

Updating Software

Updating ES-1 software is fast and easy. The latest versions of software are provided on the High End Systems web site, and are also available through High End Systems customer service (see "Contacting High End Systems, Inc." on page vi).

There are three ways to upload new software to your ES-1 fixtures:

1. Attach a High End Systems upload dongle to your computer and upload the software to your ES-1 fixture.*

   To use a High End Systems upload dongle, you will need a 386-based (or faster) computer, MS DOS® version 3.3 (or later), and one MB of free disk space. To obtain an upload dongle (with installation and operation instructions), contact your High End Systems dealer/distributor (see "Contacting High End Systems, Inc." on page vi).

2. Crossload software from one fixture that contains newer software to all other ES-1 fixtures on the link.*

   ES-1, EC-1, Studio Spot 575, and Studio Color 575 fixtures use the same software. Therefore, if you have an EC-1, ES-1, Studio Spot 575, or Studio Color 575 fixture with newer software, you can crossload its software to all other EC-1, ES-1, Studio Spot 575, and Studio Color 575 fixtures on the link. The crossloading procedure is explained in "Crossloading Fixtures (XLD)" on page 3-15.

3. Upload the newer software to all EC-1, ES-1, Studio Spot 575, or Studio Color 575 fixtures on the link using the Status Cue lighting console.*

    Refer to the *Status Cue User Manual* for the procedure used to upload software using a Status Cue lighting console.

*Note: *before you upload new software, you must disconnect any controllers, bypass any serial data distributors and/or data line optoisolators, and bypass or make sure that any fixtures using RS-422 communications (such as Dataflash® AF1000 xenon strobes, Intellabeam® fixtures, and Emulator® laser simulators) are located after the EC-1, ES-1, Studio Spot 575 or Studio Color 575 fixtures on the link. These devices will block communication with any other EC-1, ES-1, Studio Spot 575 or Studio Color 575 fixtures on the link.*

Regardless of the method you chose to upload software, if you receive an error during the upload, see "Software Upload Troubleshooting" on page A-6.

Appendix B
Accessory Installation

Overview

This appendix provides information on how to install ES-1 accessories. A list of accessories is provided in "Optional Accessories" on page Intro-7. For ordering or additional information, contact your authorized dealer or High End Systems (see "Contacting High End Systems, Inc." on page vi).

Specifications for dichroic glass, LithoPatterns, gobos, and effects are provided in "Specifications" on page Intro-4.

Installing Optional Accessories

Approved optional accessories are listed in "Optional Accessories" on page Intro-7.

Cautions: 1) **this fixture must be serviced by qualified personnel. The information listed in this section is intended to assist qualified personnel only.**

2) **equipment surfaces may reach 140° C (284° F). Allow the fixture to cool before handling.**

3) **install** *only* **accessories that are approved by High End Systems. Installing unapproved accessories may damage the fixture and void the warranty.**

4) **failure to install dichroic glass and LithoPatterns in the proper orientation can damage them.**

WARNING: **disconnect power before servicing.**

Replacing the Lens

You can replace the lens if it is damaged or to install an accessory lens to achieve a different beam angle (see "Optional Accessories" on page Intro-7).

You will need:

*   5/32" allen wrench
*   torque wrench
*   wide tip, flat head screwdriver
*   replacement or accessory lens

To replace the lens:

1.   Electrically isolate the fixture. If the fixture has been operating, allow the fixture to cool before handling.

2. Using a 5/32" allen wrench, remove the 12 screws around the edge of the front bezel and remove the front bezel (see Figure B-1).

front bezel screws (12)
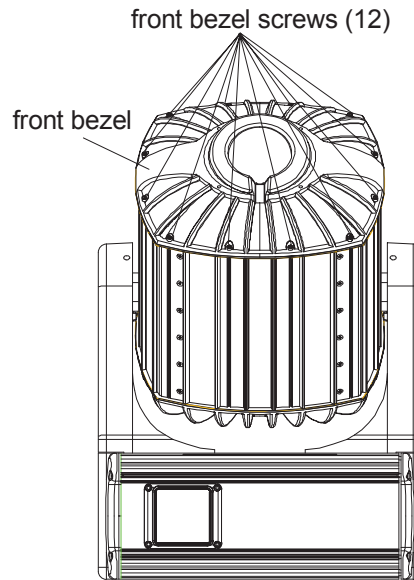
front bezel

Figure B-1. Remove the front bezel

3. Locate the lens ring thumbscrew and lens on the ES-1 optical assembly inside the fixture head (see Figure B-2).

4. Loosen the lens ring thumbscrew and pivot the ring away from the lens.

5. Remove the existing lens from the assembly.

6. Align the lip of the new lens with the ring and slide the new lens into the assembly.

7. Pivot the ring back to secure the lens to its assembly and retighten the thumbscrew.

8. Replace the front bezel and the 12 front bezel screws.

lens

lens ring thumbscrew
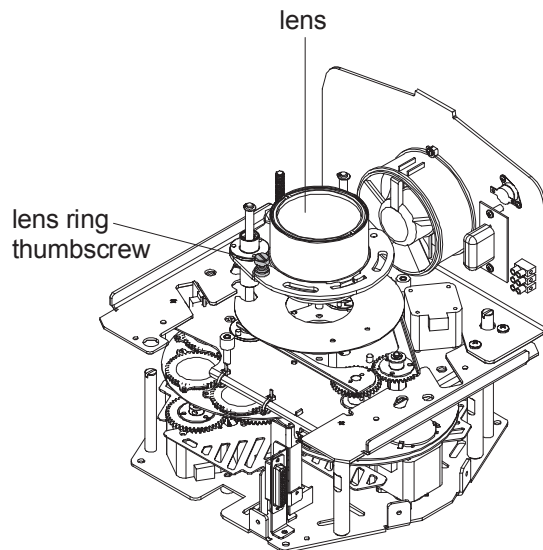
Figure B-2. ES-1 optical assembly

Make sure the rubber gasket used to seal the front bezel is aligned and seated correctly when replacing the front bezel (see Figure B-3).

*Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.*
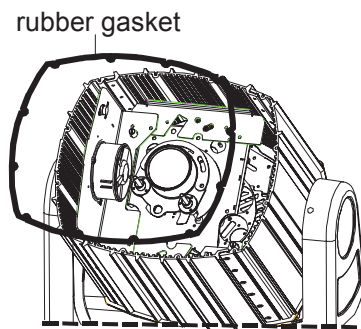
rubber gasket

Figure B-3. Rubber gasket on front bezel

Dichroic Installation

Replace dichroic filters if they are damaged or broken or to install a custom color. To order replacement dichroics or custom colors, see "Optional Accessories" on page Intro-7.

When replacing colors, plan ahead to ensure you will acquire the desired color combinations. Colors such as indigo and aqua can only be created by a dedicated filter and they do not mix with other colors.

You will need:

*   5/32" allen wrench
*   torque wrench
*   phillips-head screwdriver
*   replacement dichroic glass

To install dichroics:

1. Electrically isolate the fixture. If the fixture has been operating, allow the fixture to cool as described above.

2. Unscrew the twelve 5/32" socket cap screws around the edge of the front bezel and remove the front bezel (see Figure B-1).

3. Unscrew and remove the two "hold-down" screws on the optical assembly (see Figure B-4).

"hold down" screws (2)

Figure B-4. "Hold down" screws on the optical assembly

4. Disconnect the stepper motor drive cable and lens cable from their cable connectors. Loosen the three terminal screws in the fan cable terminal block and remove the fan cable from its terminal (see Figure B-5).

fan cable terminal block

lens cable connector

stepper motor cable connector
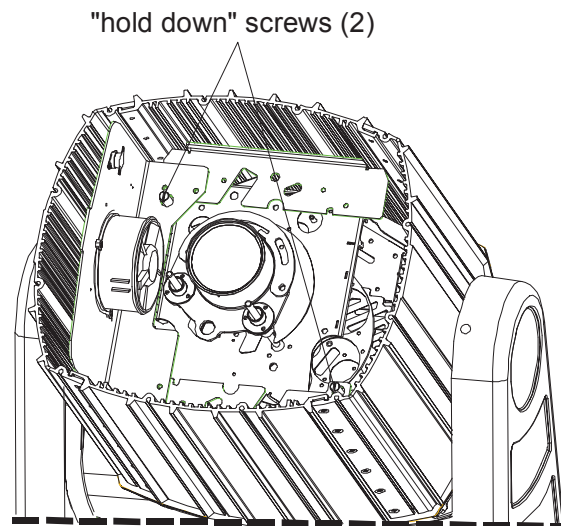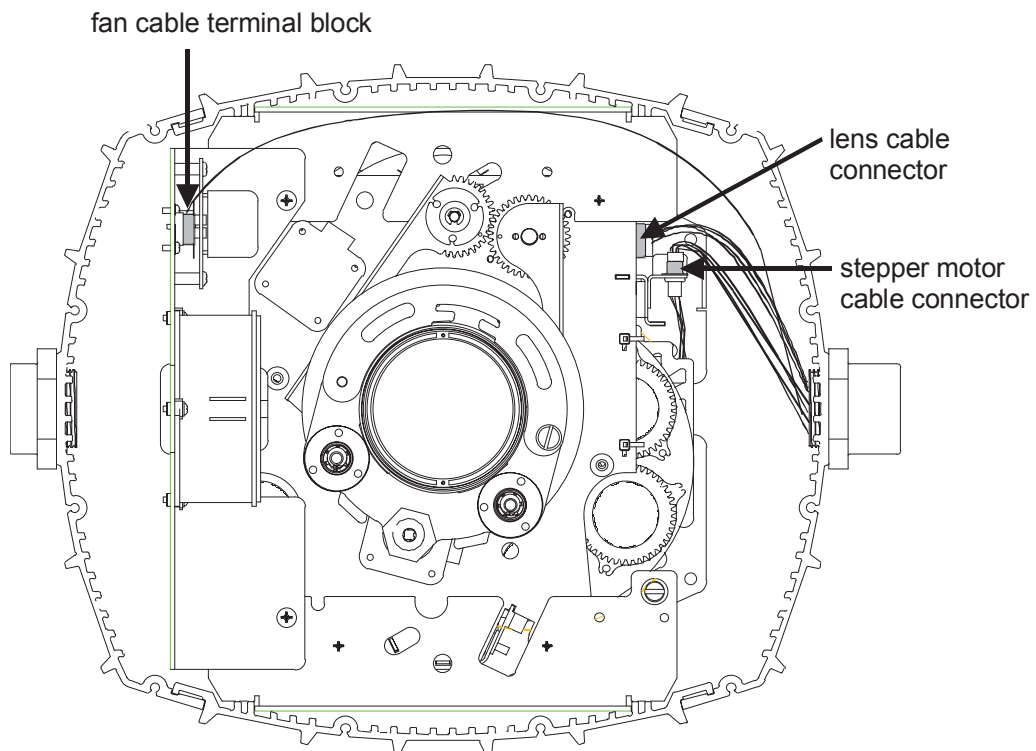
Figure B-5. Location of the stepper motor, lens, and fan cables

5. Slide the optical assembly up and out of the fixture (see Figure B-6).
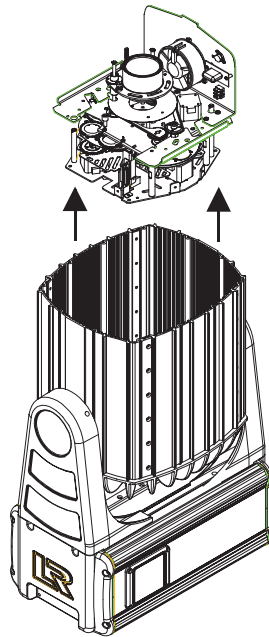
Figure B-6. Remove the optical assembly

6.	Using a phillips-head screwdriver, remove the four screws that hold the optical assembly together (see Figure B-7). Remove the lens assembly and attached fan plate.
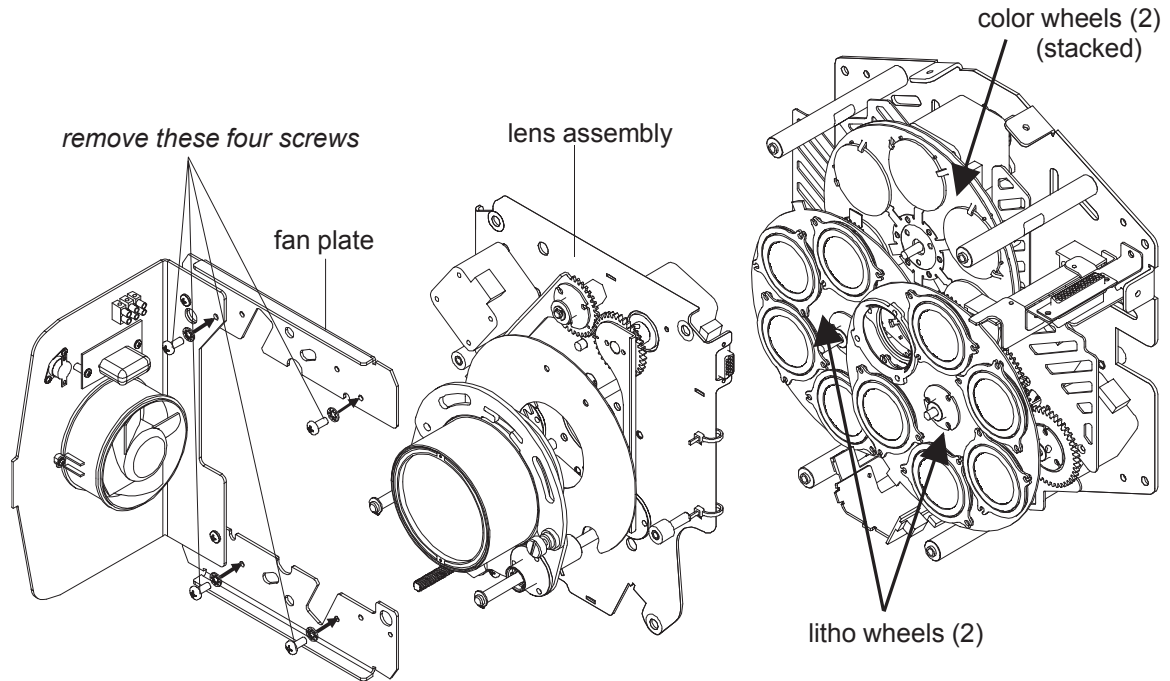
Figure B-7. Remove the screws in the optical assembly to access the color wheels

7.	Locate the color wheels stacked one on top of the other (see Figure B-7).

8.	Rotate the desired color wheel so that the color you wish to replace is accessible from the edge and rotate the opposing color wheel so that its open position is at the edge (see Figure B-8).
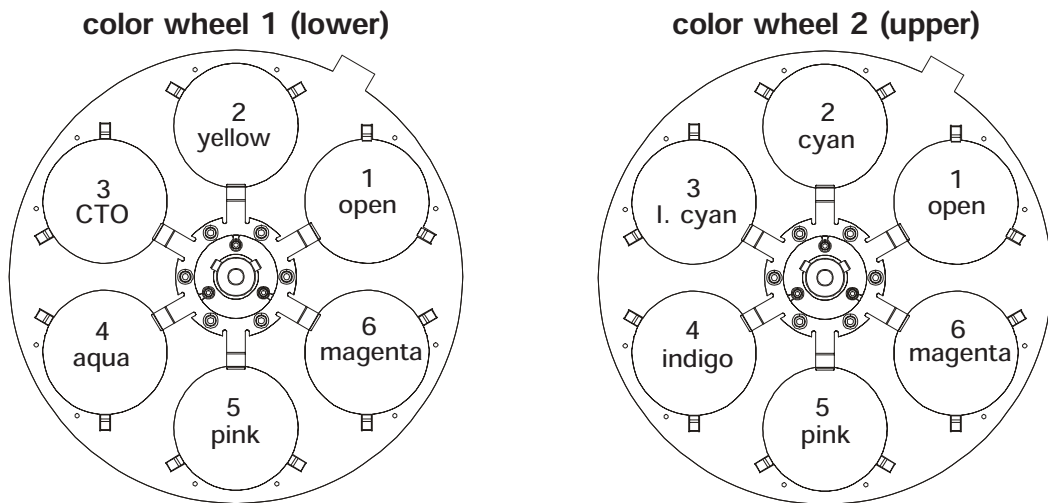
Figure B-8. Factory color wheels and index positions

Note*: color wheel 1 is inversely oriented in the optical module.*

9. Gently push the dichroic glass towards the spindle in the center of the color wheel (A), lift the edge away from the wheel (B), and remove the glass (see Figure B-9).

A.

B.
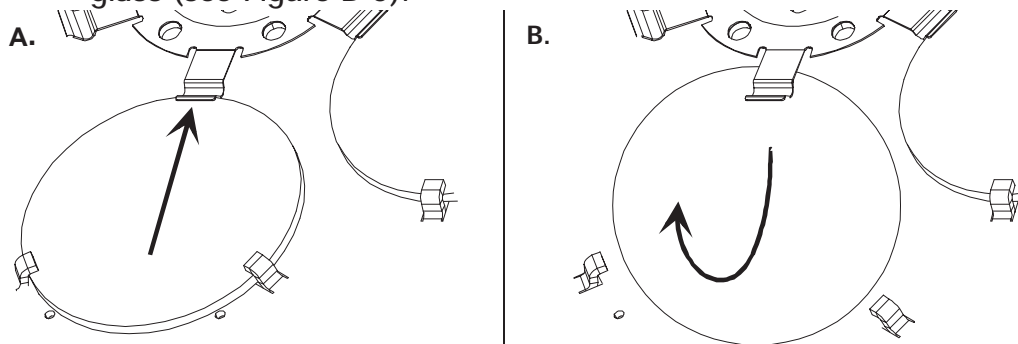
Figure B-9. Removing the dichroic glass

⚠ **Caution: do not bend or lift the inner tabs up. This could damage the tabs.**

10. Install the new dichroic into the color wheel with the coated side towards the wheel. In other words, on the color wheel closest to the lamp, install the dichroic so that the coated side faces *away* from the lamp. On the color wheel furthest from the lamp, install the dichroic so that the coated side faces *toward* the lamp. See Figure B-10 to understand how to determine the coated side of a dichroic.

coated   uncoated
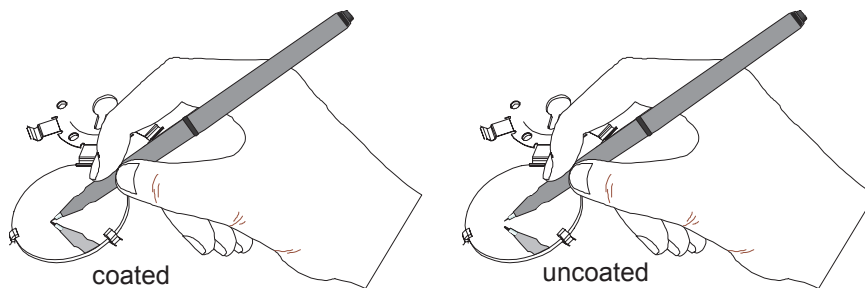
Place an object near the surface, the reflection will appear to touch the object on the coated side.

Figure B-10. Determining the coated side of dichroic glass

⚠ **Caution: improper installation can cause color shifts around the edge of the beam.**

11. Replace the lens assembly and fan plate on the optical assembly and install the four screws removed in step 6.

12. Replace the optical assembly in the fixture's head (see Figure B-6). Note that the optical assembly can only fit into the fixture head in one orientation to allow the stepper motor, lens, and fan cables to connect to their cable connectors.

13. Reconnect the stepper motor, lens, and fan cables to their cable connectors (see Figure B-5).

14. Reinstall the two "hold-down" screws in the optical assembly (see Figure B-4).

rubber gasket

15. Replace the front bezel and reinstall the twelve screws around the edge of the front bezel (see Figure B-1).

    Make sure the rubber gasket used to seal the front bezel is aligned and seated correctly when replacing the front bezel (see Figure B-11).

    Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.
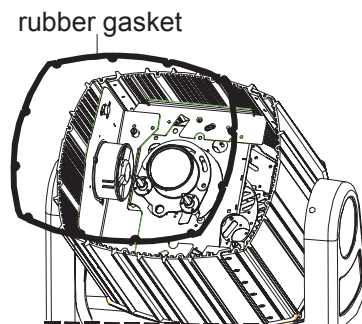
Figure B-11. Rubber gasket on the front bezel

LithoPattern, Gobo, and Effect Installation

To install LithoPatterns, gobos, or effects:

1. To access the litho wheels, follow steps 1-6 in the section titled "Dichroic Installation" on page B-3.

2. Locate the litho wheels (see Figure B-7).

3. Rotate the desired wheel so that the litho or effect you want to replace is easy to access.

4. Locate the spring securing the litho or effect to the wheel. Pull the spring tip towards the center of the litho (see Figure B-12). The spring will release from its groove inside the aperture.

5. Remove the spring and litho/effect from the aperture.

6. Place the new litho, effect, or gobo into the aperture and replace the spring. If you are installing a litho, insert it with the coated side away from the lamp. To determine the coated side, see Figure B-10.

   However, if you are installing an effect, insert the effect with the smooth side towards the wheel (and the spring touching the textured or "bumpy" side).
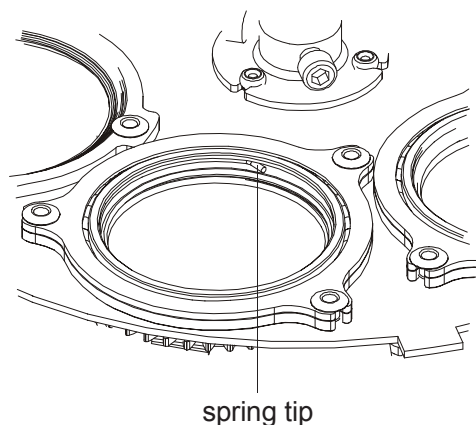
spring tip

Figure B-12. Removing the spring

⚠ **Caution: improper installation may cause lithos to fail.**

7. Replace the lens assembly and fan plate to the optical assembly (see Figure B-7) and install the four screws removed in step 6.

8. Replace the optical assembly in the fixture's head (see Figure B-6). Note that the optical assembly can only fit into the fixture head in one orientation to allow the stepper motor, lens, and fan cables to connect to their cable connectors.

9. Reconnect the stepper motor and lens to their cable connectors. Reconnect the fan cable to its terminal block (see Figure B-5).

10. Reinstall the two "hold-down" screws in the optical assembly (see Figure B-4).

11. Replace the front bezel and reinstall the twelve screws around the edge of the front bezel (see Figure B-1).

    Make sure the rubber gasket used to seal the front bezel is aligned and seated correctly when replacing the front bezel (see Figure B-13).

    Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.
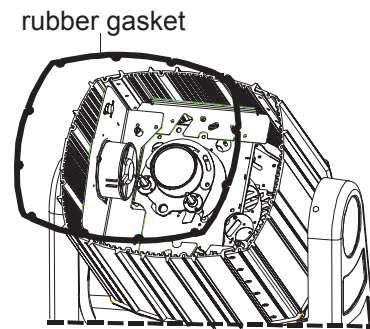
rubber gasket

Figure B-13. Rubber gasket on the front bezel

Appendix C
Supplemental Information

Overview

Use this appendix to determine ES-1's MSpeed times, DMX start channels, beam diameters, and color combinations. Decimal values have been rounded to the nearest tenth.

Converting DMX Values to MSpeed Times

Use Table C-1 to convert DMX values and fader percentages to the desired MSpeed time.

Note: *ES-1, EC-1, Studio Color 575, and Studio Spot 575 MSpeed times are identical.*

Table C-1. DMX Values to MSpeed Times

DMX Value	Fader %	MSpeed Time in Seconds	DMX Value	Fader %	MSpeed Time in Seconds	DMX Value	Fader %	MSpeed Time in Seconds
1	0.4	disable	26	10.2	210.4	51	20	167
2	0.8	disable	27	10.6	208.5	52	20.4	165.3
3	1.2	disable	28	11	206.7	53	20.8	163.7
4	1.6	252.7	29	11.4	204.9	54	21.2	162.1
5	2	250.7	30	11.8	203.1	55	21.6	160.5
6	2.4	248.7	31	12.2	201.3	56	22	159.9
7	2.7	246.7	32	12.5	199.5	57	22.4	157.5
8	3.1	244.7	33	12.9	197.7	58	22.7	155.7
9	3.5	242.7	34	13.3	195.9	59	23.1	154.1
10	3.9	240.8	35	13.7	194.2	60	23.5	152.6
11	4.3	238.8	36	14.1	192.4	61	23.9	151
12	4.7	236.8	37	14.5	190.6	62	24.3	149.5
13	5.1	234.9	38	14.9	188.9	63	24.7	147.9
14	5.5	233	39	15.3	187.2	64	25.1	146.4
15	5.9	231	40	15.7	185.4	65	25.5	144.9
16	6.3	229.1	41	16.1	183.7	66	25.9	143.3
17	6.7	227.2	42	16.5	182	67	26.3	141.8
18	7.1	225.3	43	16.9	180.3	68	26.7	140.3
19	7.5	223.4	44	17.3	178.6	69	27.1	138.8
20	7.8	221.5	45	17.6	176.9	70	27.5	137.3
21	8.2	219.6	46	18	175.2	71	27.8	135.9
22	8.6	217.8	47	18.4	173.6	72	28.2	134.4
23	9	215.9	48	18.8	171.9	73	28.6	132.9
24	9.4	214	49	19.2	170.4	74	29	131.5
25	9.8	212.2	50	19.6	168.6	75	29.4	130

Table C-1. DMX Values to MSpeed Times (Continued)

DMX Value	Fader %	MSpeed Time in Seconds	DMX Value	Fader %	MSpeed Time in Seconds	DMX Value	Fader %	MSpeed Time in Seconds
76	29.8	128.6	117	45.9	76.5	158	62	37.9
77	30.2	127.2	118	46.3	75.4	159	62.4	37.1
78	30.6	125.7	119	46.7	74.3	160	62.7	36.3
79	31	124.3	120	47.1	73.2	161	63.1	35.6
80	31.4	122.9	121	47.5	72.1	162	63.5	34.8
81	31.8	121.5	122	47.8	71.1	163	63.9	34.1
82	32.2	120.1	123	48.2	70	164	64.3	33.3
83	32.5	118.7	124	48.6	68.9	165	64.7	32.6
84	32.9	117.4	125	49	67.9	166	65.1	31.9
85	33.3	116	126	49.4	66.9	167	65.5	31.2
86	33.7	114.6	127	49.8	65.8	168	65.9	30.5
87	34.1	113.3	128	50.2	64.8	169	66.3	29.8
88	34.5	111.9	129	50.6	63.8	170	66.7	29.1
89	34.9	110.6	130	51	62.8	171	67.1	28.2
90	35.3	109.3	131	51.4	61.8	172	67.5	27.8
91	35.7	108	132	51.8	60.8	173	67.8	27.1
92	36.1	106.6	133	52.2	59.8	174	68.2	26.4
93	36.5	105.3	134	52.5	58.8	170	66.7	29.1
94	36.9	104.1	135	52.9	57.9	171	67.1	28.2
95	37.3	102.8	136	53.3	56.9	172	67.5	27.8
96	37.6	101.5	137	53.7	56	173	67.8	27.1
97	38	100.2	138	54.1	55	174	68.2	26.4
98	38.4	99	139	54.5	54.1	175	68.6	25.8
99	38.8	97.5	140	54.9	53.2	176	69	25.2
100	39.2	96.5	141	55.3	52.2	177	69.4	24.5
101	39.6	95.2	142	55.7	51.3	178	69.8	23.9
102	40	94	143	56.1	50.4	179	70.2	23.3
103	40.4	92.8	144	56.5	49.5	180	70.6	22.7
104	40.8	91.5	145	56.9	48.7	181	71	22.1
105	41.2	90.3	146	57.3	47.8	182	71.4	21.5
106	41.6	89.1	147	57.6	46.9	183	71.8	20.9
107	42	88	148	58	46	184	72.2	20.4
108	42.4	86.8	149	58.4	45.2	185	72.5	19.8
109	42.7	85.6	150	58.8	44.3	186	72.9	19.2
110	43.1	84.4	151	59.2	43.5	187	73.3	18.7
111	43.5	83.3	152	59.6	42.7	188	73.7	18.1
112	43.9	82.1	153	60	41.9	189	74.1	17.6
113	44.3	81	154	60.4	41	190	74.5	17.1
114	44.7	79.8	155	60.8	40.2	191	74.9	16.6
115	45.1	78.7	156	61.2	39.4	192	75.3	16.1
116	45.5	77.6	157	61.6	38.6	193	75.7	15.6

Table C-1. DMX Values to MSpeed Times (Continued)

DMX Value	Fader %	MSpeed Time in Seconds	DMX Value	Fader %	MSpeed Time in Seconds	DMX Value	Fader %	MSpeed Time in Seconds
194	76.1	15.1	235	92.2	1.8			
195	76.5	14.6	236	92.5	1.6			
196	76.9	14.1	237	92.9	1.4			
197	77.3	13.6	238	93.3	1.3			
198	77.6	13.2	239	93.7	1.2			
199	78	12.7	240	94.1	1.1			
200	78.4	12.3	241	94.5	0.94			
201	78.8	11.8	242	94.9	0.83			
202	79.2	11.4	243	95.3	0.73			
203	79.6	11	244	95.7	0.63			
204	80	10.6	245	96.1	0.55			
205	80.4	10.2	246	96.5	0.47			
206	80.8	9.8	247	96.9	0.41			
207	81.2	9.4	248	97.3	0.35			
208	81.6	9	249	97.6	0.29			
209	82	8.6	250	98	0.25			
210	82.4	8.3	251	98.4	0.21			
211	82.7	7.9	252	98.8	0.19			
212	83.1	7.6	253	99.2	0.17			
213	83.5	7.2	254	99.6	0.15			
214	83.9	6.9	255	100	0.15			
215	84.3	6.6						
216	84.7	6.2						
217	85.1	5.9						
218	85.5	5.6						
219	85.9	5.3						
220	86.3	5.1						
221	86.7	4.8						
222	87.1	4.5						
223	87.5	4.3						
224	87.8	4						
225	88.2	3.8						
226	88.6	3.5						
227	89	3.3						
228	89.4	3.1						
229	89.8	2.9						
230	90.2	2.7						
231	90.6	2.5						
232	91	2.3						
233	91.4	2.1						
234	91.8	1.9						

C Supplemental Information

DMX Start Channels

Table C-2 lists the DMX start channels for ES-1 fixtures using either a controller that supports ES-1 fixtures or a controller that only supports Studio Spot 575 fixtures. This table assumes that all ES-1 fixtures will be assigned to the same link, one after another. Keep in mind, however, that if you mix different devices on the same link, those devices may have different channel ranges that could overlap the sequence listed below and cause the devices to behave erratically.

Table C-2. DMX Start Channels

Fixture Order in Link	DMX Start Channel (controller for ES-1)	DMX Start Channel (controller for Studio Spot 575)
1	1	5
2	21	25
3	41	45
4	61	65
5	81	85
6	101	105
7	121	125
8	141	145
9	161	165
10	181	185
11	201	205
12	221	225
13	241	245
14	261	265
15	281	285
16	301	305
17	321	325
18	341	345
19	361	365
20	381	385
21	401	405
22	421	425
23	441	445
24	461	465
25	481	485

Color Combinations

Use Table C-3 to determine the color combinations from the factory color wheels.

Table C-3. Color Combinations

Wheel 1	Wheel 2	Combination Color
2. yellow	2. cyan	dark green
2. yellow	3. light cyan	dark yellow green
2. yellow	4. indigo	does not mix
2. yellow	5. pink	orange
2. yellow	6. magenta	red
3. CTO	2. cyan	moonlight blue
3. CTO	3. light cyan	blue green
3. CTO	4. indigo	dark indigo
3. CTO	5. pink	cherry rose
3. CTO	6. magenta	red rose
4. aqua	2. cyan	primary green
4. aqua	3. light cyan	indigo
4. aqua	4. indigo	does not mix
4. aqua	5. pink	does not mix
4. aqua	6. magenta	does not mix
5. pink	2. cyan	medium blue
5. pink	3. light cyan	congo blue
5. pink	4. indigo	indigo
5. pink	5. pink	pink
5. pink	6. magenta	broadway pink
6. magenta	2. cyan	indigo
6. magenta	3. light cyan	rose indigo
6. magenta	4. indigo	indigo
6. magenta	5. pink	broadway pink
6. magenta	6. magenta	magenta

C
Supplemental
Information

Calculating Beam Diameters

Use Table C-4 to calculate the beam diameter with each type of lens. Calculations can be used for feet or meters.

Table C-4. Calculating Beam Diameters

Distance From Fixture	13° Lens Diameter	18° Lens Diameter	30° Lens Diameter
5	1.1	1.6	2.7
10	2.3	3.2	5.4
15	3.4	4.8	8
20	4.5	6.3	10.7
25	5.7	7.9	13.4
30	6.8	9.5	16.1
35	8	11.1	18.8
40	9.1	12.7	21.4
45	10.3	14.3	24.1
50	11.4	15.8	26.8
55	12.5	17.4	29.5
60	13.7	19	32.2
65	14.8	20.6	34.8
70	16	22.2	37.5
75	17.1	23.8	40.2
80	18.2	25.3	42.9
85	19.4	26.9	45.6
90	20.5	28.5	48.2
95	21.6	30.1	50.9
100	22.8	31.7	53.6

Appendix D
Important Safety Information

Warning: For Continued Protection Against Fire

1. This equipment is designed for use with Phillips 575 Watt, GX 9.5 base, M Series, metal halide lamp only. Use of any other type lamp may be hazardous and will void the warranty.
2. Do not mount on a flammable surface.
3. Maintain minimum distance of 1.0 meter (3.28 feet) from combustible materials.
4. Replace fuses only with the specified type and rating.
5. Observe minimum distance to lighted objects of 1.0 meter (3.28 feet).
6. This equipment for connection to branch circuit having a maximum overload protection of 20 A.

Warning: For Continued Protection Against Electric Shock

If this equipment was received without a line cord plug, attach the appropriate line cord plug according to the following code:

- brown—live
- blue—neutral
- green/yellow—earth

As the colours of the cores in the mains lead of this equipment may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

- the core which is coloured green and yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol ⏚, or coloured green or green and yellow.
- the core which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
- the core which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

1. This equipment must be earthed.
2. Disconnect power before re-lamping or servicing.
3. Refer servicing to qualified personnel; no user serviceable parts inside.
4. Class I equipment - this fixture employs a grounded type receptacle and is not intended for connection to a two wire, ungrounded source of supply.

Warning: For Continued Protection Against Exposure To Excessive Ultraviolet (UV) Radiation

1. Do not operate this equipment without complete lamp enclosure in place or if shields, lenses, or ultraviolet screens are damaged.
2. Change shields, lenses, or ultraviolet screens if they have become visibly damaged to such an extent that their effectiveness is impaired, for example by cracks or deep scratches.
3. Never look directly at the lamp while lamp is on.

Warning: For Continued Protection Against Injury To Persons

1. Caution: hot lamp may be an explosion hazard. Do not open for 5 minutes after switching off. Wear eye and hand protection when re-lamping.
2. Equipment surfaces may reach temperatures up to 140 degrees C (284 degrees F). Allow 5 minutes for cooling before handling.
3. Change the lamp if it becomes damaged or thermally deformed.

Appendice D
Importantes Informations Sur La Sécurité

Mise En Garde: Pour Une Protection Permanente Contre Les Incendies

1. Cet appareil est conçu uniquement pour une lampe métallique à halogène Philips série M, de 575 watts, à base GX 9.5. Son utilisation avec tout autre type de lampe peut être dangereuse et annuler la garantie.
2. Ne pas monter les lampes sur une surface inflammable.
3. Maintenir à une distance minimum de 1.0 mètre de matières inflammables.
4. Ne remplacer les fusibles qu'avec des modèles et valeurs assignées recommandés.
5. Respecter une distance minimum de 1.0 mètre par rapport aux objets éclairés.
6. Cet appareil de connection au circuit comporte une protection contre les surcharges de 20 A.

Mise En Garde: Pour Une Protection Permanente Contre Les Chocs Électriques

1. Si cet équipement est livré sans prise de cable, veuillez connecter la prise de cable correcte selon le code suivant:
   - marron - phase
   - bleu - neutre
   - vert/jaune - terre
2. Débrancher le courant avant de changer les lampes ou d'effectuer des réparations.
3. À l'intérieur de l'équipement il n'y a pas de pièces remplaçables par l'utilisateur. Confiez l'entretien à un personnel qualifié.
4. Equipement de Classe I. Cet équipement doit être mis à la terre.

Mise En Garde: Pour Une Protection Permanente Contre Des Expositions Excessives Aux Rayons Ultra Violets (UV)

1. Ne pas utiliser cet appareil si le boîtier de la lampe n'est pas complètement fixé ou si les blindages, lentilles, ou écrans ultraviolets sont endommagés.
2. Changer les blindages ou les écrans ultraviolets s'ils sont visiblement endommagés au point que leur efficacité aient été altérée, par exemple par des fissures ou de profondes égratignures.
3. Ne jamais regarder directement la lampe quand celle ci est allumée.

Mise En Garde: Pour Une Protection Permanente Contre Les Blessures Corporelles

1. AVERTISSEMENT: les lampes chaudes comportent un risque d'explosion. Après l'avoir éteinte, attendre 5 minutes avant de la dégager. Lors du remplacement de la lampe, une protection des yeux et des mains est requise.
2. Les surfaces de l'appareil peuvent atteindre des températures de 140 C. Laisser refroidir pendant 5 minutes avant la manipulation.
3. Changer la lampe si elle est endommagée ou thermiquement déformée.

Anhang D
Wichtige Hinweise Für Ihre Sicherheit

Warnung: Zum Schutz Vor Brandgefahr

1. Dieses Gerät ist nur für den Gebrauch mit einer 575-Watt, Philips Serie M, Metall-Halogen-Lampe mit GX 9.5-Sockel konzipiert. Der Gebrauch irgend eines anderen Lampentyps könnte Sie gefährden und Ihre Garantie außer Kraft setzen.
2. Das Gerät nie auf einer feuergefährlichen Fläche montieren.
3. Stets einen Mindestabstand von 1 Meter zu brennbaren Materialien einhalten.
4. Zum Ersatz nur Sicherungen verwenden, die dem vorgeschriebenen Typ und Nennwert entsprechen.
5. Einen Mindestabstand von 1 Meter zu den angestrahlten Objekten einhalten.
6. Dieses Gerät darf nur an eine Zweigleitung mit einem Überlastungsschutz von höchstens 20 A angeschlossen werden.

Warnung: Zum Schutz Gegen Gefährliche Körperströme

1. Wenn dieses Gerät ohne einen Netzkabelstecker erhalten wurde, ist der entsprechende Netzkabelstecker entsprechend dem folgenden Code anzubringen:
    • Braun - Unter Spannung stehend
    • Blau - Neutral
    • Grün/Gelb - Erde
2. Vor dem Austauschen von Lampen oder vor Wartungsarbeiten stets den Netzstecker ziehen.

3. Servicearbeiten sollten nur von Fachpersonal ausgeführt werden. Das Gerät enthält keine wartungsbedürftigen Teile.
4. Dieses Gerät gehört zur Klasse I. Dieses Gerät muß geerdet werden.

Warnung: Zum Schutz Gegen Übermässige Ultraviolett (UV)-Bestrahlung

1. Benutzen Sie dieses Gerät nur, wenn das komplette Lampengehäuse fest eingebaut ist; ebenfalls dürfen keine der Schutzabdeckungen, Linsen oder der UV-Schutz Beschädigungen aufweisen.
2. Die Schutzabdeckungen, Linsen und der UV-Schutz müssen ausgewechselt werden, wenn sie sichtlich dermaßen beschädigt sind, daß sie ihre Wirksamkeit einbüßen, z.B. infolge von Rissen oder tiefen Kratzern.
3. Nie direkt in die eingeschaltete Lampe schauen.

Warnung: Zum Schutz Vor Verletzungen

1. VORSICHT: Bei einer heiße Lampe besteht Explosionsgefahr. Nach dem Abschalten der Netzspannung sollten Sie etwa 5 Minuten warten, bevor Sie das Lampengehäuse öffnen. Schützen Sie beim Auswechseln der Lampen Ihre Hände und tragen Sie eine Schutzbrille.
2. Die Oberflächen des Gerätes können Temperaturen bis zu 140 C erreichen. Vor dem Anfassen stets 5 Minuten lang abkühlen lassen.
3. Falls die Lampe beschädigt oder durch Wärmeeinwirkung verformt ist, muß sie ausgewechselt werden.

Apéndice D
Información Importante De Seguridad

Advertencia: Para Protección Continua Contra Incendios

1. Este equipo está diseñado para utilizarse únicamente con la lámpara de haluro metálico Philips serie M, de 575 vatios y base GX 9.5. El uso de cualquier otro tipo de lámpara puedá resultar peligroso, y puedá anular la garantía.
2. No monte el equipo sobre una superficie inflamable.
3. Mantenga una distancia mínima de materiales combustibles de 1,0 metro.
4. Cambie los fusibles únicamente por otros que sean del tipo y la clasificación especificadas.
5. Guarda una distancia mínima a objetos iluminados de 1,0 metro.
6. Este equipo debe conectarse a un circuito que tenga una protección máxima contra las sobrecargas de 20 A.

Advertencia: Para La Protección Continua Contra Electrocuciones

1. Si se recibió este equipo sin el enchufe de alimentacion, monte usted el enchufe correcto según el clave siguente:
   • moreno - vivo
   • azul - neutral
   • verde/amarillo - tierra

2. Desconecte el suministro de energía antes de recambiar lámparas o prestar servicio de reparación.
3. Derive el servicio de reparación de este equipo al personal calificado. El interior no contiene repuestos que puedan ser reparados por el usuario.
4. Equipo de Clase I. Este equipo debe conectarse a la tierra.

Advertencia: Para Protección Continua Contra La Exposición A Radiación Ultravioleta (UV) Excesiva

1. No opere este equipo sin tener colocada en su lugar la caja protectora completa de la lámpara o bien, si el blindaje, los lentes o las pantallas ultravioletas están dañadas.
2. Cambie el blindaje, los lentes o las pantallas ultravioleta si nota una avería visible, a tal grado que su eficacia se vea comprometida. Por ejemplo, en el caso de grietas o rayaduras profundas.
3. Jamás mire directamente a la lámpara en tanto ésta esté encendida.

Advertencia: Para Protección Continua Contra Lesiones Corporales

1. Precaución: una lámpara caliente puede constituir un peligro de explosión. No la abra por 5 minutos luego de haberla apagado. Lleve puestos, un protector ocular, y guantes al recambiar lámparas.
2. Las superficies del equipo pueden alcanzar temperaturas máximas de 140 grados centígrados. Deje que se enfríen por 5 minutos antes de tocarlas.
3. Cambie la lámpara si ésta se avería o deforma por acción térmica.

Appendice D
Importanti Informazioni Di Sicurezza

Avvertenza: Per Prevenire Incendi

1. Questa apparecchiatura è stata progettata per l'uso esclusivo con lampada a sali metallici Philips da 575 watt, base GX 9.5, serie M. L'uso di qualsiasi altro tipo di lampada può essere pericoloso e può annullare la garanzia.
2. Da non montare sopra una superficie infiammabile.
3. Mantenere l' apparecchio a un minimo di 1.0 metri (3.28 piedi) di distanza dai materiali combustibili.
4. Rimpiazare i fusibili usando soltanto quelli del tipo e della taratura adatta.
5. Mantenere una distanza minima di 1.0 metri (3.28 piedi) dagli oggetti accesi.
6. Questa apparecchiatura e' da collegarsi ad un circuito con una protezzione da sovraccarico massima di 20 amperes.

Avvertenza: Per Prevenire Le Scosse Elettriche

1. Se questa apparecchiatura è stata consegnata senza una spina del cavo di alimentazione, collegare la spina appropriata del cavo di alimentazione in base ai seguenti codici:
   • marrone - sotto tensione

- blu - neutro
- verde/giallo - terra

2. Disinnestare la corrente prima di cambiare la lampadina o prima di eseguire qualsiasi riparazione.
3. Per qualsiasi riparazione rivolgersi al personale specializzato. L' utente non deve riparare nessuna parte dentro l' unita'.
4. Aparecchio di Classe I. Questa apparecchiatura deve essere messa a terra.

Avvertenza: Per Proteggersi Contro Le Radiazioni Dei Raggi Ultravioletti

Non usare questa apparecchiatura se il sistema di chiusura della lampadina non e' completo o se gli scudetti, le lenti, o gli schermi ultravioletti si sono visibilmente danneggiati di maniera tale che la loro efficacia sia stata ridotta --- ad esempio, se vi sono visibili spaccature o graffi profondi. Mai guardare direttamente verso la lampadina quando sia accesa.

Avvertenza: Per Non Ferire Ad Altre Persone

1. Avvertenza: la lampadina calda potrebbe esplodere. Spegnerla per 5 minuti prima di aprirla. Usare protezzioni per le mani e per gli occhi prima di cambiare la lampadina.
2. Le superfici della apparecchiatura possono arrivare a temperature di 140 gradi centrigradi (284 gradi f). Aspettare 5 minuti prima di maneggiare.
3. Cambiare la lampadina se si danneggia o se si e' deformata dovuto alle alte temperature.

Vigtig Sikkerhedsinformation

Advarsel: Beskyttelse mod elektrisk chock.

VIGTIGT!

LEDEREN MED GUL/GROEN ISOLATION MAA KUN TILSLUTTES KLEMME MAERKET

⏚ ELLER ⏚.

Index

M

Index