EC-1™

User Manual

High End Systems, Inc.
2217 West Braker Lane
Austin, TX 78758 U.S.A.

LIGHTWAVE RESEARCH®

p/n 60600101 Version 2.1

EC-1™

User Manual

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P/N 60600101 Version 2.0
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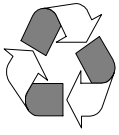

International Sales

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Patents

EC-1 may use one or more of the following patents: US 4,962,687; US 5,078,039; UK 2,043,769; US 5,331,822; US 5,402,326; US D372550; UK 2292896; US D365165; US 5,430,629; US D360,404; US 5,455,748; 0475082; US 5,506,762; M9604224.9; US 5,515,254; US D370080; UK 2.291,814; US 5,545,951; UK 2055842; UK 2,292,530; UK 2294909; UK 2292896; MR 8621996; and US 5,580,164.

Additional patents pending.

Trademarks

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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 USA
Distributor's name:	High End Systems, Inc.
Distributor's address:	2217 West Braker Lane Austin, Texas 78758 USA

Declares that the product

Product Name:	EC-1
Product Number:	EC-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 was first manufactured in compliance with the following standards in 1997:

Safety:	EN 60598-1 EN 60598-2-17 : 1989 A1-A3 : 1993
EMC:	EN 55022, Class A ITE IEC 801-2, Level 2 (4/8kV) IEC 801-3, Level 2 (3 V/m) IEC 801-4, Level 2 (1kV/.5kV)

U.S.A., November 25, 1998
Kenneth Stuart Hansen, Compliance Engineer

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 Systemen entsprechen den Anforderungen der U.S.A. und den internationalen Sicherheitsvorschriften. Abänderungen dieses Produktes können dessen Sicherheit beeinträchtigen und u. U. 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.

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 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 RMA (Return Material Authorization) number from your dealer or 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 RMA number. Accompany all returned Product units or parts with a written explanation of the alleged problem or malfunction. Ship returned Product units or parts to:

2227 West Braker Lane
Austin, TX 78758 USA

Note: Freight Damage Claims are invalid for fixtures shipped in non-factory boxes and packing materials.

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

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 assembly, 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 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.

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Introduction

Congratulations on your purchase of the EC-1™ architectural outdoor wash luminaire. EC-1 is a weather-resistant, static luminaire that is both attractive and unobtrusive. The EC-1 housing is made of high-strength aluminum alloy and is available in a variety of colors to adapt to its environment. With the major functions and award-winning design of Studio Color®, EC-1 is a cost-effective alternative when the use of a High End Systems® Ecodome™ is prohibitive or where the pan and tilt motion of Studio Color is not required. EC-1 is water-resistant, dust-resistant, and can be mounted in any orientation.

EC-1™ Features

- Ventilated, weatherized design to IP 66
- 7500 Kelvin color temperature using the MSR 575/2 lamp and 5600 Kelvin using the MSD 575 lamp
- Rotatable, variable beam shaping that gives full control over soft-edge framing
- No fans - convection cooled for quiet operation via integrated heatsink/ reflector combination
- Selectable (8° to 22°) beam angle, plus optional lenses*
- Smooth dichroic subtractive color mixing system providing over 100 million color permutations
- Six-position color wheel with replaceable dichroic filters
- Effects such as partial colors, color spins, color cycles, and strobe
- Color temperature correction filters may be fitted in the color wheel (full CTO fitted as standard)
- Variable frost
- Available accessory PAR type lenses providing MFL (medium flood), WFL (wide flood), and XWFL (extra wide flood) beams
- Easy, quick lamp replacement in a self-aligning lamp socket
- Smooth iris dimming
- Easy to program LED display
- All functions controllable via DMX 512 protocol
- Selectable input power supply of 100V/120V/230V/277V at 50/60 Hz
- Robust magnetic ballast
- Precision stepper motors used to control iris, shutter, color, and effects wheels
- Power factor correction
- Remote fixture power up and shutdown
- Self optimizing lamp socket

**All beam angles are accurate ± 1°.*

Caution and Warning Symbols

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

Cautions

Not heeding these messages could result in personal injury and/or damage to equipment.

Caution: This symbol indicates caution messages.

Hot Surface: This symbol indicates a hot surface.

Warnings

Not heeding these messages could result in serious personal injury.

Warning: This symbol indicates high voltage warning messages.

Fire Hazard: This symbol indicates that a fire hazard is present.

Eye Protection: This symbol indicates that eye protection is required.

Explosion: This symbol indicates an explosion hazard.

Minimum Distance: This symbol indicates the minimum distance to a lighted object, which in this case is 1 meter.

Installation Requirements

EC-1 is an ETL/CETL recognized component when the following conditions of acceptability are met:

1. EC-1 must be installed in accordance with local and national building and electrical codes.
2. EC-1 must be mounted on a site that provides adequate drainage so that the fixture is *never* immersed in standing water.
3. EC-1 must be properly secured with recommended mounting hardware when mounted on a wall or ceiling (see *EC-1 Mounting Instructions* included with this manual).

Getting Help

You can contact High End Systems customer service in one of the ways shown:

U.S., the Americas, and Europe

Service address:
2227 West Braker Lane
Austin, TX 78758
USA

From 8 a.m. to 6 p.m. (U.S. Central time)
Monday through Friday: (800) 890-8989
24 hour FAX: (512) 834-9195
24 hour voice mail: (512) 837-3063
(800) 890-8989

or

Service address:
8200 Haskell Avenue
Van Nuys, CA 91406
USA

From 8 a.m. to 5 p.m. (U.S. Pacific time)
Monday through Friday: (818) 947-0550
FAX: (818) 908-8975

Singapore

High End Systems Singapore Pte. Ltd.
1 Tannery Road 06-05
Cencon 1
Singapore 1334

voice:+65 742 8266
FAX:+65 743 9322

24-hour customer service World Wide Web response

http://info.highend.com/service/service.html

World Wide Web site

http://www.highend.com

Specifications

Model Information

Model:	EC-1
Manufacturer:	Lightwave Research 2217 West Braker Lane Austin, TX 78758 USA
Distributor:	High End Systems, Inc. 2217 West Braker Lane Austin, TX 78758 USA
Product Number:	EC-1

Physical Specifications

Dimensions:	50.8 cm W x 33.6 cm D x 62.73 cm H (20” L x 13.2” W x 24.7” H)
Weight:	59.1 Kg (130 lbs)
Lamp type:	Philips® M Series, GX 9.5 base, 575 watt, metal halide lamp only **MSR 575/2** color temperature: 6200 Kelvin **MSD 575** color temperature: 5600 Kelvin

Electrical Specifications

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:	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 Specifications

Ingress Protection:	IP 66
E.P.A. (Effective Projected Area):	3.2 sq. ft.
Maximum ambient temperature, Ta:	40° C (104° F)
Maximum exterior surface temperature:	140° C (284° F)
Minimum distance to lighted object:	1.0 meter (3.28 feet)
Minimum distance to flammable objects:	1.0 meter (3.28 feet)

Warnings: 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 100-140 Ω

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

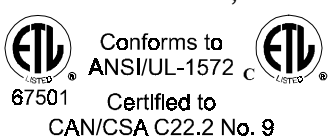
DMX data terminators:
Male XLR connector with 120 ohm terminator

Safety Specifications

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

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

CE



Optional Accessories

Table Intro-1 below lists the EC-1 optional accessories available from your High End Systems dealer/distributor.

Table Intro-1. EC-1 optional accessories

Part Description	Part Number
Accessory effect lenses (set of five)	99090029
10' heavy duty data cable with Neutrix 3-pin XLRs	55050005
25' heavy duty data cable with Neutrix 3-pin XLRs	55050006
50' heavy duty data cable with Neutrix 3-pin XLRs	55050007
100' heavy duty data cable with Neutrix 3-pin XLRs	55050008
Cheeseborough clamp	55040014
Dark blue color filter	80510061
Orange color filter	80510060
Purple color filter	80510063
Blue color filter	80510116
Green color filter	80510117
Indigo color filter	80510114
Magenta color filter	80510118
Yellow color filter	80510119
EC-1 conduit wiring kit	Call*
Philips MSR 575/2 lamp	55030045
Philips MSD 575 lamp	55030050
Lightwave Research Upload Dongle	26040002
Status Cue Lighting Console	22020002
Studio Color LCD Controller	01020006
Unprogrammed RAM card for Studio Color LCD controller	80440017

*Call - For more information about optional accessories, contact either your High End Systems dealer/distributor, High End System Sales, or visit the High End Systems Web site. For contact information, see “International Sales” on page ii.

Note: Additional custom color dichroics are available from High End Systems. The EC-1 fixture housing is also available in custom colors (blue, green, beige, etc.).

Chapter 1
Unpacking and Assembling EC-1™

In this chapter, you will unpack your fixture and identify fixture components, set the fixture's input voltage, and install the lamp.

Unpacking EC-1™

Unpack your fixture and verify that it arrived complete and without any damage.

Inspecting the Contents

Carefully unpack the carton and inspect the contents for damage. If any of the items in the following list are missing or damaged, notify both the shipping agent and your sales agent immediately.

- EC-1 fixture
- Philips® MSR 575/2 or MSD 575 series lamp
- two mounting "feet"
- eight 3/8" socket cap screws
- eight 3/8" split lock washers

Saving the Shipping Materials

Do not discard the shipping carton and packing materials. The carton and packing materials are specifically designed to protect the product during transport.

High End Systems assumes no responsibility for products that have been damaged during transport. Therefore, you should return a product for repair in its original shipping carton and packing materials.

Note: Before sending anything to the factory, call your High End Systems dealer/distributor for a RMA (Return Material Authorization) number. The factory cannot accept any goods shipped without a RMA number.

Identifying EC-1™ Components

Display Panel

The EC-1 display panel is located on the front panel of the fixture and is protected by a plastic covering. To access this display panel, remove the four 5/32" socket cap screws in the display covering.

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

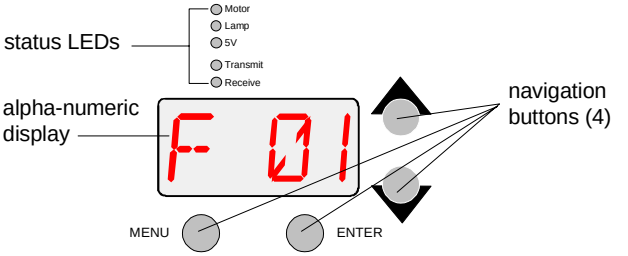


Figure 1-1. Front panel display

Under normal circumstances, the alpha-numeric display alternates between displaying the fixture's software version (Vxxx), the fixture name (EC-1), and the fixture number (F xx) / DMX start channel (Cxxx). However, if you are experiencing problems with your fixture, the status LEDs and/or alpha-numeric display provide insight on where the problem is originating. For more information on error messages, see Chapter 6. The menu navigation buttons allow you to access and change the fixture's menu items. For more information on the menu system, see Chapter 4.

Side Panel

Locate the side panel connectors for the fixture's power cord and Data In/Data Out cables (see Figure 1-2). You will use these connectors to link the fixture to a power source, a controller and/or other fixtures. For more information on linking fixtures, see "Linking the Fixture(s) to a Controller" on page 2-2. For more information on connecting the fixture to a power source, see "Branch Mains Power Connections" on page 2-7.

If you choose, you can fit user-supplied conduit for the data and power cords directly to the connectors via the 1/2" NPT (National Pipe Thread) cable

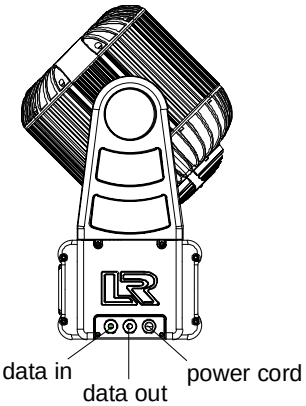


Figure 1-2. Side panel connectors

connectors installed on the side panel. For more information, see the "*EC-1 Installation Guide*" (p/n 60600125) shipped with this manual.

Setting the Fixture Voltage

The EC-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.

EC-1 has a selectable input voltage that allows you to choose 100V, 120V, 230V, or 277V at 50 or 60 Hertz. The voltage range for each setting is ± 10 percent. For example, if you have a 208 or 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. Remove the fixture's side panel by unscrewing the panel's eight 5/32" socket cap screws. Remove only the side panel nearest the fixture's LED display to gain access to the power supply board (see Figure 1-3).

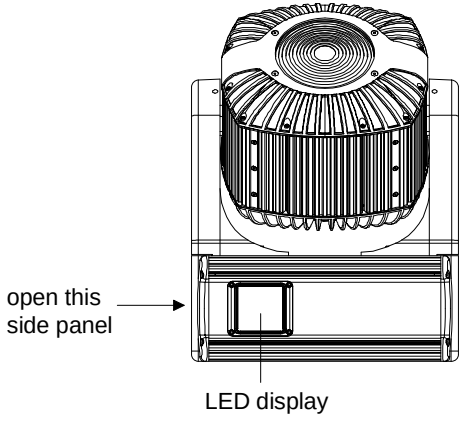


Figure 1-3. Remove the side panel closest to the display

3. Locate the power supply board tray and ballast tray inside the fixture (see Figure 1-4). These trays are connected to each other by internal wiring. Therefore, to move one tray, you must move *both* trays at the same time.

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

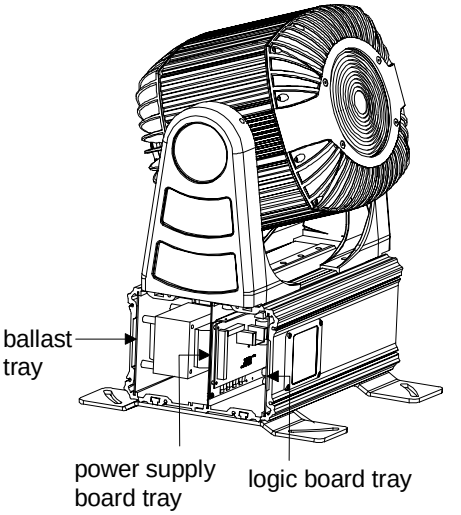


Figure 1-4. Identify internal components

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 1-5).

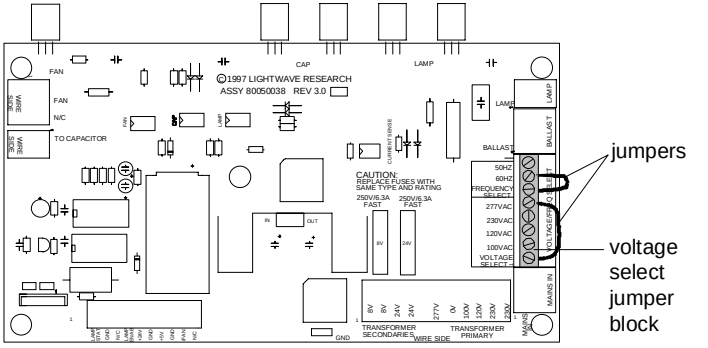


Figure 1-5. Power supply board

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 1-6).

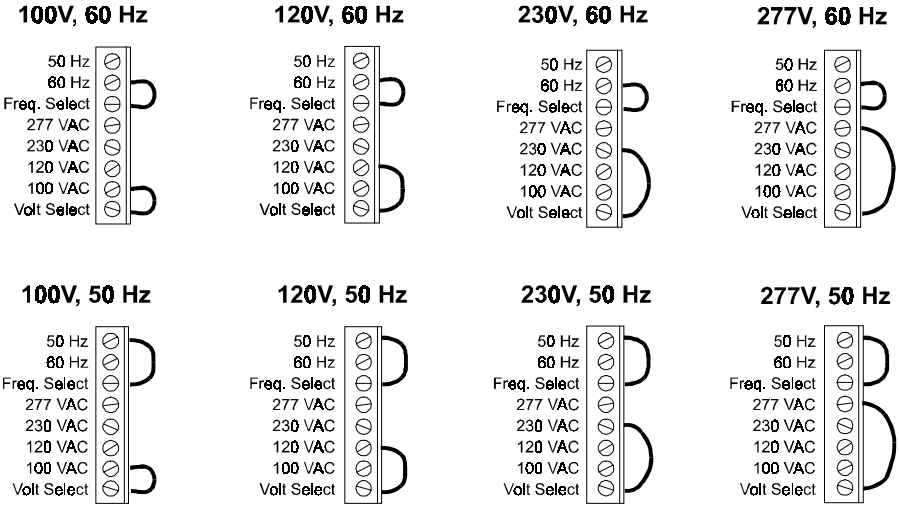


Figure 1-6. Possible voltage/frequency jumper combinations

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 and reattach the side panel with the eight socket cap screws removed in Step 2 above. *Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.*

Installing/Replacing the Lamp

You will need:

- 5/32” allen wrench
- torque wrench
- Philips® MSR 575/2 or MSD 575 watt, metal halide lamp
- protective gloves
- protective eyewear

Note: The MSR 575/2 and MSD 575 lamps have different color temperatures and characteristics. The MSR 575/2 has a color temperature of 6200 K, and the MSD 575 offers extended lamp life with a color temperature of 5600 K.

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 install/replace the lamp:

1. Electrically isolate the fixture. If the fixture has been operating, wait at least 5 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 1-7).
4. Using the 5/32” allen wrench, remove the four socket cap screws on the lamp cap (see Figure 1-7).

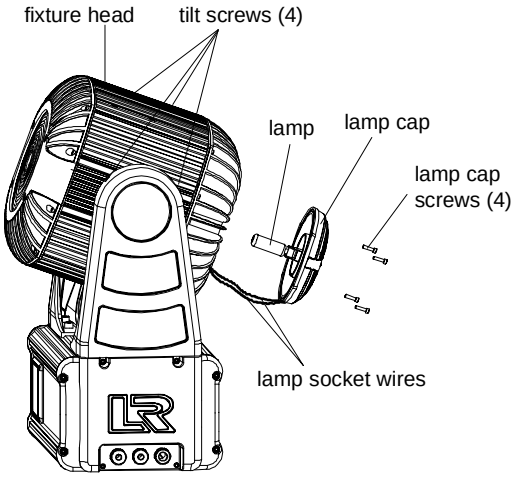


Figure 1-7. Removing the lamp cap

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

   The lamp cap is connected to the fixture by lamp socket wires (see Figure 1-7). Support the lamp cap while replacing or installing a lamp. *Do not allow the lamp socket wires to support the weight of the lamp cap.*

6. If you are replacing the lamp, hold the existing lamp by its ceramic base and carefully pull the lamp straight out of the lamp socket (see Figure 1-8).

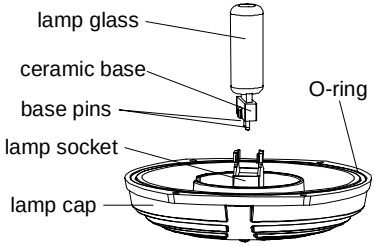


Figure 1-8. Installing a new lamp

Cautions: 1) Do not squeeze the lamp glass when removing the old lamp from the socket. Lamp glass may shatter.

2) When handling the MSR or MSD lamp, avoid contact with the lamp glass. If the lamp glass is soiled by oil or dirt from skin, gloves, etc., clean the cold lamp glass with an alcohol wipe. A soiled lamp could overheat and burst, causing damage to the fixture.

7. Remove all packaging materials from the new lamp. Holding the new lamp by its ceramic base, gently press the two base pins into the lamp socket until the lamp is firmly seated (see Figure 1-8).

   You do not need to optimize the lamp because the EC-1 fixture uses a self-aligning lamp socket.

8. Locate the O-ring in the outer groove of the lamp cap (see Figure 1-8). 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.*

9. Insert the lamp cap and attached lamp in the fixture. Make sure you do not crimp the lamp socket wires while replacing the lamp cap (see Figure 1-7).

10. 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.*

11. Reset the fixture's lamp hours to zero (see "Resetting Lamp Hours (L/RS)" on page 4-5) now. Resetting the lamp hours allows you to track the lamp life.

    Note: You may skip this step if you have just installed the first lamp in a new fixture, because the fixture's lamp hours are already set to zero.

Chapter 2
Configuring EC-1™

After setting the fixture's input voltage and installing the lamp, you must configure EC-1 for operation. This chapter explains how to obtain the necessary cabling, link the fixture to a controller, mount the fixture, connect the fixture to an appropriately-rated power source, power up the fixture, and assign each fixture a fixture number or DMX start channel.

Obtaining Data Cabling and Terminators

To link one or more fixtures to a controller, 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-6 or "Constructing Cabling" on page 2-1.

The last fixture in a link must have a 120 ohm, 1/4 watt (minimum) terminator attached to its Data Out connector. Although High End Systems does not sell terminators, instructions for constructing terminators is listed in the section titled "Constructing Terminators" on page 2-2.

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 2-1).

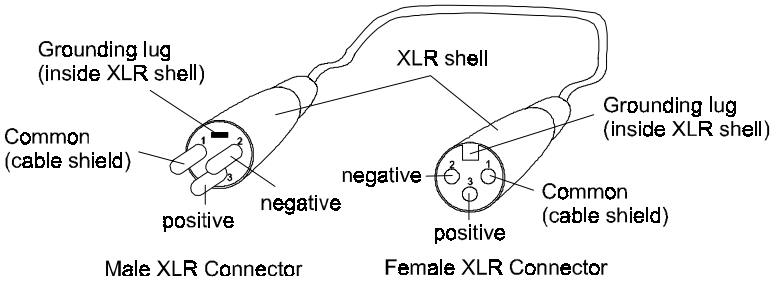


Figure 2-1. XLR 3-pin connectors

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. You can construct a terminator by following the instructions below:

1. Obtain a male 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 2-2).
4. Reassemble the XLR connector.

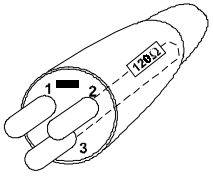


Figure 2-2. Data cable terminator

Linking the Fixture(s) to a Controller

To operate EC-1, you must link your fixture(s) to a DMX 512-compatible controller using data cabling. Because EC-1 and Studio Color fixtures use the same software, you can control EC-1 fixtures with either a controller that supports EC-1 fixtures or a controller that supports Studio Color fixtures. For more information on controllers, see "DMX 512-Compatible Controllers" on page A-1.

The number of EC-1 fixtures you can control per link depends on your controller. If your controller supports EC-1 fixtures, you can control up to 42 EC-1 fixtures per link. If your controller only supports Studio Color fixtures, you can control up to 32 EC-1 fixtures per link.

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 EC-1 fixtures on the link. If you cannot move these devices after EC-1 fixtures on the link, remember to remove or bypass these devices when you want to perform software uploads or crossloads.

You will need:

- DMX data cabling
- terminator(s)

For more information on obtaining cabling and terminators, see “Obtaining Data Cabling and Terminators” on page 2-1.

To link the fixture(s):

1. Start with the controller. Consult the documentation provided with the controller for the procedure to connect the male end of an XLR cable to the controller’s Data Out connector. Connect the female end of the XLR cable that is connected to the controller to the first fixture’s Data In connector.
2. Connect the male end of a new XLR cable to the first fixture’s Data Out connector and the female end to the next fixture’s Data In connector.
3. Continue using this method to connect all of the EC-1 fixtures on the link (see Figure 2-3).

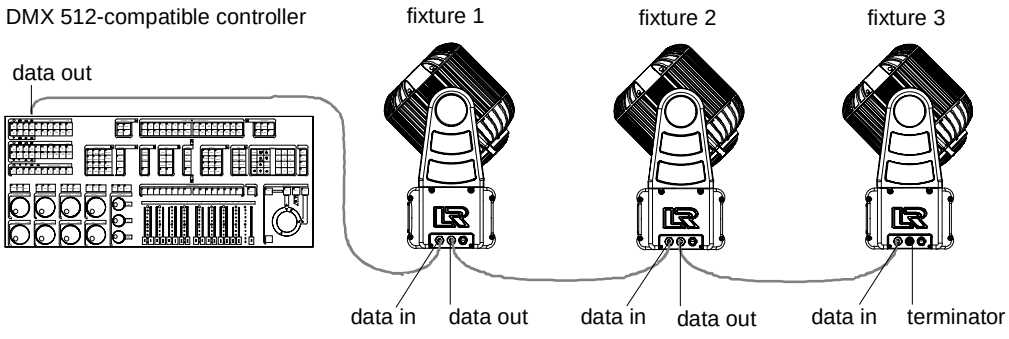


Figure 2-3. Linking the fixtures

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

If you choose, you can fit user-supplied conduit for the data and power cords directly to the connectors via the 1/2" NPT cable connectors installed on the side panel. For more information, see the "*EC-1 Installation Guide*" (p/n 60600125) shipped with this manual.

Mounting the Fixture

Before you mount EC-1, you must have already prepared a foundation for each fixture by following the instructions in the attached "*EC-1 Mounting Instructions*."

EC-1 can be mounted in any orientation on a foundation built on the wall, ceiling, or ground. EC-1 comes with four T-bars installed in the bottom panel (see Figure 2-4). 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.

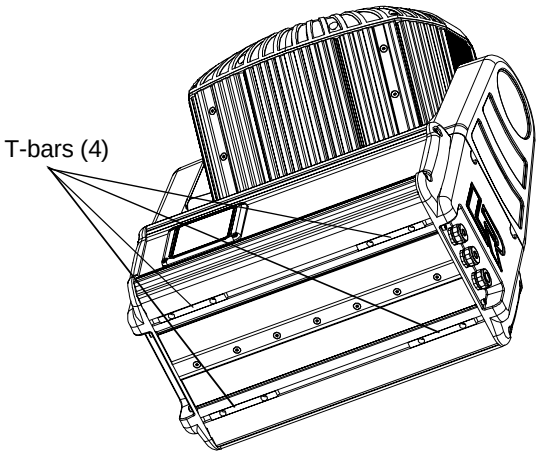
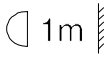


Figure 2-4. T-bars on bottom panel

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 EC-1 fixture weight is listed in "Physical Specifications" on page Intro-4.

Attaching the Mounting Feet

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

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

- 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 2-4).
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 2-5).

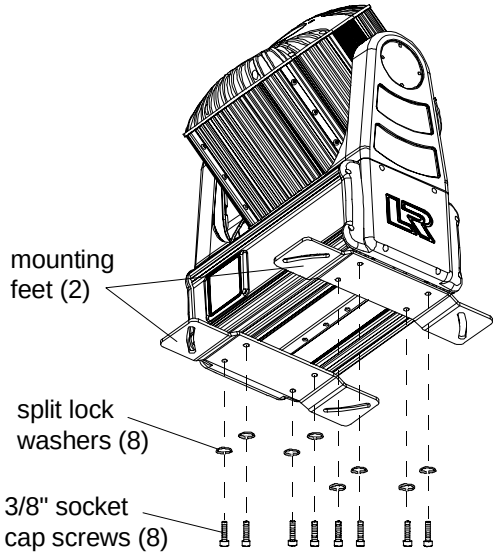


Figure 2-5. Install the feet

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 2-5).

Securing the Fixture to the Prepared Foundation

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

- four 3/8” NC stainless steel or plated carbon steel hex nuts rated SAE grade 5 or higher
- four 3/8” extra large fender washers

1. Mount the slots of the mounting feet over the studs in the foundation you constructed using “*EC-1 Mounting Instructions*.” The mounting feet slots provide 17° of pan. Position EC-1 at the desired pan angle.

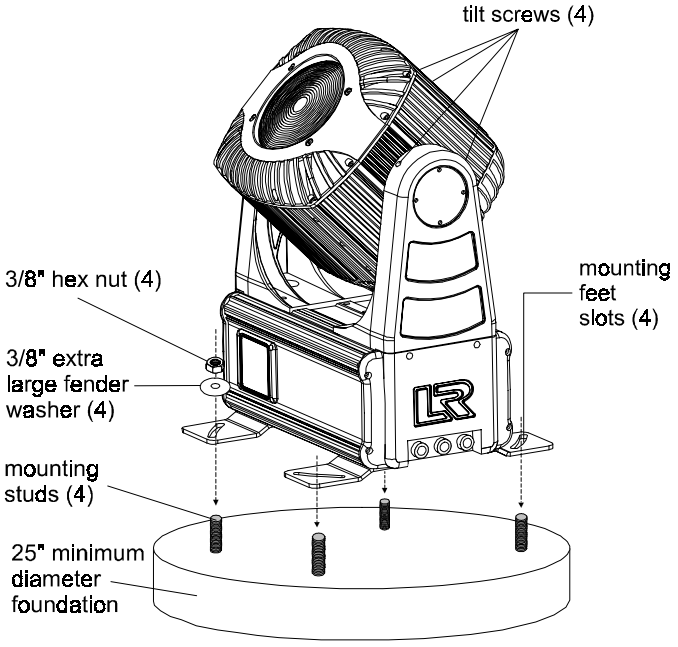


Figure 2-6. Securing EC-1 on the prepared foundation

2. When the EC-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 2-6).
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 2-6).

Branch Mains Power Connections

Warning: Class 1 equipment: This equipment must be earthed.

EC-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 EC-1 to a standard electrical outlet (for temporary installations). If you choose to fit user-supplied conduit for the data and power cords directly to the connectors, see the "*EC-1 Installation Guide*" (p/n 60600125) shipped with this manual.

Note: If you choose to install a power cord cap, the type of cap you need depends on the location and country in which the EC-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

EC-1 does not have a power switch. To power up (or switch ON) the fixture, simply connect it into an appropriately-rated power source (see “Branch Mains Power Connections” on page 2-7). You can also remotely power up or shutdown the fixture via controller commands (see “Control” on page 3-4). 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 EC-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. EC-1 also homes when you power up the fixture via your DMX controller (see “Remote Power Up (Homing and Lamp Restrike)” on page 3-5.) To manually home EC-1 via the fixture menu system, see “Homing the Fixture (HOME)” on page 4-10.

Assigning a Fixture Number or DMX Start Channel

To operate EC-1, you must first assign either a fixture number or DMX start channel to each fixture. The fixture number/DMX start channel identifies each fixture’s unique channel range on the DMX 512 link.

If your controller supports EC-1 fixtures, each fixture will reserve 12 channels in its channel range, and you may choose to assign each fixture either a fixture number (a unique number between 1 and 42) or a DMX start channel. However, because different types of devices use different channel ranges, assigning a DMX start channel (rather than a fixture number) helps you to keep track of the channel range used by each device in the link and prevent overlapping channel ranges. For more information on DMX channel ranges, see “DMX 512 Protocol” on page A-1.

If your controller only supports Studio Color fixtures, each fixture will reserve 16 channels in its channel range, and you must assign each fixture a DMX start channel. For sample DMX start channels, see “DMX Start Channels” on page A-2.

To assign a fixture number/DMX start channel, follow the procedure in the section titled “Setting the Fixture Number or DMX Start Channel (CHNL)” on page 4-14 now.

Chapter 3
Operating EC-1™

Once you have linked your fixture to a DMX 512-compatible controller, connected your fixture to a power source, and assigned a fixture number/DMX start channel, you are ready to begin operating your fixture.

Fixture Constructs

When you program your fixtures via a DMX controller, you are assigning a DMX value to the fixture's constructs. EC-1 has 12 constructs which are listed in Table 3-1 and defined in greater detail in this chapter. For a listing of the fixture's construct parameters, see Table A-2 on page A-4.

Note: If you control EC-1 with the Studio Color LCD controller, the fixture's constructs are accessed by individual buttons and their values do not exactly correspond with the DMX values listed in this chapter. See the documentation provided with your Studio Color LCD controller for more information.

Table 3-1. Fixture Constructs

Construct	Channel Assignment (controller for EC-1)	Channel Assignment (controller for STC)*
Color Functions	channel 1	channel 5
Color Wheel	channel 2	channel 6
Cyan Mixing Wheel	channel 3	channel 7
Magenta Mixing Wheel	channel 4	channel 8
Yellow Mixing Wheel	channel 5	channel 9
Effects Wheel 1 (wide)	channel 6	channel 10
Effects Wheel 2 (frost)	channel 7	channel 11
Shutter	channel 8	channel 12
Dim (iris)	channel 9	channel 13
MSpeed	channel 10	channel 14
Control (remote shut-down or lamp restrike)	channel 11	channel 15
Checksum	channel 12	channel 16

*Note: If your controller only supports Studio Color fixtures, each fixture will reserve 16 channels instead of 12. However, channels 1-4, which control pan and tilt motion on Studio Color fixtures, are ignored by EC-1.

Color Functions

EC-1 has six color functions which use the color wheel (with five dichroic color filters) and the three subtractive color mixing wheels. You can assign a single color function or combine two or more color functions for additional flexibility. The color functions are described in more detail below. See Table A-2 on page A-4 for a listing of the possible combinations of color functions and their corresponding DMX controller values.

Default

The default function allows the color wheel to rotate under direct control of the DMX controller. Using the default color function, the color wheel can crossfade in either direction allowing for varying degrees of color and partial colors, but the wheel cannot take the quickest path. For example, if you are currently on Open (color wheel position 1), and you want Aqua (color wheel position 6) next, the wheel must spin forward through five color filters to get there.

F1 - Double Rotate

Function 1 enables the three subtractive color mixing wheels to make two complete rotations. This allows movement over the edges of the wheel for special effects (saturated color and open for partial colors). The ability to make two complete rotations allows the wheel to take the quickest path. For example, if you are currently on the least saturated side of the color mixing wheel, and the color you want next is located on the most saturated side, the wheel can spin past the open section of the wheel to the most saturated side.

F2 - MSpeed

Function 2 allows the motors (including the dim (iris) motor, color wheel motor, the three subtractive color mixing wheel motors, and the two effects wheel motors) to use MSpeed to determine the time it takes to move from one position to another. Using this function, the changes in position occur smoothly in the specified MSpeed time. If you do not enable this function, your DMX controller will control the motor speed by crossfading the motor positions. For more information on MSpeed, see “MSpeed (Motor Speed)” on page 3-4.

F3 - Forward Spin / Synchronized Sequences

Using Function 3 at lower DMX controller values allows the color wheel to spin forward; at higher DMX controller values, it allows the three subtractive color mixing wheels to perform synchronized color mix sequences. When you operate multiple EC-1 fixtures in synchronized color mix sequences, all fixtures will change to the same color at the same time.

F4 - Reverse Spin / Random Cycling

Using Function 4 at lower DMX controller values allows the color wheel to spin in reverse; at higher DMX controller values, it allows the three subtractive color mixing wheels to perform random color mix cycling. When you operate multiple EC-1 fixtures in random color mix cycling, all fixtures will change to different colors at different times.

F5 - Color Lock and Quickest Path

Function 5 allows the color wheel to snap on whole colors. It also rotates the wheel in the quickest path to reach the color you specify. For example, if you are on Open (color wheel position 1), and you want Aqua (color wheel position 6) next, this function allows the color wheel to spin back one position to color 6.

Color Wheel

The color function(s) you choose affects the parameters available on the color wheel. For example, if you choose color Function 3, your color wheel parameters will differ from the parameters available in color Function 5. See Table A-2 on page A-4 for a listing of the color wheel parameters available with each color function.

You can also order custom color filters from your High End Systems dealer/ distributor (see “Getting Help” on page Intro-3).

The color wheel is shipped with the following dichroic filters (see Figure 3-1):

- position 1 - White (open)
- position 2 - full CTO
- position 3 - Pink
- position 4 - Magenta
- position 5 - Red
- position 6 - Aqua

Position 2 on the color wheel contains a CTO filter which corrects color temperature to 3100 K with the MSR 575/2 lamp or 2800 K with the MSD 575 lamp.

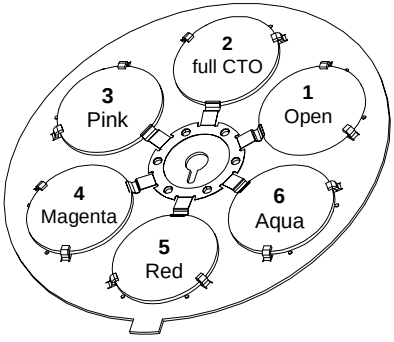


Figure 3-1. Color wheel

Cyan, Magenta, and Yellow Color Mixing System

EC-1 uses three (cyan, magenta, and yellow) subtractive color mixing wheels with gradient patterns to allow for different levels of saturation. See Appendix C for a list of common gel colors and their corresponding color mixing values.

Effects Wheel 1 and 2 - Beam Shaping

EC-1 has a standard beam angle of 8° to 22° which may be further shaped using the two effect wheels. Effects wheel 1 includes a variable wide angle lens for narrow-horizontal to wide-vertical beam shaping. Effects wheel 2 includes a variable frost lens for narrow-vertical to wide-horizontal beam shaping.

Shutter

The mechanical shutter in EC-1 can be used to produce strobe-like effects, including 120 random and 120 continuously variable strobe effects, and instantaneous blackout.

Dim

EC-1 uses a dimming iris which allows full dimming capability without changing the color temperature. The dim values range from 0 (closed) to 255 (full open).

MSpeed (Motor Speed)

MSpeed is the time required for a motor to complete movement when changing from one position to another. MSpeed provides a means for all motors to reach their target position at the same time, even though they may have different distances to move. You can set an MSpeed time for the following:

- Dim
- Color wheel
- Cyan color mixing wheel
- Magenta color mixing wheel
- Yellow color mixing wheel
- Effects wheel 1
- Effects wheel 2

For an MSpeed conversion chart showing MSpeed time in seconds and the corresponding DMX controller values, see “Appendix B MSpeed Times” on page B-1.

Control

Using the control construct, you can remotely shutdown and restart the fixture. The shutter must be closed to access the control construct. You must hold the control value static for at least 0.5 seconds before the fixture will accept information from the control construct.

Remote Shutdown

You can shut down EC-1 with a command from your DMX controller. When you shut down (or lock) a fixture, the fixture's shutter and iris close, and the motors and lamp turn OFF.

To shut down EC-1 using a DMX controller:

1. For the specified fixture(s), set the shutter value (controller that supports EC-1 fixtures = channel 8; controller that only supports Studio Color fixtures = channel 12) to 0. This will unlock the control value.
2. For the specified fixture(s), set the control value (controller that supports EC-1 fixtures = channel 11; controller that only supports Studio Color fixtures = channel 15) to 128 for numeric controllers or 50% for fader-type controllers). When the value is sent for at least 0.5 seconds, the fixture(s) will shut down.

Remote Power Up (Homing and Lamp Restrike)

You can power up EC-1 with a command from your DMX controller. When you power up (or unlock) a fixture, the lamp restrikes, all motors switch ON, and the fixture homes.

To power up EC-1 using a DMX controller:

1. For the specified fixture(s), set the shutter value (controller that supports EC-1 fixtures = channel 8; controller that only supports Studio Color fixtures = channel 12) to 0. This will unlock the control value.
2. For the specified fixture(s), set the control value (controller that supports EC-1 fixtures = channel 11; controller that only supports Studio Color fixtures = channel 15) to 64 for a numeric controller or 25% for a fader-type controller). When the value is sent for at least 0.5 seconds, the fixture(s) will restrike and home.

Checksum

This channel is reserved for future use.

Updating EC-1™ Software

Updating EC-1 software is fast and easy. The latest version of EC-1 software is provided on the High End Systems Web site, and is also available through High End Systems customer service (see “Getting Help” on page Intro-3).

Uploading Software to EC-1™

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

1. Attach a Studio Color Upload Dongle from your computer to an EC-1 fixture and upload the software to all EC-1 fixtures on the link.
2. Crossload software from one EC-1 fixture that contains the new software to all other EC-1 fixtures on the link.
3. Upload the new software to all EC-1 fixtures on the link using the Status Cue lighting console.

   Note: Remember that before you can 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 the RS-422 DMX standard of serial communications (such as Dataflash® AF1000 xenon strobes, Intellabeam® fixtures, and Emulator® fixtures) are located *after* the EC-1 fixtures on the link. These devices will block communication with any other EC-1 fixtures on the link.

Regardless of the method you chose to upload software, if you receive an error during the upload, see “Upload and Crossload Troubleshooting” on page 6-7.

Attaching an Upload Dongle

To use an Upload Dongle (p/n 99190009), you will need a 386-based (or faster) PC, MS DOS® version 3.3 (or later), and one MB of free disk space. To obtain an Upload Dongle (with instructions), contact your High End Systems dealer/distributor (see “Getting Help” on page Intro-3).

Crossloading Software

If you have an EC-1 fixture with newer software, you can crossload software between EC-1 fixtures on the link by accessing the fixture’s menu system. The crossloading procedure is explained in the section titled “Crossloading Fixture Software (XLD)” on page 4-13.

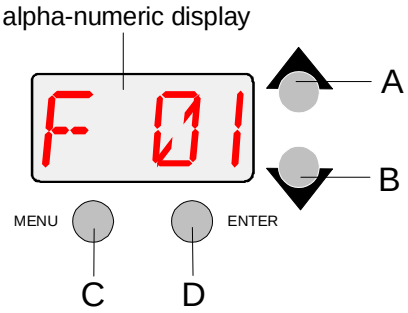
Uploading Software from Status Cue®

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

Chapter 4
Understanding the Menu System

Using the EC-1 menu system, you can view fixture information such as lamp hours, lamp strikes, total fixture hours, current internal temperature, and DMX data. The menu system also allows you to perform self tests.

You navigate through the menu system using the display navigation buttons (see Figure 4-1) on the display panel. As you navigate the menu system, the alpha-numeric display will show the menu items you select from the menu map (see Figure 4-3 on page 4-2).



A - <Up> arrow button scrolls upward through menu items or options.

B - <Down> arrow button scrolls downward through menu items or options.

C - <Menu> button backs out of the current menu to the previous menu level

D - <Enter> button selects the current menu item or option.

Figure 4-1. Explanation of display navigation buttons

Note: 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). If you do not press the <Enter> button, the new option you selected will not be stored. The <Menu> key moves you back to the previous option or menu without changing an option.

To access the display panel, remove the four 5/32” socket cap screws and the protective plastic covering over the display (see Figure 4-2).

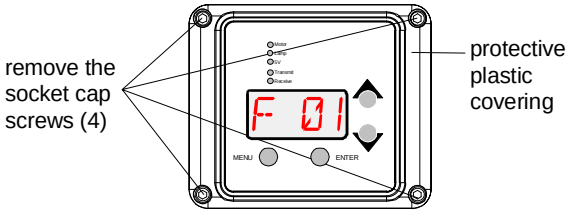


Figure 4-2. Remove the LED display covering

Menu Map

A complete map of the menu system for EC-1 is shown in Figure 4-3. See individual sections below for descriptions of each menu item.

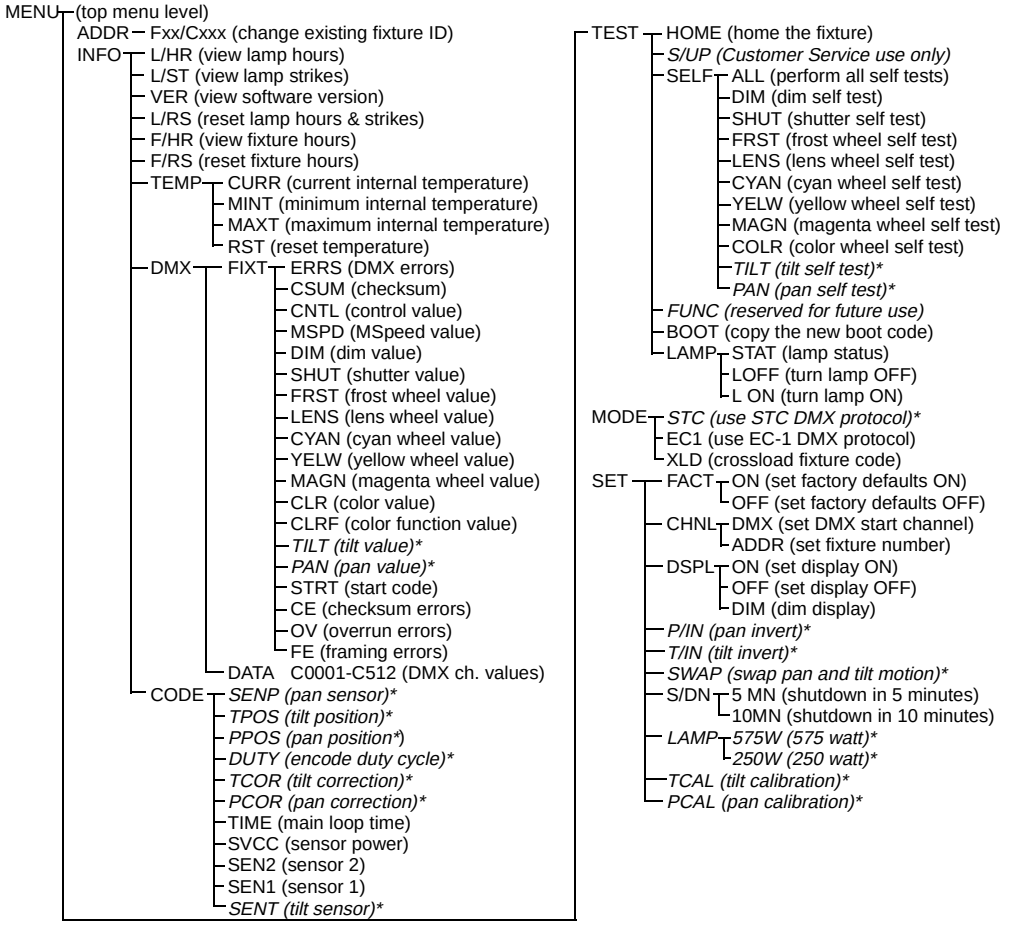


Figure 4-3. Menu map

*Note: EC-1 uses the same menu system found in Studio Color fixtures, which have pan and tilt movement. Because EC-1 does *not* have pan or tilt motion, these menu items have no functionality.

Menu

EC-1 is protected against inadvertent menu changes by requiring the <Menu> button to be held for a few seconds before allowing entry to the menu system.

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, the fixture name, and the fixture number/DMX start channel.

Note: You may see the words "AUTO" and "LOCK" in the display after "MENU" disappears. As mentioned above, the fixture's protective software is "locking" the display after you have accessed the menu system.

Address Menu (ADDR)

Use the Address menu to quickly change the current fixture number/DMX start channel. Using this menu option, you can only change the *existing* fixture number to *another* fixture number, or the *existing* DMX start channel to *another* DMX start channel. If you want to change the way you identify the fixture (i.e. a fixture number *instead of* a DMX start channel, or vice versa), complete the procedure described in "Setting the Fixture Number or DMX Start Channel (CHNL)" on page 4-14.

To change the current fixture number or DMX start channel:

1. Press and hold the <Menu> button until "ADDR" appears on the LED display.
2. Press the <Enter> button to select the "ADDR" menu.

or

3. Use the <Up> and <Down> arrow buttons to select a new fixture number (F 01 to F 42) / DMX start channel (C001 - C512). The LED display will flash when a new option is selected.
4. Press the <Enter> button to accept the new fixture number / DMX start channel. The LED display will stop flashing when a new option is entered. If you do not press the <Enter> button, the new option you selected will not be stored.

Note: Be sure you do not overlap fixture channel ranges when changing the fixture number/DMX start channel (see "DMX 512 Protocol" on page A-1.)

Information Menu (INFO)

The information menu allows you to view current fixture information such as the lamp hours, lamp strikes, software version, total fixture hours, internal temperature, DMX errors, and individual function values. You can also reset lamp hours, fixture hours, and temperature readings. The procedures below are listed in the order they are appear on the Menu Map (see Figure 3-3 on page 3-2).

Viewing Lamp Hours (L/HR)

To view the number of hours the current lamp has been ON:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “L/HR” option. (This will be the first option displayed.)

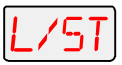
4. Press the <Enter> button to select the “L/HR” option. The LED will display the number of lamp hours.

Viewing Lamp Strikes (L/ST)

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

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.



3. Using the <Up> and <Down> arrow buttons, scroll to the “L/ST” option and press the <Enter> button to select the “L/ST” option. The LED will display the number of lamp strikes.

Note: Lamp strikes are automatically reset when the lamp hours are reset (see “Resetting Lamp Hours (L/RS)” on page 3-5).

Viewing Software Version (VER)

To view the fixture's current software version:

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "VER" option and press the <Enter> button to select the "VER" option. The LED will display the fixture's current software version.

Resetting Lamp Hours (L/RS)

To reset the lamp hours (and lamp strikes):

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "L/RS" option and press *and hold* the <Enter> button to select the "L/RS" option. The LED will display "0000" when the lamp hours are reset.

Viewing Fixture Hours (F/HR)

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

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "F/HR" option and press the <Enter> button to select the "F/HR" option. The LED will display the number of hours the fixture has been ON.

Note: Think of this option as a mileage counter on an automobile. This option is helpful in determining the number of hours a fixture has been in use over a certain period of time. After viewing the fixture hours, you can reset the fixture hours (see "Resetting Fixture Hours (F/RS)" below).

Resetting Fixture Hours (F/RS)

To reset the number of hours the fixture has been ON:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “F/RS” option and press *and hold* the <Enter> button to select the “F/RS” option. The LED will display “0000” when the lamp hours are reset.

Viewing the Current Internal Temperature (CURR)

To view the fixture’s current internal temperature:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “TEMP” menu and press the <Enter> button to select the “TEMP” menu.

4. Using the <Up> and <Down> arrow buttons, scroll to the “CURR” option and press the <Enter> button to select the “CURR” option. The LED will display the fixture’s current internal temperature followed by “xxxC” (degrees centigrade).

Viewing the Minimum Internal Temperature (MINT)

To view the fixture’s minimum internal temperature:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “TEMP” menu and press the <Enter> button to select the “TEMP” menu.

4. Using the <Up> and <Down> arrow buttons, scroll to the “MINT” option and press the <Enter> button to select the “MINT” option. The LED will display the fixture’s minimum internal temperature followed by “xxxC” (degrees centigrade).

Note: This option is helpful to service personnel in determining the minimum internal temperature a fixture has experienced over a certain period of time. After viewing the fixture's minimum internal temperature, you can reset this option (see "Resetting the Internal Temperature Readings (RST)" on page 3-7).

Viewing the Maximum Internal Temperature (MAXT)

To view the fixture's maximum internal temperature:

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

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

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

4. Using the <Up> and <Down> arrow buttons, scroll to the "MAXT" option and press the <Enter> button to select the "MAXT" option. The LED will display the fixture's maximum internal temperature followed by "xxxC" (degrees centigrade).

Note: This option is helpful to service personnel in determining the maximum internal temperature a fixture has experienced over a certain period of time. After viewing the fixture's maximum internal temperature, you can reset this option (see "Resetting the Internal Temperature Readings (RST)" below).

Resetting the Internal Temperature Readings (RST)

To reset the internal temperature readings:

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

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

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

4. Using the <Up> and <Down> arrow buttons, scroll to the "RST" option and press *and hold* the <Enter> button to select the "RST" option. The LED will display "000C" when the internal temperature readings are reset.

Viewing DMX Errors and Function Values (FIXT)

This menu feature is provided as a troubleshooting menu for qualified personnel to view the following:

- ERRS - DMX errors
- CSUM - checksum channel
- CNTL - control channel
- MSPD - MSpeed
- DIM - dim
- SHUT - shutter
- FRST - effects wheel 1 position
- LENS - effects wheel 2 position
- CYAN - cyan wheel position
- YELW - yellow wheel position
- MAGN - magenta wheel position
- CLR - fixed color wheel position
- CLRF - color function
- TILT - tilt position*
- PAN - pan position*
- STRT - start code
- CE - checksum errors
- OV - overrun errors
- FE - framing errors

**menu items not applicable for EC-1*

To view any of the DMX errors and function values listed above:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “DMX” menu and press the <Enter> button to select the “DMX” menu.

4. Using the <Up> and <Down> arrow buttons, scroll to the “FIXT” menu and press the <Enter> button to select the “FIXT” menu.

5. Using the <Up> and <Down> arrow buttons, scroll to the desired option (listed above) and press the <Enter> button to select the desired option. The LED will display the option’s DMX value.

Viewing DMX Data by Channel Number (DATA)

This menu feature allows you to use an EC-1 fixture to view DMX values for any device on the link. You may access this menu item from any EC-1 fixture to determine if all devices are receiving the correct data from your controller. When your controller sends out DMX data, all of the devices on the link receive all 512 channels of information. Each device, however, only "uses" the channels reserved for that fixture (set by the fixture's identifying fixture number or DMX start channel that you assigned). Use this procedure to test devices that do not have built-in DMX diagnostics or are inconvenient to physically monitor directly.

For a listing of DMX construct values by channel, see Table A-2 on page A-4.

To view DMX data by channel number:

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

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

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

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

5. Using the <Up> and <Down> arrow buttons, scroll to the desired channel and press the <Enter> button to select the desired channel. The LED will display the channel's DMX value.

Viewing Supplemental Fixture Data (CODE)

This menu feature is provided as a troubleshooting menu for qualified personnel to view the following:

- SENP - checks for pan homing tab on the sensor (homed)*
- TPOS - checks the tilt position from the encoder*
- PPOS - checks the pan position from the encoder*
- DUTY - encoder duty cycle and phase angle*
- TCOR - number of tilt corrections*
- PCOR - number of pan corrections*
- TIME - additional internal timer for the main loop
- SVCC - checks sensor power on all sensors
- SEN2 - checks for effects wheel 2 homing tab on the sensor (homed)
- SEN1 - checks for effects wheel 1 homing tab on the sensor (homed)
- SENT - checks for tilt homing tab on the sensor (homed)*

**menu items not applicable for EC-1*

To view any of the supplemental fixture data listed above:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “INFO” menu and press the <Enter> button to select the “INFO” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “CODE” menu and press the <Enter> button to select the “CODE” menu.

4. Using the <Up> and <Down> arrow buttons, scroll to the desired option (listed above press the <Enter> button to select the desired option. The LED will display the option’s value.

Test Menu

The test menu allows you to manually home the fixture, perform fixture self tests, and store new boot code information. If you are experiencing problems that you suspect are mechanical, you can perform the self tests to determine where the problem originates. The procedures below are listed in the order they appear on the Menu Map (see Figure 3-3 on page 3-2).

Note: The fixture must be connected to a controller and the controller must be ON for the fixture to strike the lamp. If you attempt to run any of the self tests (SELF) when the lamp is OFF, the LED display will show “STRK” to indicate that the lamp is not struck, and you will not be able to see the effects of the self tests.

Homing the Fixture (HOME)

To home the fixture:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “TEST” menu and press the <Enter> button to select the “TEST” menu.

3. Using the <Up> and <Down> arrow buttons, scroll to the “HOME” option. (This will be the first option displayed.)

4. Press the <Enter> button to select the “HOME” option. The LED will alternately display “RST” and “HOME” while the fixture homes.

Assigning the Fixture to Setup (S/UP)

The setup position is used only by service personnel.

Performing Self Tests (SELF)

This menu feature performs self tests for the following:

- ALL - performs each self test listed below twice
- DIM - moves the dimming iris position from closed to full open
- SHUT - performs all strobe functions
- FRST - rotates effects wheel 2 from 0 to 255 and back
- LENS - rotates effects wheel 1 through all four positions
- CYAN - rotates the cyan wheel from 0 to 255 and back
- YELW - rotates the yellow wheel from 0 to 255 and back
- MAGN - rotates the magenta wheel from 0 to 255 and back
- COLR - rotates the color wheel from position 1 to 6
- TILT - moves the tilt motor from 0° to 370°*
- PAN - moves the pan motor from 0° to 370°*

**menu items not applicable for EC-1*

To perform any self test listed above:

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

2. Using the <Up> and <Down> arrow buttons, scroll to the “TEST” menu and press the <Enter> button to select the “TEST” menu.
3. Using the <Up> and <Down> arrow buttons, scroll to the desired option.
4. Press the <Enter> button to select the desired option. The fixture will perform the selected self test.
5. Press the <Menu> button to exit the test.

Note: The self tests will run in a loop until you press the <Menu> button to exit.

Changing Functions (FUNC)

The function modes are reserved for future use.

Changing Boot Codes (BOOT)

When you upload new software to EC-1, occasionally it is necessary to perform this test to accept and store the new boot code. This is apparent when the LED displays a "BOOT DIFF" error. *Do not remove power from the fixture while performing a boot copy.*

To accept and store the new boot code:

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "BOOT" option and press the <Enter> button to select the "BOOT" option. The fixture will store the new boot code.

Mode Menu

The mode menu allows you to set your fixture's operating mode to EC-1 and to crossload software from one fixture to all other EC-1s on the link. The procedures below are listed in the order they are appear on the Menu Map (see Figure 3-3 on page 3-2).

Setting the Operating Mode (MODE)

EC-1 is shipped factory set to the EC-1 operating mode. Because EC-1 fixtures and Studio Color fixtures use the same software, there is a menu option to choose between EC-1 fixtures (EC-1) or Studio Color fixtures (STC). You must always operate your EC-1 fixture in EC-1 operating mode. If the operating mode is inadvertently changed to "STC," use this menu item to change your fixture's operating mode to EC-1.

To change the fixture's operating mode:

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "EC1" option.

4. Press the <Enter> button to select the "EC-1" option.

Crossloading Fixture Software (XLD)

To crossload software from one fixture to all other EC-1s on the link:

1. Disconnect or bypass any controllers, serial data distributors, data line optoisolators, and any fixtures using the RS-422 DMX standard of serial communications (such as Dataflash® AF1000 xenon strobes, Intellabeam® fixtures, and Emulator® fixtures). These devices will block communication between your crossloading fixture and any other EC-1 fixtures on the link.

2. On the crossloading fixture *only*, press and hold the <Menu> button until "ADDR" appears on the LED display.

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

4. Using the <Up> and <Down> arrow buttons, scroll to the "XLD" option and press the <Enter> button to select the "XLD" option. The fixture will upload its software to all other EC-1 fixtures on the link. (The LED on all other EC-1 fixtures will display "UPLD" as they are receiving the software upload.)

Note: After each fixture receives the software upload, the fixture will reset and home. If the fixture takes longer than one minute to reset, disconnect then reconnect power to the fixture and repeat the crossload.

Set Menu

The set menu allows you to change the fixture number to a DMX start channel or vice versa, and either turn all factory presets ON or change the factory presets individually. The procedures below are listed in the order they appear on the Menu Map (see Figure 3-3 on page 3-2).

Setting Factory Presets ON (FACT)

When you set this menu item ON, all factory presets return to their default settings. EC-1 is shipped from the factory with the following presets set to the following defaults:

- Pan/Tilt swap = OFF
- Pan invert = OFF
- Tilt invert = OFF
- Shutdown time = 5 minutes
- Operating mode = EC-1
- LED display = ON

Note: If you change any of the presets listed above by accessing their individual menu items, this menu item will automatically be turned OFF.

To return all factory presets to their default settings or turn the factory presets OFF:

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the “FACT” option. (This will be the first option displayed.) Press the <Enter> button to select the “FACT” option.

4. Using the <Up> and <Down> arrow buttons, choose either the “ON” or “OFF” option and press the <Enter> button to select the desired option.

Setting the Fixture Number or DMX Start Channel (CHNL)

Use this menu item if your fixture is currently set to a fixture number and instead you want to identify the fixture using a DMX start channel, or vice versa. To simply change an existing fixture number to a different fixture number (or DMX start channel to a different DMX start channel) see “Address Menu (ADDR)” on page 4-3.

To set a fixture number or DMX start channel:

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

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

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

or

4. Using the <Up> and <Down> arrow buttons, choose either the “DMX” or “ADDR” option and press the <Enter> button to select the desired option. Choosing “DMX” allows you to assign a DMX start channel (C001-C512); “ADDR” allows you to assign a fixture number (F 01 - F 42).

Note: Be sure you do not overlap fixture channel ranges when setting the fixture number/DMX start channel (see “DMX 512 Protocol” on page A-1.)

Changing the Display Output (DSPL)

Use this menu item to change the appearance of the fixture's alpha-numeric display. You can choose to turn the display ON, OFF, or dim the display to reduce visibility.

To change the display output:

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "DSPL" menu and press the <Enter> button to select the "DSPL" menu.
4. Using the <Up> and <Down> arrow buttons, choose the "ON," "OFF," or "DIM" option and press the <Enter> button to select the desired option.

Inverting Pan (P/IN)

This menu item is not applicable for the EC-1 fixture.

Inverting Tilt (T/IN)

This menu item is not applicable for the EC-1 fixture.

Swapping Pan and Tilt (SWAP)

This menu item is not applicable for the EC-1 fixture.

Setting Fixture Shutdown Time (S/DN)

You can set EC-1 to shut itself OFF when the controller is turned off or the link is unplugged (no DMX data is present).

To set the shutdown time (in minutes):

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

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

3. Using the <Up> and <Down> arrow buttons, scroll to the "S/DN" menu and press the <Enter> button to select the "S/DN" menu.
4. Using the <Up> and <Down> arrow buttons, choose either the "5MN" or "10MN" option and press the <Enter> button to select the desired option.

Changing the Lamp Power (LAMP)

This menu item is not applicable for the EC-1 fixture.

Calibrating Pan (PCAL)

This menu item is not applicable for the EC-1 fixture.

Calibrating Tilt (TCAL)

This menu item is not applicable for the EC-1 fixture.

Chapter 5
General Maintenance

This chapter includes information on replacing parts, installing optional accessories, and cleaning your fixture. Please note the warnings under each heading before servicing your fixture.

Replacing Parts

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.

Warnings: 1) Disconnect power before re-lamping or servicing.

2) Replace fuses only with the specified type and rating.

Replacing the Lamp

To replace the lamp, see “Installing/Replacing the Lamp” on page 1-6.

Replacing Power Supply Fuses

You will need:

- replacement fuse(s) (see Table 5-1)
- 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 5-1.

Table 5-1. Description and function of EC-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, remove the fixture's side panel by unscrewing the eight 5/32" socket cap screws. Remove only the side panel nearest the fixture's display to gain access to the power supply PCB (see Figure 5-1).

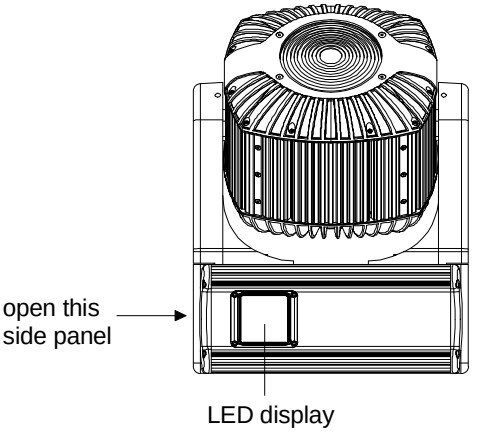


Figure 5-1. Remove the side panel nearest the LED display

4. Locate the power supply board tray and ballast tray inside the fixture (see Figure 5-2). 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 four inches.

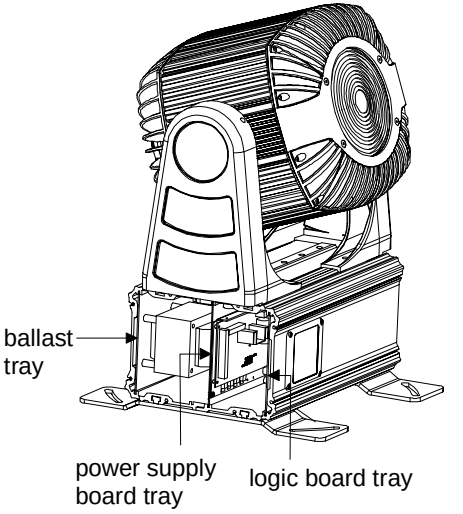


Figure 5-2. Identify internal components

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 5-3).

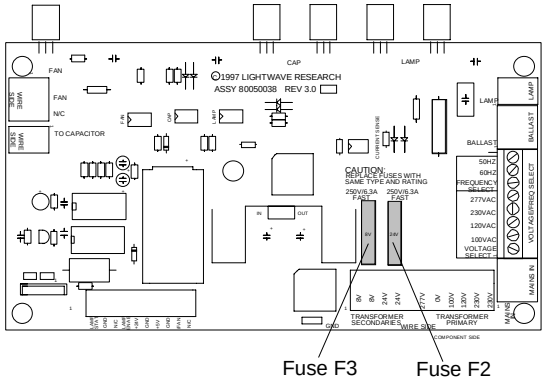


Figure 5-3. Fuses on the power supply PCB

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 and reattach the side panel with the eight socket cap screws removed in Step 3 above. *Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.*

Installing Optional Accessories

Approved optional accessories are listed in “Optional Accessories” on page Intro-6.

Cautions: 1) Install *only* accessories that are approved by High End Systems. Installing unapproved accessories may damage the fixture and void the warranty.

2) This fixture must be serviced by qualified personnel. The information listed in this section is intended to assist qualified personnel only.

3) Equipment surfaces may reach 140° C (284° F). Allow the fixture to cool before handling.

Warning: Disconnect power before servicing.

Replacing Dichroic Filters

You can replace dichroic filters if they are damaged or broken or to install a custom color. To order replacement dichroics or custom colors, see “Getting Help” on page Intro-3.

You will need:

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

To install dichroic glass filters:

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 lens plate and remove the lens plate (see Figure 5-4).

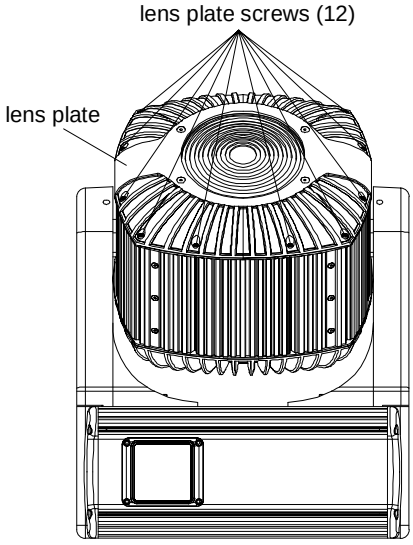


Figure 5-4. Remove the lens plate

3. Disconnect the stepper motor drive cable and slide the optical assembly (and attached H-frame) up and out of the fixture (see Figure 5-5).

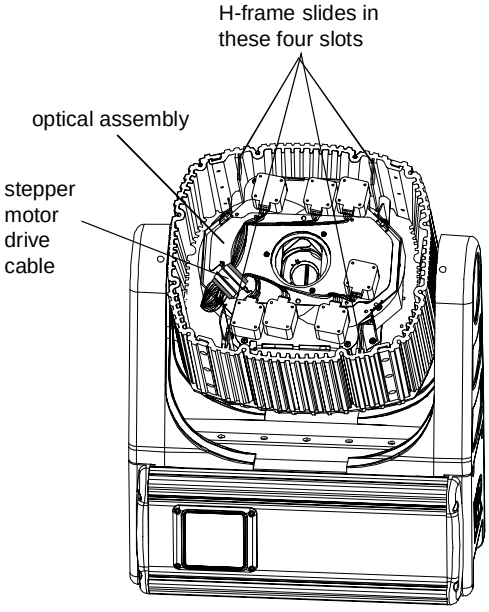


Figure 5-5. Disconnect stepper motor drive cable and remove optical assembly

4. Using a phillips-head screwdriver, remove the four screws securing the optical assembly to the H-frame (see Figure 5-6).

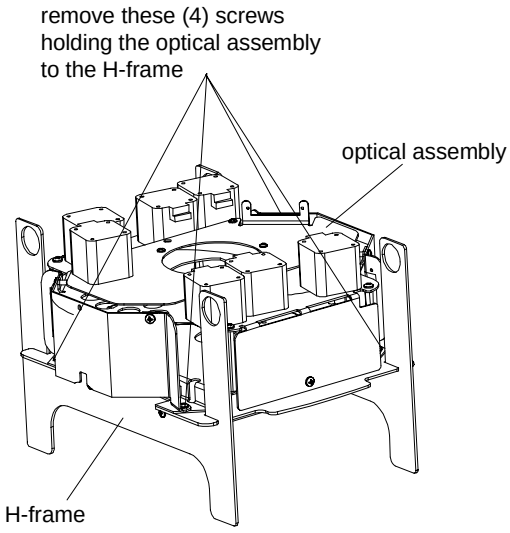


Figure 5-6. Optical assembly on H-frame

5. Turn the optical assembly over so that it is resting on the stepper motors (see Figure 5-7).

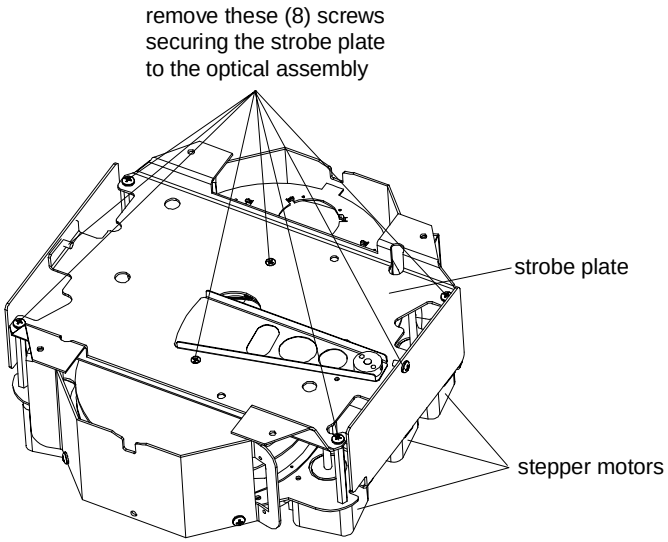


Figure 5-7. Remove the strobe plate

6. Remove the eight screws securing the strobe plate to the optical assembly (see Figure 5-7).

7. Locate the strobe motor connector (see Figure 5-8). Note the strobe motor connector's position *outside* the standoff, so that you can reattach this connector correctly in step 14.

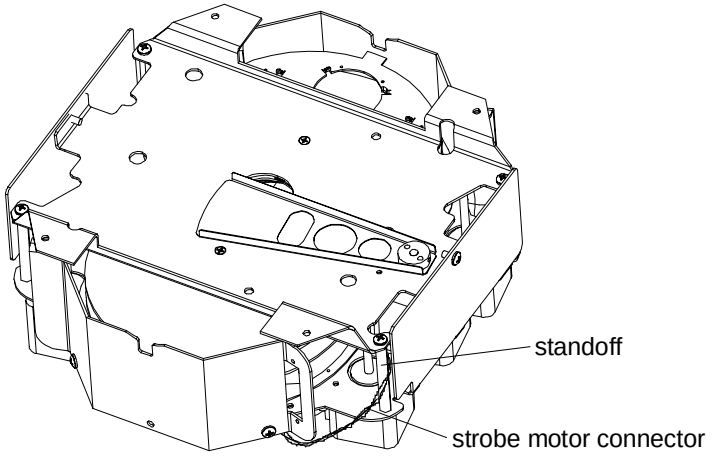


Figure 5-8. Strobe motor connector position

8. As you remove the strobe plate, carefully unplug the strobe motor connector.
9. Locate the color wheel and the dichroic you wish to replace (see Figure 5-9).

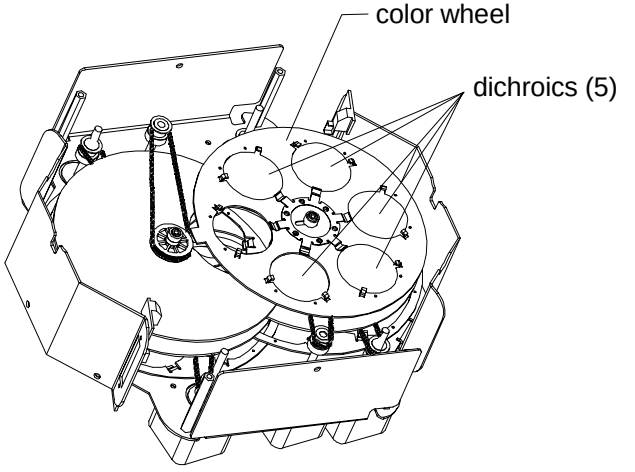


Figure 5-9. Location of the color wheel

10. To remove the dichroic from the color wheel, push the dichroic you wish to replace toward the center of the wheel (into the large retaining clip). This will free the dichroic from the two wheel tabs and provide the clearance needed to remove the dichroic (see Figure 5-10).

11. Pull the dichroic out of the large retaining clip and over the wheel tabs to free it from the wheel.

    If you intend to reuse this dichroic, put it in a safe place where it will not get scratched.

12. Orient the new dichroic so that the coated side is facing up (away from the stepper motors).

    To determine which side of the dichroic is coated, place the tip of a pen against each side of the dichroic. Look at the dichroic and pen from a slight angle. On the coated side, the tip of the pen appears to "touch" its reflection. On the uncoated side, there appears to be a gap between the pen and its reflection (see Figure 5-11).

13. Install the new dichroic in the wheel by pushing it under the large retaining clip, then pull it up so it fits under the two wheel tabs (see Figure 5-10).

14. When you have successfully installed the new dichroic, reconnect the strobe motor connector and reinstall the strobe plate removed in Step 8 above. Remember to reposition the strobe motor connector wires *outside* the standoff.

15. Replace the eight strobe plate screws removed in Step 6 above.

16. Replace the optical assembly on the H-frame and secure the four screws removed in Step 4 above.

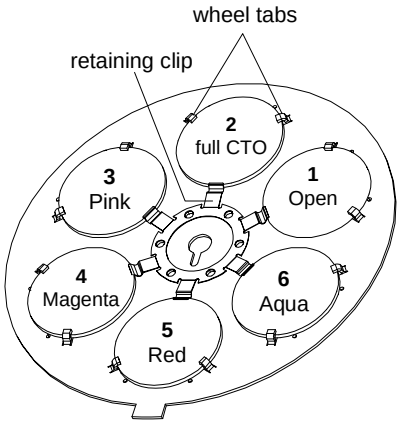


Figure 5-10. EC-1 color wheel

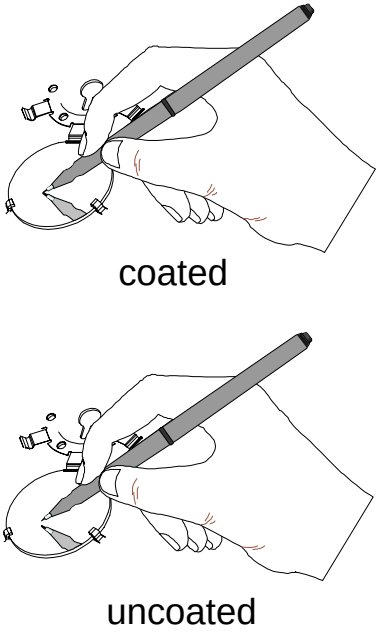


Figure 5-11. Determining the coated side of dichroic glass

5

17. Replace the optical assembly into the fixture head by sliding the H-frame into the four slots on the inside of the fixture head (see Figure 5-5).

18. Reconnect the stepper motor drive cable disconnected in Step 3 above.

19. Replace the lens plate on the fixture head and secure the 12 screws removed in Step 2 above. *Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.*

Replacing the Lens

You can replace the lens if it is damaged or broken or to install an accessory lens to achieve a different beam angle such as medium flood or extra wide flood (see “Optional Accessories” on page Intro-6).

You will need:

- 5/32” allen wrench
- torque wrench
- phillips-head screwdriver
- replacement or accessory lens

To install an accessory lens:

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

2. Unscrew the twelve 5/32” socket cap screws around the edge of the lens plate and remove the lens plate (see Figure 5-4). Locate the lens and clips on the inside of the lens plate (see Figure 5-12).

3. Using a phillips-head screwdriver, loosen but *do not remove* the six screws securing the clips to the lens. When the clips are loose, rotate the clips 90° and remove the existing lens.

   Do not remove the rubber gasket located around the lens opening (see Figure 5-12). Removing this gasket will compromise the fixture’s weather-resistant seal.

4. Install the new lens, rotate the clips back in place and tighten the six screws to secure the lens to the lens plate. Make sure the lens is secure by attempting to rotate it.

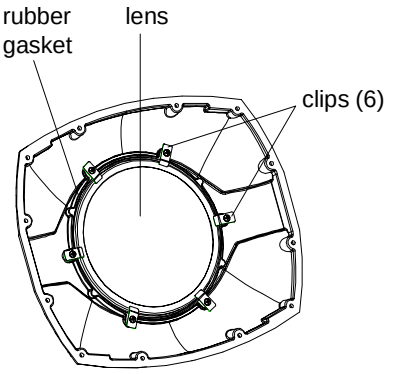


Figure 5-12. Lens plate

5. Replace the lens plate on the fixture head and replace the 12 screws removed in step 2. *Tighten the screws to a torque setting between 36 - 48 in. lb. (4 - 5 N-m) to achieve a weather-resistant seal.*

Cleaning the Fixture

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

To clean your EC-1, you will need:

- a soft, lint-free cloth
- mild glass cleaning solution
- 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 1-3 in "Replacing Dichroic Filters" on page 5-4 to remove the lens plate, disconnect the stepper motor drive cable, and remove the optical assembly.
2. After you remove the optical assembly, look inside the fixture and locate the reflector (see Figure 5-13).
3. If the reflector is not clean, gently wipe the interior of the reflector with a dry, soft, lint-free cloth.
4. Follow Steps 17-19 on page 5-8 to replace the optical assembly, reconnect the stepper motor drive cable, and reinstall the lens plate.

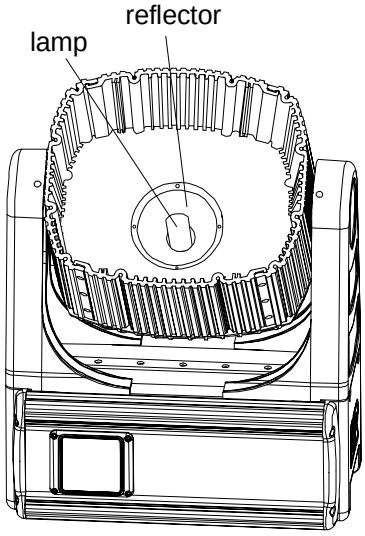


Figure 5-13. Locate the reflector

Cleaning the Exterior Surfaces

How often you clean the outer surfaces of your EC-1 depends on the environment. If your fixture is used in a dusty/rainy environment, you should clean the outside housing 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 and cause loss of light output, overheating, and/or malfunctions.

To clean the outer surfaces of EC-1:

1. Clear away any accumulations of snow, soil, grass clippings, or leaves around the heatsink area.
2. Clean the lens with a soft cloth and soapy water to remove dust and dirt. A lens 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 with a mild glass cleaning solution.

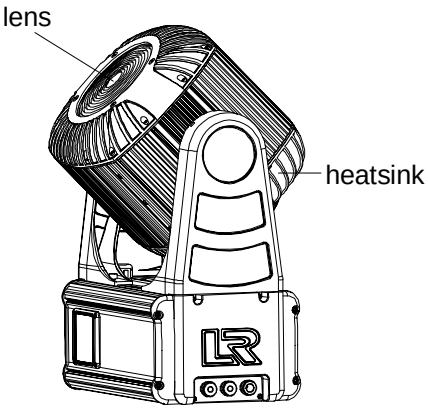


Figure 5-14. Location of the heatsink and lens

Chapter 6
Troubleshooting

This chapter lists typical symptoms and solutions for problems you might experience when using your EC-1. If you need additional help, or if the problem you are experiencing is not listed in this section, contact High End Systems customer service in one of the ways shown in the section titled "Getting Help" on page Intro-3.

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

Problems and Solutions

The EC-1 menu system provides a comprehensive listing of error messages when problems occur. Use the tables below to identify problems and resolve error messages. If the solution listed below does not solve the problem, contact High End Systems customer service (see "Getting Help" on page Intro-3).

Alpha-Numeric Display Error Messages

To find solutions to problems indicated by messages on the alpha-numeric display, see Table 6-1.

Table 6-1. Alpha-Numeric Display Error Messages

Display Message	Problem	Explanation	Solution
ADDR LOST	Address was unreadable	Fixture was unable to recover fixture address. This error message may be received if your fixture's DMX channel range overlaps another fixture's channel range (see "DMX 512 Protocol" on page 7-1).	Verify the starting channel / fixture number (see "Setting the Fixture Number or DMX Start Channel (CHNL)" on page 4-14).
ADDR OVER	Stored address value is out of range	• A new logic board (without a stored address) was installed in the fixture. • Memory location has not been initialized.	Verify the starting channel or fixture number (see "Setting the Fixture Number or DMX Start Channel (CHNL)" on page 4-14).
BOOT DIFF ERR	Boot code differences	Current boot code does not match the new boot code. This error may occur after you crossload new software.	Update the boot code (see "Changing Boot Codes (BOOT)" on page 4-12).

Table 6-1. Alpha-Numeric Display Error Messages

Display Message	Problem	Explanation	Solution
EMEM ERR	EEPROM error	Data is not readable from PINV, TINV, DSPL, CHNL, SWAP, LSTA, LPLV, MODE, S/DN, LHRS, FHRS, L/ST, or LSTA.	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
ERSE FLSH	Cannot erase the flash ROM	• Bad comm board • Bad data bus	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
FMEM ERR	Flash ROM error	Read/write error from flash ROM	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
FPGA ERR	FPGA error	Read/write error from the Field Programmable Gate Array	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
ID ERR	ID or unique number error	• Error reading ID • Error reading unique fixture ID	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
LAMP OUT ERR	Lamp shuts OFF *during* operation	• Failed lamp • Lamp power supply failure	• Replace lamp (see “Installing/ Replacing the Lamp” on page 1-6). • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
LAMP TOUT ERR	Lamp time-out error occurred when lamp tried to strike	• Lamp is too hot to restrike. • failed lamp • Ignitor failure	• Allow time for the lamp to cool, and home the fixture to restrike the lamp (see “Homing the Fixture (HOME)” on page 4-10). • Replace lamp (see “Installing/ Replacing the Lamp” on page 1-6). • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
LINK BUSY	Other data is present on the link during a crossload	Controller or other crossloading fixture is communicating on the link.	Disconnect controller or wait for other crossloading fixture to finish crossloading.
LINK ERR	Link error	• Bad cable(s) • No data or bad data • Output from previous fixture is bad. • Bad comm board	• Test and replace cable(s) as necessary. • Test data line • Test by bypassing previous fixture • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).

Table 6-1. Alpha-Numeric Display Error Messages

Display Message	Problem	Explanation	Solution
OVER	Value counter is out of range	Lamp strikes, lamp hours, or fixture hours have exceeded 9999.	Reset the menu item that has rolled out of range (see “Resetting Lamp Hours (L/RS)” on page 4-5, or “Resetting Fixture Hours (F/RS)” on page 4-6).
OVER TEMP	Fixture is overheated	The fixture’s internal temperature is too high.	• Move the fixture if it is too close to a heat source. • Remove any object which may be obstructing the fixture’s heatsink. • Check and reduce ambient temperature by turning on fans, etc.
PRGM TIME	Program time has expired during an upload	Bad board	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
SVCC ERR	Sensor power error	Bad board loose cable	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
SEN1 ERR	Sensor error for color wheel, cyan color mixing wheel, or effects wheel 1	Problem with the tab, sensor or motor on the color wheel, cyan color mixing wheel, or effects wheel 1.	• Run a self-test on sensor 1 (see “Performing Self Tests (SELF)” on page 4-11). • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
SEN2 ERR	Sensor error for magenta or yellow color mixing wheel, or effects wheel 2	Problem with the tab, sensor, or motor on the magenta color mixing wheel, yellow color mixing wheel, or effects wheel 2.	• Run a self-test on sensor 2 (see “Performing Self Tests (SELF)” on page 4-11). • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
U.P.L.D.	Fixture held in boot mode	The fixture was disconnected during an upload.	Reconnect the fixture and perform the upload again.

Status LEDs

The status LEDs help determine where any problems with your EC-1 may be originating. See Table 6-2 for a description of the five status LEDs.

Table 6-2. Status LEDs

LED	State	Problem Indication?	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 necessarily†	No DMX 512 data is being transmitted.
Receive	solid green	No	The fixture is receiving new software from a crossload or upload.
	OFF	Not necessarily†	No DMX 512 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/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 6-5.

† - Neither the Transmit nor the Receive LED will be ON until you have connected the fixture to a DMX 512-compatible controller using XLR data-grade cabling. If these LEDs remain OFF even though you have connected the fixture to a controller and are sending DMX 512 commands to the fixture, see “General Troubleshooting” on page 6-5.

General Troubleshooting

To find solutions to general fixture problems not indicated by alpha-numeric display error messages or status LEDs, see Table 6-3.

Table 6-3. General Troubleshooting

Problem	Probable Cause	Solution
Fixture will not turn ON.	• No power • Breaker is turned OFF • Bad power connectors • Bad power line filter	• Connect power • Turn breaker ON • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
Fixture functions but lamp does not strike.	• Bad lamp • Incorrect voltage • Lamp is too hot from operation (fixture turned OFF and ON) • Ignitor connection is loose • F3 fuse on power supply board bad	• Replace lamp • Provide correct power source voltage or change input voltage setting (see “Branch Mains Power Connections” on page 2-7 or “Setting the Fixture Voltage” on page 1-3). • Allow time for the lamp to cool, and home the fixture to restrike the lamp (see “Homing the Fixture (HOME)” on page 4-10). • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3). • Replace F3 fuse (see “Replacing Power Supply Fuses” on page 5-1).
Lamp is dimmer than other fixtures.	• Bad lamp • Incorrect voltage • Different type of lamp	• Replace lamp • Provide correct power source voltage or change input voltage setting (see “Branch Mains Power Connections” on page 2-7 or “Setting the Fixture Voltage” on page 1-3). • Replace lamp with the specified type recommended by High End Systems (see “Physical Specifications” on page Intro-4).
Fixture will not home properly.	• Bad sensor • Bad driver • Bad motor	Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).
Color system is not producing the correct color.	Fixture is not homed properly.	• Home the fixture (see “Homing the Fixture (HOME)” on page 4-10). • Contact High End Systems Customer Service (see “Getting Help” on page Intro-3).

Table 6-3. General Troubleshooting

Problem	Probable Cause	Solution
Fixture is not responding to controller commands or is producing unexpected results.	• Incorrect fixture number or DMX start channel • Bad data cable(s) • Link not terminated	• Verify the fixture number or DMX start channel does not overlap another fixture's DMX start channel or fixture number (see "DMX 512 Protocol" on page 7-1 and/or "Setting the Fixture Number or DMX Start Channel (CHNL)" on page 4-14). • Replace data cables as necessary. • Terminate the link (see "Constructing Terminators" on page 2-2).
Display is not functioning.	• Display is set OFF • Bad power supply fuses • Power connectors are loose • Bad logic board • Bad upload software	• Turn the display ON (see "Changing the Display Output (DSPL)" on page 4-15). • Check the power supply fuses (see "Replacing Power Supply Fuses" on page 5-1). • Contact High End Systems Customer Service (see "Getting Help" on page Intro-3). • At fixture startup, press the two navigational arrow buttons simultaneously. The LED will display "UPLD" and hold the fixture in boot mode. Reload the latest version of the software.
Cracks have developed in the color mixing wheels (stress relieving fissures).	Heat and natural expansion of the glass	Stress relieving fissures are normal and do not in any way degrade the functionality or performance of the fixture.

Upload and Crossload Troubleshooting

To find solutions to problems encountered while uploading or crossloading new software versions, see Table 6-4.

Table 6-4. Upload and Crossload Troubleshooting

Problem	Probable Cause	Solution
Not all fixtures on the link are receiving the upload.	• Fixture(s) are OFF • Bad cable(s) • Cable(s) disconnected	• Turn Fixture(s) ON • Test and replace cable(s) as necessary • Reconnect cable(s)
Status Cue Lighting Console displays “Fixture could not erase flashrom”	• The XLR cable(s) disconnected • Bad cable(s) • The fixture’s electrical circuitry is damaged	• Reconnect XLR cable(s) • Replace cable(s)
Status Cue Lighting Console displays “Warning: No response from Fixture xx (Link xx Address xx).	• Status Cue was configured with a fixture at that address, but no fixtures were found there • Controllers, serial data distributors, data line Opto Isolators, or fixture(s) using RS-422 connected before EC-1 fixtures on the link.	• If there is not a fixture at that address, ignore this message - if there is a fixture at that address, verity the fixture number/ DMX start channel. • Check connections • Check to ensure fixture is turned ON. • Remove or bypass any offending devices from the data link or move them after the EC-1 fixtures.
Fixture LED alpha-numeric display shows: BOOT DIFF ERR	New software also included boot code (this is normal).	Copy the fixture’s boot code (see “Changing Boot Codes (BOOT)” on page 4-12).
Fixtures are not crossloading.	Controllers, serial data distributors, data line Opto Isolators, or fixture(s) using RS-422 connected before EC-1 fixtures on the link.	Remove or bypass any offending devices from the data link or move them after the EC-1 fixtures.

Appendix A
DMX Control of EC-1

This appendix provides information on DMX protocol and includes tables which list appropriate DMX start channels and EC-1 construct parameters.

DMX 512 Protocol

You must control EC-1 fixtures using DMX 512 protocol. DMX 512 (D for digital, MX for multiplex, and 512 for the number of channels per link) is an industry-standard control protocol.

Each of the 512 channels available with DMX protocol are divided among *all* the devices connected to the controller in a particular link. The block of channels assigned to each fixture defines the fixture's channel range. Each EC-1 fixture reserves a block of 12 contiguous channels. If your controller supports EC-1 fixtures, you can control up to 42 EC-1 fixtures per DMX 512 link (512/12 = 42.6 fixtures). If your controller only supports Studio Color fixtures, you can control up to 32 EC-1 fixtures per DMX 512 link (512/16* = 32 fixtures).

*Note: Studio Color protocol reserves 16 contiguous channels where the first four channels control pan and tilt information. Because EC-1 fixtures do not have pan or tilt motion, EC-1 fixtures controlled by Studio Color protocol must reserve - but cannot use - the first four channels of DMX data.

A DMX start channel is the first channel of the fixture's unique channel range. Although you can control EC-1 from any DMX start channel you choose, that start channel must not interfere with another fixture's channel range. If the channel range for two devices overlap, one or both of the devices will behave erratically. The single exception to the non-overlapping rule is if you want two devices to respond to control commands in exactly the same way; in that case, both devices must share the *entire* channel range.

DMX 512-Compatible Controllers

You must operate EC-1 via a DMX 512-compatible controller. There are two DMX controllers for EC-1 available from High End Systems: Studio Color LCD controller, and Status Cue Lighting Console (see "Optional Accessories" on page Intro-6). If you choose to operate your fixtures with a controller that does not specifically support the EC-1 fixture (such as the Studio Color LCD controller), you must assign each fixture a DMX start channel (rather than a fixture number).

DMX Start Channels

Table A-1 lists the DMX start channels for EC-1 fixtures using either a controller that supports EC-1 fixtures or a controller that only supports Studio Color fixtures. This table assumes that all EC-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 DMX 512 link, those devices may have different channel ranges that could overlap the sequence listed below and cause the devices to behave erratically.

Table A-1. Sample Start Channels

Fixture Order in Link	DMX Start Channel (controller for EC-1)	DMX Start Channel (controller for STC)
1	1	5
2	13	21
3	25	37
4	37	53
5	49	69
6	61	85
7	73	101
8	85	117
9	97	133
10	109	149
11	121	165
12	133	181
13	145	197
14	157	213
15	169	229
16	181	245
17	193	261
18	205	277
19	217	293
20	229	309
21	241	325
22	253	341
23	265	357
24	277	373
25	289	389
26	301	405
27	313	421
28	325	437

Table A-1. Sample Start Channels

Fixture Order in Link	DMX Start Channel (controller for EC-1)	DMX Start Channel (controller for STC)
29	337	453
30	349	469
31	361	485
32	373	501
33	385	N/A
34	397	N/A
35	409	N/A
36	421	N/A
37	433	N/A
38	445	N/A
39	457	N/A
40	469	N/A
41	481	N/A
42	493*	N/A

*Note: Channels 505-512 cannot be used due to EC-1's 12-channel range in EC-1 operating mode.

A

EC-1 Construct Parameters

Table A-2 lists the 12 EC-1 constructs and their corresponding DMX controller values. If you have a numeric-type controller, use the Value (dec.) column. If you have a fader-type controller, use the Value (%) column. If your controller allows you to program hex values, use the Value (hex) column.

The values displayed in Table A-2 may vary slightly depending on your controller's rounding convention.

Table A-2. Construct Parameters

Controller for EC-1	Controller for STC	Construct	Description	Value (dec.)	Value (%)	Value (hex)
	Channel 1	Pan	coarse positioning	N/A	N/A	N/A
	Channel 2		fine positioning	N/A	N/A	N/A
	Channel 3	Tilt	coarse positioning	N/A	N/A	N/A
	Channel 4		fine positioning	N/A	N/A	N/A
Channel 1	Channel 5	Color Function*	default	0	0	00
			F3	16	8	10h
			F4	32	14	20h
			F5	48	20	30h
			F1	64	26	40h
			F1 and F3	80	33	50h
			F1 and F4	96	39	60h
			F1 and F5	112	45	70h
			F2	128	51	80h
			F2 and F3	144	58	90h
			F2 and F4	160	64	a0h
			F2 and F5	176	70	b0h
			F1 and F2	192	76	c0h
			F1, F2, and F3	208	83	d0h
			F1, F2, and F4	224	89	e0h
			F1, F2, and F5	240	95	f0h

**see "Color Functions" on page 3-2 for color function descriptions*

Table A-2. Construct Parameters

Controller for EC-1	Controller for STC	Construct	Description	Value (dec.)	Value (%)	Value (hex)
Channel 2	Channel 6	Color Wheel	**default , F1 - Double Rotate, F2 - MSpeed***			
			pos 1 - open	0 & 255	0 & 100	00 & ffh
			pos 2 - CTO	44	17	2ch
			pos 3 - pink	86	34	56h
			pos 4 - magenta	128	50	80h
			pos 5 - red	170	66	aah
			pos 6 - aqua	213	83	d5h
			F3 - Forward Spin / Synchronized Sequences*			
			spin stop	0-3	0-1	00-03h
			spin forward slowest	4	2	04h
			spin forward fastest	127	48	7fh
			color mix sequence slowest	128	50	80h
			color mix sequence fastest	255	100	ffh
			F4 - Reverse Spin / Random Cycling*			
			spin stop	0-3	0-1	00-03h
			spin reverse slowest	4	2	04h
			spin reverse fastest	127	48	7fh
			color mix cycle slowest	128	50	80h
			color mix cycle fastest	255	100	ffh
			F5 - Color Lock and Quickest Path*			
			pos 1 - open	0-43	0-17	0-2bh
			pos 2 - CTO	44-85	0-17	2ch-55h
			pos 3 - pink	86-127	34-50	56h-79h
			pos 4 - magenta	128-169	51-66	80h-a9h
			pos 5 - red	170-212	67-83	aah-d4h
			pos 6 - aqua	213-255	84-100	d5h-ffh
**see "Color Functions" on page 3-2 for color function descriptions*						
Channel 3	Channel 7	Cyan Mixing Wheel	cyan in	0	0	00h
			cyan out	255	100	ffh
Channel 4	Channel 8	Magenta Mixing Wheel	magenta in	0	0	00h
			magenta out	255	100	ffh

A

Table A-2. Construct Parameters

Controller for EC-1	Controller for STC	Construct	Description	Value (dec.)	Value (%)	Value (hex)
Channel 5	Channel 9	Yellow Mixing Wheel	yellow in	0	0	00h
			yellow out	255	100	ffh
Channel 6	Channel 10	Lens wheel (effects wheel 1)	open	0 & 255	0 & 100	00 & ffh
			wide angle filter	64	25	40h
			narrow horizontal shaping center axis	128	50	80h
			wide vertical shaping center axis	192	75	c0h
Channel 7	Channel 11	Frost wheel (effects wheel 2)	open	0 & 255	0 & 100	00& ffh
			frost	64	25	40h
			narrow vertical shaping center axis	128	50	80h
			wide horizontal shaping center axis	192	75	c0h
Channel 8	Channel 12	Shutter	closed	0-7	0-2	00h-07h
			strobe slowest	8	3	08h
			strobe fastest	127	49	7fh
			random strobe-low saturation	128	50	80h
			random strobe - high saturation	247	96	f7h
			open	248-255	97-100	f8h-ffh
Channel 9	Channel 13	Dim	closed	0	0	0h
			open	255	100	ffh
Channel 10	Channel 14	MSpeed	controller crossfade	0-3	0-1	00-03h
			slowest	4	2	04h
			fastest	255	100	ffh
Channel 11	Channel 15	Control	safe	0	0	0h
			home	64	25	40h
			shutdown	128	50	80h
Channel 12	Channel 16	Checksum	set to default value (00)	00	0	00h

Appendix B
MSpeed Times

Converting MSpeed Times

Use this appendix to convert MSpeed (motor) movement times to a DMX value for either a numeric-type controller (Value #) or a fader-type controller (Value %).

The values displayed in Table B-1 may vary slightly depending on your controller's rounding conventions.

Table B-1. Converting DMX Values to MSpeed Times

MSpeed Time in Seconds	Value #	Value %	MSpeed Time in Seconds	Value #	Fader %
252.7	4	1.6	203.1	30	11.8
250.7	5	2	201.3	31	12.2
248.7	6	2.4	199.5	32	12.5
246.7	7	2.7	197.7	33	12.9
244.7	8	3.1	195.9	34	13.3
242.7	9	3.5	194.2	35	13.7
240.8	10	3.9	192.4	36	14.1
238.8	11	4.3	190.6	37	14.5
236.8	12	4.7	188.9	38	14.9
234.9	13	5.1	187.2	39	15.3
233	14	5.5	185.4	40	15.7
231	15	5.9	183.7	41	16.1
229.1	16	6.3	182	42	16.5
227.2	17	6.7	180.3	43	16.9
225.3	18	7.1	178.6	44	17.3
223.4	19	7.5	176.9	45	17.6
221.5	20	7.8	175.2	46	18
219.6	21	8.2	173.6	47	18.4
217.8	22	8.6	171.9	48	18.8
215.9	23	9	170.4	49	19.2
214	24	9.4	168.6	50	19.6
212.2	25	9.8	167	51	20
210.4	26	10.2	165.3	52	20.4
208.5	27	10.6	163.7	53	20.8
206.7	28	11	162.1	54	21.2
204.9	29	11.4	160.5	55	21.6

Table B-1. Converting DMX Values to MSpeed Times

MSpeed Time in Seconds	Value #	Value %	MSpeed Time in Seconds	Value #	Fader %
159.9	56	22	104.1	94	36.9
157.5	57	22.4	102.8	95	37.3
155.7	58	22.7	101.5	96	37.6
154.1	59	23.1	100.2	97	38
152.6	60	23.5	99	98	38.4
151	61	23.9	97.5	99	38.8
149.5	62	24.3	96.5	100	39.2
147.9	63	24.7	95.2	101	39.6
146.4	64	25.1	94	102	40
144.9	65	25.5	92.8	103	40.4
143.3	66	25.9	91.5	104	40.8
141.8	67	26.3	90.3	105	41.2
140.3	68	26.7	89.1	106	41.6
138.8	69	27.1	88	107	42
137.3	70	27.5	86.8	108	42.4
135.9	71	27.8	85.6	109	42.7
134.4	72	28.2	84.4	110	43.1
132.9	73	28.6	83.3	111	43.5
131.5	74	29	82.1	112	43.9
130	75	29.4	81	113	44.3
128.6	76	29.8	79.8	114	44.7
127.2	77	30.2	78.7	115	45.1
125.7	78	30.6	77.6	116	45.5
124.3	79	31	76.5	117	45.9
122.9	80	31.4	75.4	118	46.3
121.5	81	31.8	74.3	119	46.7
120.1	82	32.2	73.2	120	47.1
118.7	83	32.5	72.1	121	47.5
117.4	84	32.9	71.1	122	47.8
116	85	33.3	70	123	48.2
114.6	86	33.7	68.9	124	48.6
113.3	87	34.1	67.9	125	49
111.9	88	34.5	66.9	126	49.4
110.6	89	34.9	65.8	127	49.8
109.3	90	35.3	64.8	128	50.2
108	91	35.7	63.8	129	50.6
106.6	92	36.1	62.8	130	51
105.3	93	36.5	61.8	131	51.4

Table B-1. Converting DMX Values to MSpeed Times

MSpeed Time in Seconds	Value #	Value %	MSpeed Time in Seconds	Value #	Fader %
60.8	132	51.8	29.1	170	66.7
59.8	133	52.2	28.2	171	67.1
58.8	134	52.5	27.8	172	67.5
57.9	135	52.9	27.1	173	67.8
56.9	136	53.3	26.4	174	68.2
56	137	53.7	25.8	175	68.6
55	138	54.1	25.2	176	69
54.1	139	54.5	24.5	177	69.4
53.2	140	54.9	23.9	178	69.8
52.2	141	55.3	23.3	179	70.2
51.3	142	55.7	22.7	180	70.6
50.4	143	56.1	22.1	181	71
49.5	144	56.5	21.5	182	71.4
48.7	145	56.9	20.9	183	71.8
47.8	146	57.3	20.4	184	72.2
46.9	147	57.6	19.8	185	72.5
46	148	58	19.2	186	72.9
45.2	149	58.4	18.7	187	73.3
44.3	150	58.8	18.1	188	73.7
43.5	151	59.2	17.6	189	74.1
42.7	152	59.6	17.1	190	74.5
41.9	153	60	16.6	191	74.9
41	154	60.4	16.1	192	75.3
40.2	155	60.8	15.6	193	75.7
39.4	156	61.2	15.1	194	76.1
38.6	157	61.6	14.6	195	76.5
37.9	158	62	14.1	196	76.9
37.1	159	62.4	13.6	197	77.3
36.3	160	62.7	13.2	198	77.6
35.6	161	63.1	12.7	199	78
34.8	162	63.5	12.3	200	78.4
34.1	163	63.9	11.8	201	78.8
33.3	164	64.3	11.4	202	79.2
32.6	165	64.7	11	203	79.6
31.9	166	65.1	10.6	204	80
31.2	167	65.5	10.2	205	80.4
30.5	168	65.9	9.8	206	80.8
29.8	169	66.3	9.4	207	81.2

Table B-1. Converting DMX Values to MSpeed Times

MSpeed Time in Seconds	Value #	Value %	MSpeed Time in Seconds	Value #	Fader %
9	208	81.6	1.9	234	91.8
8.6	209	82	1.8	235	92.2
8.3	210	82.4	1.6	236	92.5
7.9	211	82.7	1.4	237	92.9
7.6	212	83.1	1.3	238	93.3
7.2	213	83.5	1.2	239	93.7
6.9	214	83.9	1.1	240	94.1
6.6	215	84.3	0.94	241	94.5
6.2	216	84.7	0.83	242	94.9
5.9	217	85.1	0.73	243	95.3
5.6	218	85.5	0.63	244	95.7
5.3	219	85.9	0.55	245	96.1
5.1	220	86.3	0.47	246	96.5
4.8	221	86.7	0.41	247	96.9
4.5	222	87.1	0.35	248	97.3
4.3	223	87.5	0.29	249	97.6
4	224	87.8	0.25	250	98
3.8	225	88.2	0.21	251	98.4
3.5	226	88.6	0.19	252	98.8
3.3	227	89	0.17	253	99.2
3.1	228	89.4	0.15	254	99.6
2.9	229	89.8	0.15	255	100
2.7	230	90.2	0.15	1	0.4
2.5	231	90.6	0.15	2	0.8
2.3	232	91	0.15	3	1.2
2.1	233	91.4			

Appendix C
Color Matching

C

Color Matching

This appendix provides the values (for numeric-type controllers) and percentages (for fader-type controllers) to approximately match common gel colors using EC-1. Additional color matches are available on the High End Systems web site. In the Color # column, "*R*" depicts a Rosco® gel color, "*L*" depicts a Lee® gel, and "LHT" depicts a high temperature Lee gel.

Table C-1. Color Matching

Color Name	Color#	Color Wheel Value	Color Wheel %	Red Value	Red %	Green Value	Green %	Blue Value	Blue %
No Color Blue	R60	0	0%	255	100%	189	74%	166	65%
Mist Blue	R61	0	0%	255	100%	196	77%	168	66%
Booster Blue	R62	0	0%	255	100%	255	100%	201	79%
Pale Blue	R63	0	0%	255	100%	223	87%	189	74%
Light Steel Blue	R64	0	0%	171	67%	223	87%	255	100%
Daylight Blue	R65	0	0%	158	62%	255	100%	209	82%
Cool Blue	R66	0	0%	255	100%	221	87%	166	65%
Light Sky Blue	R67	0	0%	135	53%	222	87%	255	100%
Sky Blue	R68	0	0%	30	9%	161	63%	255	100%
Brilliant Blue	R69	0	0%	36	14%	255	100%	199	78%
Nile Blue	R70	0	0%	166	65%	255	100%	163	64%
Sea Blue	R71	0	0%	110	43%	255	100%	171	67%
Azure Blue	R72	0	0%	115	45%	255	100%	176	69%
Peacock Blue	R73	0	0%	84	33%	255	100%	148	58%
Light Green Blue	R76	0	0%	0	0%	255	100%	194	76%
Green Blue	R77	0	0%	17	7%	181	71%	255	100%
Trudy Blue	R78	0	0%	158	62%	168	66%	255	100%
Green Blue	R80	0	0%	5	2%	122	48%	255	100%
Urban Blue	R81	0	0%	56	22%	150	58%	255	100%
Clearwater	R360	0	0%	255	100%	189	74%	166	65%
Tipton Blue	R362	0	0%	255	100%	222	87%	207	81%
Aquamarine	R363	0	0%	255	100%	240	94%	176	69%
Blue Bell	R364	0	0%	181	71%	191	75%	255	100%

Table C-1. Color Matching

Color Name	Color#	Color Wheel Value	Color Wheel %	Red Value	Red %	Green Value	Green %	Blue Value	Blue %
Tharon Delft Blue	R365	0	0%	217	85%	201	79%	255	100%
Bermuda Blue	R376	0	0%	105	41%	255	100%	181	71%
Alice Blue	R378	0	0%	150	59%	132	52%	255	100%
Medium Yellow	L010	0	0%	255	100%	158	62%	15	6%
Medium Amber	L020	0	0%	255	100%	84	33%	18	7%
Gold Amber	L021	0	0%	255	100%	18	7%	41	16%
Scarlet	L024	0	0%	255	100%	34	13%	49	19%
Bright Red	L026	0	0%	255	100%	255	100%	0	0%
Medium Red	LHT027	0	0%	255	100%	255	100%	33	13%
Light Pink	L035	0	0%	255	100%	115	45%	112	44%
Medium Pink	L036	0	0%	255	100%	84	33%	112	44%
Dark Magenta	L046	0	0%	255	100%	0	0%	71	28%
Light Lavender	L052	0	0%	255	100%	128	50%	148	58%
Lavender	L058	0	0%	153	60%	94	37%	255	100%
Deep Amber	L104	0	0%	255	100%	115	45%	15	6%
Orange	LHT105	0	0%	255	100%	99	39%	0	0%
Magenta	L113	0	0%	255	100%	0	0%	38	15%
Peacock Blue	L115	0	0%	43	17%	255	100%	110	43%
Light Blue	L118	0	0%	46	18%	255	100%	186	73%
Dark Green	L124	0	0%	26	10%	255	100%	38	15%
Mauve	L126	0	0%	255	100%	0	0%	158	62%
Medium Blue	L132	0	0%	0	0%	166	65%	255	100%
Primary Green	L139	0	0%	0	0%	255	100%	0	0%
Deep Orange	L158	0	0%	227	89%	36	14%	0	0%
Chrome Orange	L179	0	0%	255	100%	87	34%	0	0%
Dark Lavender	L180	0	0%	102	40%	79	31%	255	100%

Appendix D
Important Safety Information

Warning: For Continued Protection Against Fire

1. This equipment is designed for use with a Phillips 575 Watt, GX 9.5 base, M Series, metal halide lamp only. Use of any other type lamp may be hazardous and may 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

1. 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
2. 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.
3. Class I equipment. This equipment must be earthed.
4. Disconnect power before re-lamping or servicing.
5. Refer servicing to qualified personnel; no user serviceable parts inside.

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° C (284° 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 (149 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  .

Glossary

Channel range

The contiguous block of DMX 512 channels that a device reserves to control its constructs. EC-1 fixtures reserve either 12 channels (when used with a controller that supports EC-1 fixtures) or 16 channels (when used with a controller that only supports Studio Color fixtures).

Color corrector

A means of matching a specific color temperature to simulate standard types of light, such as Tungsten light or daylight. EC-1 uses a daylight Color Temperature Orange (CTO) color corrector.

Color temperature

A term used to describe the balance or content of each spectral component of white light. Color temperature, in turn, relies on the concept of the black body.

A black body is a theoretical object that absorbs all of the energy that contacts it. Heating a black body causes it to emit radiation. When the spectral composition of a black body matches the spectral composition of a white light source, the temperature of the black body (in degrees Kelvin) is the color temperature of the light source.

For example, a light source that is rated at 6200 Kelvin (such as the MSR 575/2 light source used in EC-1) matches the radiation of a black body heated to 6200 Kelvin.

Because not all light sources exhibit a smooth spectral power distribution, color temperature is an approximate measure of a lamp's spectral output.

Conduit

A protective weatherproof covering for wires such as EC-1's power or serial data cables. Conduit helps protect these cables from physical damage and from elements such as rain and dust. For more information on obtaining an EC-1 conduit wiring kit, contact High End Systems customer service (see "Getting Help" on page Intro-3).

Constructs

Features of the fixture (such as color wheel, shutter, and dim). You assign a value to these constructs via a controller to define the way your light source operates. EC-1 fixtures have 12 constructs (see "Fixture Constructs" on page 3-1).

Crossload

The act of copying fixture software from one fixture which already contains the software to other fixtures on the same link.

Controller

A device used to “program” your fixture. If your DMX-compatible controller does not recognize EC-1 fixtures, you can use a controller that recognizes Studio Color fixtures. The type of controller you use determines the size of EC-1’s channel range. When used with a controller that only supports Studio Color fixtures, EC-1 will reserve 16 channels in its channel range - but ignore the first four channels (which control pan and tilt movement in a Studio Color fixture).

Dichroic

A dichroic (from Greek, meaning “two-color”) filter achieves a richly-saturated color without using any pigmented (colored) materials. In simple terms, it achieves this effect by either reflecting or “cancelling out” through destructive interference all but a narrow range of the light spectrum.

The “dichroic” name refers to the fact that one color (or broad range of colors) is reflected or cancelled out, and one color (or narrow range of colors) is transmitted through the dichroic filter.

The dichroics used in EC-1 are all manufactured at the High End Systems Optical Coating and Assembly Laboratory in Austin, Texas. They are made from a base of low expansion glass material coated with multiple, microscopic layers of specialized materials separated by junctions that either transmit or reflect certain wavelengths of light, accounting for the resulting color.

Dichroic filters offer a number of advantages over traditional gel filters: since they are made of low expansion glass and absorb almost no heat themselves, they theoretically have no failure mechanism; they transmit more light than gels; and their resultant colors are more richly-saturated than is possible with a gel.

Dichroic filters are used in the EC-1 color wheel and the three subtractive color mixing wheels. (Dichroics are also used on other High End Systems fixtures.)

DMX 512 protocol

DMX 512 (D for digital, MX for multiplex, and 512 for the number of channels per link) is the standard method of controlling (sending data to) lighting fixtures and other devices. Its strength lies in its ability to control virtually any mix of DMX-compatible devices (such as lighting fixtures, lasers, and hazers) on the same link.

DMX 512 protocol provides 512 channels that are divided among all the devices connected to the controller in a particular link. The number of channels each device in the link uses is determined by the channel range of the device.

DMX start channel

The first DMX channel in a fixture's channel range on a particular DMX 512 link. You must assign either a unique DMX starting channel or fixture number to each EC-1 you wish to respond independently to controller commands. Assigning a DMX start channel (rather than a fixture number) helps you to keep track of the channel range used by each device in the link and prevent overlapping channel ranges.

Fixture number

The fixture's order in a particular DMX 512 link. You must assign either a unique fixture number or DMX starting channel to each EC-1 you wish to respond independently to controller commands. You may choose to assign a fixture number instead of a DMX starting channel if you are very familiar with DMX 512 protocol, and feel confident that none of your device's channel ranges will overlap.

Homing

The process of moving to a "home" or starting point that is set by the fixture. In EC-1, the three subtractive color mixing wheels, color wheel, shutter, iris (dim), and effects wheels 1 and 2 all have a designated home.

Status LED (Light Emitting Diode)

Lights on the EC-1 fixture's display panel that indicate activity of the fixture's motors, lamp, logic board power, and DMX 512 data status (transmitting or receiving).

Link

A group of fixtures joined by connecting data cables that receive data from a controller or crossloading fixture.

Luminaire

Another word for "fixture" or "lighting equipment."

MSpeed

A means of defining the time it takes for a motor to move to a different defined position.

Navigation buttons

The buttons on the fixture's display panel that allow you to enter, select, and store menu values for the fixture. The EC-1 navigation buttons include the Menu, Enter, Arrow Up, and Arrow Down buttons (see Figure 4-1 on page 4-1).

Operating mode

A setting that determines how your controller sends data to your EC-1 fixture. Because EC-1 fixtures and Studio Color fixtures use the same software, there is a menu option to choose between EC-1 (EC-1) operating mode or Studio Color (STC) operating mode. Your EC-1 fixture should always be set to EC-1 operating mode.

Optimize

The process of positioning a lamp inside its reflector to achieve the brightest possible light output with the brightest point of light in the center of the beam. An optimized lamp prevents the beam from damaging other internal components inside the fixture. EC-1 fixtures use a self-optimizing lamp socket, so you do not need to optimize the lamp.

Terminal block

A means of connecting incoming wires to the EC-1 fixture. A terminal block is included with the EC-1 conduit wiring kit to allow you to easily connect the power cord and serial data cables inside the fixture. For more information on obtaining an EC-1 conduit wiring kit, contact High End Systems customer service (see “Getting Help” on page Intro-3).

Terminator

A terminator is a resistor inside an XLR connector. It is used to prevent the digital data from continuously “echoing” up and down the data link. A terminator must be used on the last fixture in each link. For instructions on constructing a terminator, see “Constructing Terminators” on page 2-2.

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D

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S

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V

W

X

EC-1™ Menu System

- MENU
  - (top menu level)
    - ADDR — Fxx/Cxxx (change existing fixture ID)
    - INFO
      - L/HR (view lamp hours)
      - L/ST (view lamp strikes)
      - VER (view software version)
      - L/RS (reset lamp hours & strikes)
      - F/HR (view fixture hours)
      - F/RS (reset fixture hours)
      - TEMP
        - CURR (current internal temperature)
        - MINT (minimum internal temperature)
        - MAXT (maximum internal temperature)
        - RST (reset temperature)
      - DMX
        - FIXT
          - ERRS (DMX errors)
          - CSUM (checksum)
          - CNTL (control value)
          - MSPD (MSpeed value)
          - DIM (dim value)
          - SHUT (shutter value)
          - FRST (frost wheel value)
          - LENS (lens wheel value)
          - CYAN (cyan wheel value)
          - YELW (yellow wheel value)
          - MAGN (magenta wheel value)
          - CLR (color value)
          - CLRF (color function value)
          - *TILT (tilt value)**
          - *PAN (pan value)**
          - STRT (start code)
          - CE (checksum errors)
          - OV (overrun errors)
          - FE (framing errors)
        - DATA C0001-C512 (DMX ch. values)
      - CODE
        - *SENP (pan sensor)**
        - *TPOS (tilt position)**
        - *PPOS (pan position*)*
        - *DUTY (encode duty cycle)**
        - *TCOR (tilt correction)**
        - *PCOR (pan correction)**
        - TIME (main loop time)
        - SVCC (sensor power)
        - SEN2 (sensor 2)
        - SEN1 (sensor 1)
        - *SENT (tilt sensor)**
    - TEST
      - HOME(home the fixture)
      - *S/UP (Customer Service use only)*
      - SELF
        - ALL (perform all self tests)
        - DIM (dim self test)
        - SHUT (shutter self test)
        - FRST (frost wheel self test)
        - LENS (lens wheel self test)
        - CYAN (cyan wheel self test)
        - YELW (yellow wheel self test)
        - MAGN (magenta wheel self test)
        - COLR (color wheel self test)
        - *TILT (tilt self test)**
        - *PAN (pan self test)**
      - *FUNC (reserved for future use)*
      - BOOT (copy the new boot code)
      - LAMP
        - STAT (lamp status)
        - LOFF (turn lamp OFF)
        - L ON (turn lamp ON)
    - MODE
      - *STC (use STC DMX protocol)**
      - EC1 (use EC-1 DMX protocol)
      - XLD (crossload fixture code)
    - SET
      - FACT
        - ON (set factory defaults ON)
        - OFF (set factory defaults OFF)
      - CHNL
        - DMX (set DMX start channel)
        - ADDR (set fixture number)
      - DSPL
        - ON (set display ON)
        - OFF (set display OFF)
        - DIM (dim display)
      - *P/IN (pan invert)**
      - *T/IN (tilt invert)**
      - *SWAP (swap pan and tilt motion)**
      - S/DN
        - 5 MN (shutdown in 5 minutes)
        - 10MN (shutdown in 10 minutes)
      - *LAMP*
        - *575W (575 watt)**
        - *250W (250 watt)**
      - *TCAL (tilt calibration)**
      - *PCAL (pan calibration)**

Figure 4-15. Menu map

**Note: These menu items have no functionality.*