

User Manual









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



p/n 60600113 Version 1.0

LCD Controller for

TECHNOBEAM[™] TECHNORAY[™] TECHNOPRO[™]

User Manual

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according to ISO/IEC Guide 22 and EN45104

Manufacturer's name:	Lightwave Research
Manufacturer's address:	2217 West Braker Lane
	Austin, Texas 78758 U.S.A.
Distributor's name:	High End Systems Inc.
Distributor's address:	2217 West Braker Lane
	Austin, Texas 78758 U.S.A.

Declares that the product	
Product Name:	Technobeam LCD Controller
Product Number:	Technobeam LCD Controller
Product Options:	All

conforms to the following EEC directives:

73/23/EEC, as amended by 93/68/EEC 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC

Equipment referred to in this declaration of conformity first manufactured in 1995 in compliance with the following standards:

Safety: EN 60950 : 1992 A1 : 1993 A2 : 1994

 EMC:
 EN 55022
 Class A ITE
 December 1, 1995

 IEC 801-2 : 1991
 Level 2 (4/8 kV)
 November 29, 1995

 IEC 801-3: Draft 5Level 2 (3 V/m)
 November 29, 1995

 IEC 801-4: 1988
 Level 2 (1kV/.5 kV)November 29, 1995

Hunnith Hunen

U.S.A., Friday, February 27, 1998 Kenneth Stuart Hansen, Compliance Engineer

The Technobeam LCD controller 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 D 372550; 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.

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.

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.

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Unless otherwise stated, your product is covered by a two (2) year parts and labor limited warranty. It is the owner's responsibility to furnish receipts or invoices for verification of purchase, date, and dealer or distributor. Dichroic filters and LithoPatterns[®] high resolution glass gobos are not guaranteed against breakage or scratches to coating. If purchase date cannot be provided, date of manufacture will be used to determine warranty period.

Returning an Item Under Warranty for Repair

It is necessary to obtain a Return Material Authorization number (RMA#) from your dealer 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.

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 Returned Material Authorization (RMA#) number. Accompany all returned Product units or parts with a written explanation of the alleged problem or malfunction.

Please Note: Freight Damage Claims are invalid for fixtures shipped in nonfactory 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.

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

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Introduction

Congratulations on your purchase of the Lightwave Research[®] Liquid Crystal Display (LCD) controller for the TechnobeamTM, TechnoproTM and TechnorayTM automated luminaires. The Technobeam LCD controller provides designers and operators with the means to control the Technobeam family of luminaires quickly and powerfully.

Your microprocessor-based Technobeam fixture responds to an extensive set of programming commands called *constructs*. You can easily program these constructs into simple or complex pages (scenes), then play them back with the touch of a button. Pages or presets can also be played back from an analog controller in a remote location.

Once your pages are programmed and recorded, they are secure in the internal memory of the controller, protected by battery backup. You can protect programs from unauthorized editing by simply removing the power key switch. You can also store and transfer programs using either a removable PC Card memory adapter or a personal computer. Memories, pages and presets can also be crossloaded (transferred) directly from one controller to another controller.

Features

Programming:

- 16 unique control channels for 16 independently-operating fixtures per controller
- Each control channel can handle multiple Technobeam, Technopro or Technoray fixtures, if you want them to respond to commands in the same way
- Remote preset capturing allows you to easily store pages created on the controller in the fixture's onboard memory
- Master/Slave capabilities allow you to control an unlimited number of independently-operating fixtures
- 891 pages (scenes)
- 9 memories
- Up to 1024 programmable presets from the front panel through the use of *preset banking*
- Up to 1023 programmable presets using an analog controller
- Up to 99 beam position presets for instant access and updates

- Page edit and page copy
- Memory lock
- 8 programmable User macro keys
- Fixture parameter viewing
- Page time delay
- Fixture exclusion
- Individual fixture homing
- Individual fixture lamp on/off
- User-selectable submasters
- Auto advance, audio advance and random advance

Constructs (programmable fixture features):

- 13 color wheel positions, 255 forward/reverse spin speeds
- Technobeam, Technoray only: 8 selectable rotating litho wheel positions with 127 forward/reverse position spin speeds, 127 forward/reverse wheel spin speeds
- Technobeam Laser Aiming Device[™] (LAD[™]) only: turn laser on/off, or modulate from 4.25 times/sec to 255 times/sec
- Technopro only: 8 selectable color mixing wheel positions with 127 forward/reverse spin speeds
- Continuous color wheel indexing
- Scans (shakes) and random position selection on color and litho wheels
- Synchronized and unsynchronized (random) shutter strobing, color position changes and litho position changes
- Technobeam only: Adjustable beam position, also 99 beam position presets
- 4 rotating effects wheel positions, 120 forward/reverse spin speeds
- Adjustable dim
- Crossfade
- Color modulation
- Litho modulation (Technopro only: litho modulation acts as color mixing wheel modulation, or dual-color wheel modulation when used in conjunction with color modulation)
- Shutter strobing (synchronized and random)

Playback:

- Supports the MIDI Show Control "Go" command
- Remote page and preset access
- Audio advance: page advance, page halt, color modulate, litho modulate, dim modulate
- Remote enable
- One-touch preset playback of pages or loops
- Variable-speed page advance
- Random advance
- Automatic all-memory playback (all programmed pages)

Other:

- PC Card Type 1 adapter slot for backup and transfer of programs and operating system
- Professional induction joystick
- Durable polycarbonate front panel
- Self-test memory diagnostics
- Positive feel switches
- LCD display with adjustable backlight intensity

This manual provides easy-to-follow procedures for setting up and using your Technobeam LCD controller. It includes seven chapters and four appendices. First-time users should begin this manual with Chapter 1.

Chapter 1: Preparing to Use Your LCD Controller — unpacking your controller and setting the voltage, if required.

Chapter 2: Setting Up Your Controller — setting switches on the controller's rear panel, configuring and connecting fixtures, connecting cabling, master/slave controllers, MIDI connections and other connections.

Chapter 3: Overview of Controller Operation — general overview of concepts and terminology used in the manual, detailed explanation of constructs and their supported parameter values.

Chapter 4: Basic Programming — step-by-step instructions for creating a simple program, creating a loop, programming presets, playing back presets and programs, viewing programs, erasing pages, master dim, and homing fixtures.

Chapter 5: Using the Menus — navigating in the controller's menu system, selecting Lightwave Show Control or MIDI Show Control, locking/unlocking memory, erasing all memory, and setting backlight intensity.

Chapter 6: Advanced Programming — remote preset capture, using position presets, address (fixture) parameter copy, the eight User keys, remote page and preset access, fixture lockout, audio playback, remote page access and remote enable/disable.

Chapter 7: External Memory Storage and Transfer — using a RAM card for backup and restore.

Appendix A: Factory Wheel Configuration — shows how all wheels (color, litho and effects) are configured when Technobeam, Technoray and Technopro are shipped from the factory.

Appendix B: Construct Parameters — lists all constructs supported by the Technobeam LCD controller, their allowable parameters values and default values.

Appendix C: Technopro Color Selection — how to color mix or to approximate Roscoe[®] and Lee[®] gel colors with Technopro.

Appendix D: Important Safety Information — multi-lingual safety information and warnings that you must follow in order to safely operate the controller.

Symbols

The following two international symbols appear in margins throughout this manual to highlight Caution and Warning messages.



Note/Caution: This symbol appears adjacent to Caution messages. A Caution is an advisory warning; failure to heed a Caution could result in minor personal injury and/or damage to equipment.



Electrical Shock: This symbol appears adjacent to electrical shock warnings. Not heeding these messages could result in electrical shock and serious personal injury.



Explosion: This symbol appears adjacent to Explosion warning messages. These messages warn you about possible fire or explosive dangers.

Getting Help

U.S., the Americas and Europe	Service address: 2227 West Braker Lane Austin, TX 78758 U.S.A. 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 or (800) 890-8989 8200 Haskell Avenue Van Nuys, California 91406 Voice:(818) 947-0550 Fax: (818) 908-8975
Singapore	Voice:+65 742 8266 FAX:+65 743 9322
24-hour Customer Service World Wide Web site	http://info.highend.com/service/service.html
Product Updates	http://info.highend.com/service/prodsupt.html

Chapter 1 Preparing to Use Your LCD Controller

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Unpacking Your Controller

First, unpack your controller and verify that it arrived complete and without any damage.

Save the Shipping Materials



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

High End Systems, Inc. assumes no responsibility for products 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, be sure to call your HES dealer/distributor for a Return Authorization (RA) number. The factory cannot accept any goods shipped without an RA number.

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 you must notify both the shipping agent and your sales agent immediately:

- One Technobeam LCD controller
- One 512KB PC Card (aka RAM Card) enclosed in a plastic container
- One Lightwave Research T-shirt
- One plastic container with two keys and one replacement fuse

This section lists specifications for your Technobeam LCD controller.

Model and Part Numbers

•	Model:	Technobeam LCD Controller	
٠	Manufacturer:	Lightwave Research	
		2217 West Braker Lane	
		Austin, Texas 78758 U.S.A.	
		U.S.A.	
٠	Distributor:	High End Systems, Inc.	
		2217 West Braker Lane	
		Austin, Texas 78758 U.S.A.	
٠	Product Number:	Technobeam LCD Controller	

Physical Specifications

٠	Controller weight:	21 lbs, 9.5 kg
٠	Dimensions:	cm: 17.78 H x 48.29 W x 26.85 D
		in: 7.00 H x 19.00 W x 10.57 D

Electrical Specifications

•	Rated Voltage:	115/230 VAC Only
•	Rated Current:	.25/.15 A
•	Rated Frequency:	50-60 Hz

Fuses

The primary (line) fuse is accessed from the rear panel of the controller (5mm x 20mm):

- 115 V operation—use 0.5 A, 250 V, Slow Blow Only
- 230 V operation—use 0.3 A, 250 V, Slow Blow Only



Class 1 equipment-For continued protection against electric shock, connect this equipment to a grounded power source only.

Use in dry locations only.

RAM Card

256KB or 512KB Static Random-Access Memory (SRAM), Type 1 PC Card (*nee* PCMCIA adapter). One 512KB RAM card is shipped with the controller; the controller utilizes 256KB of storage space on the RAM card.

You can obtain additional/replacement adapters from your High End Systems dealer/distributor (part number 90303082).

Safety Standards

- EN 60950 : 1992
 - A1 : 1993
 - A2 : 1994
- UL 1950
- CSA 22.2 No. 950



Electromagnetic Standards

- EN 55022, Class A, ITE, December 1, 1995
- IEC 801-2: 1991, Level 2 (4/8 kV), November 29, 1995
- IEC 801-3: Draft 5, Level 2, (3 V/m), November 29, 1995
- IEC 801-4: 1988, Level 2, (1kV/.5 kV), November 29, 1995

Cables and Connectors

- **DMX data cables:** Belden[®] 9841 or equivalent (meets specifications for EIA RS-485 applications) with characteristics listed below:
 - 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 $100-140 \Omega$
 - 22–24 AWG with insulation having a dielectric rating of 300 volts or higher
- DMX data connectors: 3-pin male and female XLR connectors
- **DMX data terminators:** Male XLR connector with 120 ohm terminator (see Chapter 2)
- All other cables (listed below): 2-conductor shielded cable
 - Master/Slave cable
 - Remote Enable cable
 - Stereo Audio Input cable
- **Remote enable connector:** 3.5 mm (1/8 in) tip/ring connector as shown in Figure 6-6 on page 6-28.
- **Connectors listed below:** 6mm (1/4 in) tip/ring/sleeve connector
 - Master/Slave connector
 - Stereo Audio Input connector

Table 1-1 below shows the optional accessories for the Technobeam LCD controller available from your High End Systems dealer/ distributor:

Name	Part Number
Status Cue [®] controller	Call [*]
Unprogrammed RAM card	90303082
Heavy duty 3-pin XLR cable (10')	55050005
Heavy duty 3-pin XLR cable (25')	55050006
Heavy duty 3-pin XLR cable (50')	55050007
Heavy duty 3-pin XLR cable (100')	55050008

Table 1-1. Technobeam Optional Accessories

Call^{*} - Contact either your High End Systems dealer/distributor, High End Systems Sales, or the High End Systems World Wide Web site.

High End Systems International Sales: See the inside title page of this manual

High End Systems World Wide Web site:

http://www.highend.com

Setting the Controller Voltage

At the time of this writing, the Technobeam LCD controller is shipped from the factory set to 230V, 50Hz. Carefully examine the controller's voltage setting (as shown in Figure 1-1 on page 1-8), then follow the instructions in this section if you need to change it.



WARNINGS (1) Check the voltage selection switch before proceeding with the equipment setup! Be sure to match the voltage selection switch to your power source prior to operating this equipment. Do not set the voltage selection switch with the equipment plugged in.

> (2) Before selecting a voltage, you should verify the correct voltage setting with a local authority. Selecting an incorrect voltage will result in an electric shock hazard and can cause injury to persons as well as damage the fixture. High End Systems, Inc. can accept no responsibility for damage to your controller or other equipment caused by an incorrect voltage setting.

Set or Verify Controller Voltage

To change or verify the controller's input voltage setting, locate the voltage selection switch on the rear panels shown in Figure 1-1 on page 1-8.

115 volts – This setting should be used for power supplies rated from 90V to 127V. Slide the switch so that "115" appears inside the switch opening. You must also do both of the following:

- 1. Change the controller's fuse as shown in the section titled "Replacing the Fuse" on page 1-8.
- 2. Verify the controller's frequency by setting personality switch B-2 as shown in the section titled "Switch B-2: Time Base" on page 2-8.

230 volts – This setting should be used for power supplies rated from 180V to 250V. Slide the switch so that "230" appears inside the switch opening. You must also do all of the following:

- 1. See the section titled "Power Cord Cap" on page 1-9.
- 2. Change the controller's fuse as shown in the section titled "Replacing the Fuse" on page 1-8.
- 3. Verify the controller's frequency by setting personality switch B-2 as shown in the section titled "Switch B-2: Time Base" on page 2-8.



Caution Do not plug a controller set to 115 volts into a 230 voltage source. Permanent damage will occur.



Figure 1-1. Location of the controller's voltage selection switch and fuse.

Replacing the Fuse

You must replace the controller's fuse whenever you change the voltage setting or after the fuse becomes damaged. Before attempting to replace the controller's fuse, you must obtain a replacement fuse *of the same type and rating*. Both fuses listed below are 5mm x 20mm.

115 V operation—use 0.5 A, 250 V, Slow Blow Only230 V operation—use 0.3 A, 250 V, Slow Blow Only



- 1. Unplug the controller from the power source.
- 2. Using a small screwdriver, carefully push in on and turn the fuse holder counter-clockwise and remove it from the controller. The fuse holder is shown in Figure 1-1.
- 3. Replace the fuse with one of the same type and rating only!
- 4. Carefully insert the fuse holder back into the controller and retighten it by turning it clockwise.
- 5. If this is a new controller, continue with Chapter 2.

Power Cord Cap

If you wish to attach the controller to a 230VAC outlet, you must replace the molded power cord cap provided with the controller with another suitable type of power cord cap. The type of power cord cap you must obtain depends on the location in which the controller will be used.

Note Because of the wide variety of power cord caps used worldwide, High End Systems, Inc. cannot make specific recommendations for the particular power cord cap you should use. Contact a local authority if you are unsure which type of power cord cap you need.

IMPORTANT The cores in the mains lead are colored in accordance with the following code:

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

Important Power Cord Cap Information - U.K. Only

Since the colors of the cores in the mains lead of this equipment may not correspond with the colored markings identifying the terminals in your plug, proceed as follows:

- The core which is colored 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 colored green or green and yellow.
- The core which is colored blue must be connected to the terminal which is marked with the letter "N" or colored black.
- The core which is colored brown must be connected to the terminal which is marked with the letter "L" or colored red.



Class 1 equipment: THIS EQUIPMENT MUST BE EARTHED.

Vigtig Sikkerhedsinformation - DANMARK

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt!

Ledere med gul/groen isolation maa kun tilsluttes en klemme maerket



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The Technobeam LCD controller uses its native DMX 512 protocol (language) to control Technobeam fixtures.

Selecting Technobeam Protocol

Each fixture connected to the Technobeam LCD controller *must be* configured for Technobeam full protocol, even if the fixture is a Technopro or a Technoray.



Caution Failure to select the Technobeam protocol for Technopro and Technoray fixtures will prevent them from functioning properly.

Use the procedure below to confirm or change the fixture's protocol:

- 1. Power on the fixtures after following all of the instructions in Chapter 1 of the *Technobeam User Manual*.
- 2. Access the fixture's top-level **Addr** menu in one of the following ways:
 - a. If you have just powered up the fixture, press and hold the <Menu> key until **ADDR** appears in the LED display.
 - b. If you are currently in the menu system, keep pressing the <Menu> key until **ADDR** appears in the LED display.
 - **Note** If **MENU** is showing in the LED display, press the <Enter> key to display the ADDR option.

MOde

RddR

- 3. Use the <Up> and <Down> arrow keys to navigate to the **MODE** menu.
- 4. Press <Enter>, then use the <Up> and <Down> arrow keys to select **TB F** (Technobeam full, 18-channel protocol).
 - 5. Press <Enter>; if you changed from another fixture type, the fixture resets itself and homes.

Setting a Fixture Number

Before using the controller with Technobeam fixtures, you must select a fixture number for each fixture.

You must assign a unique fixture number, from 1 through 16, to each Technobeam fixture you wish to respond independently to control commands. Multiple fixtures can be assigned the same fixture number if you want them all to respond to the same set of control commands. *Do not use a fixture number higher than 16* because the controller will send only fixture numbers 1–16.

The order in which you assign fixture numbers is not important; use any numbering scheme you wish. (For example, the first fixture in the link does not have to be fixture number 1; it could be fixture number 16.)

- 1. Access the fixture's top-level **Addr** menu in one of the following ways:
 - a. If you have just powered up the fixture, press and hold the <Menu> key until **ADDR** appears in the LED display.
 - b. If you are currently in the menu system, keep pressing the <Menu> key until **ADDR** appears in the LED display.
 - **Note** If **MENU** is showing in the LED display, press the <Enter> key to display the ADDR option.
 - . Press the <Enter> key to view the current fixture number. It should appear in the format **F xx**.
 - **Note** If the display is *not* in the format **F xx** as shown at left, you must follow the instructions in the next section, titled "Selecting Fixture Numbering" on page 2-4. *Do not continue with this procedure.*
- 3. Use the <Up> and <Down> arrow keys to change the fixture number if needed. Do not select a fixture number higher than 16 (or **F** 16) because the controller will send only fixture numbers 1—16.
 - **Note** You must select a unique fixture number for each fixture you wish to respond independently to control commands. Selecting the same fixture number for more than one fixture means that all fixtures will respond to the same set of control commands.

However, the Technobeam fixture has several built-in random (or unsynchronized) effects which work randomly even if multiple fixtures are assigned the same fixture number. For more information, see the section titled "Synchronized and Random Effects" on page 3-2.

4. Press the <Enter> key to save the fixture number and continue with the section titled "Cables and Terminators" on page 2-10.







Selecting Fixture Numbering

The Technobeam LCD controller *requires* each fixture to be assigned a fixture number rather than a DMX start channel, so if the display indicates the fixture is currently set for DMX start channel, you must change it using the procedure below:

- 1. Access the fixture's top-level **Addr** menu in one of the following ways:
 - a. If you have just powered up the fixture, press and hold the <Menu> key until **ADDR** appears in the LED display.
 - b. If you are currently in the menu system, keep pressing the <Menu> key until **ADDR** appears in the LED display.
 - **Note** If **MENU** is showing in the LED display, press the <Enter> key to display the ADDR option.
- 2. Use the <Up> and <Down> arrow keys to select SET.
- 3. Press the <Enter> key, then use the <Up> and <Down> arrow keys to select **CHNL**.
- 4. Press the <Enter> key, then use the <Up> and <Down> arrow keys to select **ADDR**.
- 5. Press the <Enter> key to save your selection, then use the <Up> and <Down> arrow keys to navigate to the top-level **ADDR** menu option.
- 6. Repeat the procedure in the section titled "Setting a Fixture Number" on page 2-2.



SET

EHNL



Figure 2-1 shows the locations of the connectors on the rear panel of the Technobeam LCD controller.



Figure 2-1. Connectors on the controller's rear panel.

Data Link Out port: An XLR female jack that sends control data to all connected fixtures. For more information, see the section titled "Linking Fixtures to the Controller" on page 2-15.

Personality switches: The four switches in switch block A are reserved for future use. The eight switches in switch block B define the controller's modes of operation. For more information, see the section titled "Setting the Switches" on page 2-6.

Serial port RS-232 (communication): Standard PC AT[®] style 9-pin serial communications port conforming to the RS-232C (also known as EIA-232-D) standard. This port is used for playback control using Lightwave Control Center (LCC) software, or for backing up/restoring memories and pages using a personal computer. The port operates at 9600 baud, 8 data bits, no parity, and 1 stop bit. For more information, see the section titled "Other Connectors" on page 2-18.

MIDI In/Out ports: Where MIDI signals enter and exit the controller using standard MIDI connections. The controller supports the MIDI Show Control "GO" command. For more information, see the section titled "MIDI In and Out Ports" on page 2-16.

Master/Slave ports: Ports for interconnecting master and slave controllers. Use the master/slave feature to expand the system to more than 16 unique fixtures. For more information, see the section titled "MIDI In and Out Ports" on page 2-16.

Analog inputs: Locking 8-pin DIN connectors that enable remote recall of pages or presets using an analog controller, or that allow an analog controller to act as a submaster. For more information, see the section titled "Other Connectors" on page 2-18.

Remote Enable port: Enable/disable the controller from a remote location. For more information, see "Remote Enable" on page 6-28.

Stereo Audio Input: Use a stereo source to trigger audio effects, such as audio advance, color, litho and dim modulate. The sensitivity of the audio effects is controlled from the front panel of the controller using the Audio knob. For more information, see the section titled "Audio Input Playback" on page 6-25.

Setting the Switches

The two blocks of Personality DIP (dual in-line package) switches located on the controller's rear panel are labeled A and B.

Configuring Switch Block A



Switch block A is currently not used, and all four switches must be set to the OFF position.

Configuring Switch Block B



This section describes the functions of the eight switches in Personality switch block B.

All Switches OFF: Default Configuration

The controller is shipped with all Personality "B" switches set OFF, which configures the controller as follows:

- Master controller
- 50Hz input voltage frequency (see page 2-8)
- Page access (see page 2-8)
- Twelve-level preset access (see page 2-8)
- Dependent presets (see page 2-9)

Switch B-1: Master or Slave

Each controller supports up to 16 unique fixtures (16 fixtures that can be programmed to operate independently of each other). In order to expand your system to more than 16 independently-programmable fixtures, you can interconnect master and slave controllers.

You can set the controller to operate as either a master or a slave (there can be only one master controller per link). Your choice of master and slave controllers determines the following:

- The *master* controller determines the modes of playback for all controllers that are slaved to it. The master controller sets all standby, advance, and modulate settings. Only the master controller accepts commands from a lighting console, if any. Only one master controller is allowed per link.
- The *slave* (also called *slaved*) controllers retain their programming and editing functions, but cannot play back any programs. The accessible function keys on the slaved controllers are the power key switch, <Home>, <Select>, <Record>, <Erase>, and all of the Construct keys. There is no limit to the number of slaved controllers that can be attached to the master controller.

Switch B-1 Off (default; correct setting for a stand-alone controller) – the controller functions as a master and determines the modes of playback for all controllers that are slaved to it. The slave LED indicator will be OFF when the controller is set as a master. All front panel keys function normally.

Switch B-1 On – the controller operates as a slave. The slave controller can be connected the master controller via the Slave port located on the rear panel of the controller. The Slave LED located above the power key switch is ON when the controller has been configured as a slave.
Switch B-2: Time Base

Switch B-2 sets the controller's input voltage frequency at either 50 Hz or 60 Hz. This setting must match the input voltage frequency of your power source because the controller senses this frequency as part of its internal timing circuits.

Switch B-2 Off (default) – the controller operates at 60 Hz

Switch B-2 On – the controller operates at 50 Hz



Caution Selecting the incorrect time base (frequency) will result in erratic program playback. In general, the default setting (60 Hz) is appropriate for North American countries and the 50 Hz setting is appropriate for European countries. Consult a local authority if you are unsure which time base setting to use.

Switch B-3: Page or Preset Access

Switch B-3 determines how the controller responds to the Analog Inputs port as follows (for more information, see the section titled "Remote Page Access" on page 6-13 and "Remote Preset Access" on page 6-15).

Switch B-3 Off (default) – An attached analog controller accesses the pages in memory.

Switch B-3 On – An attached analog controller selects the controller's preset levels.

Switch B-4: Not Used

This switch is not used and should always be set OFF.

Switch B-5: Binary Preset Access

Switch B-5 Off (default) – (Twelve-level preset access.) An analog controller accesses each of 16 presets on 12 independent levels for a total of 192 presets. You must also select preset level access by setting switch B-3 ON.

Switch B-5 On – When switch B-5 is ON, an analog controller accesses the first 10 of the 12 analog input channels in binary combinations to provide remote access to 1023 presets. You must also select preset level access by setting switch B-3 ON.

Channels 11 and 12 control blackout and standby, as shown below:

- **Channel 11 (blackout):** closes all fixtures' shutters but wheels and effects continue to run.
- **Channel 12 (standby):** activating channel 12 when the controller is in standby (Standby LED is ON) takes the controller out of standby. Activating channel 12 when the controller is *not* in standby (Standby LED is OFF) has no effect. When the controller is in standby, all fixtures' shutters close and any in-progress wheel and effect changes stop immediately. Controller pages continue to advance.

Switch B-6: Dependent/Independent Presets

Switch 6 sets the mode of the presets as they relate to the master controller.

Switch B-6 Off (default) – Dependent Presets; the controller behaves as follows:

- The master controller's master intensity setting controls slaves.
- Slaved controllers' modulation effects respond to audio input at the master controller.
- Presets use their programmed master intensity value.

Switch B-6 On – Independent Presets; the controller behaves as follows:

- The master intensity recorded in each preset is ignored. Master intensities will remain as-is during preset playback. Slave controller master intensity is not affected or controlled by the master controller. Slave controllers will each accept independent master dim settings via Lightwave Show Control protocol.
- Slaved controllers' modulation effects respond to the audio input of each individual controller. Sequencing (Auto, Audio 1 and 2) is controlled by the master controller.
- Each controller uses its local audio input for audio effects. Advance modes (Auto, Audio 1 and 2) are still determined by the master controller.
- **Note** Although the intensity setting is not recalled, intensity is recorded with presets for compatibility with Dependent Presets.

Switches B-7 and B-8: Not Used

Switches B-7 and B-8 are not used and should always be set OFF.

There are two main types of cabling you can use: data-grade cable and microphone cable. Although pin-compatible microphone cable is suitable for small-scale designs, data cable is recommended, especially for longer cable runs. Data cable is designed to carry a higher-quality signal with less susceptibility to electromagnetic interference.

The cable you use should have the characteristics listed below:

- 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
- 22-24 AWG with insulation having a dielectric rating of 300 volts or higher

Belden® 9841 data-grade cabling meets specifications for EIA RS-485 applications and is highly recommended for use with Technobeam.

Constructing Cabling

If you need to construct cabling, you must use a shielded, twoconductor cable with a male 3-pin XLR connector on one end and a female 3-pin XLR connector on the other end. Pin 1 is the common (cable shield), pin 2 is the data complement (negative), and pin 3 is the data true (positive).



Figure 2-2. Properly-constructed data cabling.

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.

Terminators

The last device on each link must have a 120 ohm, 1/4 watt (minimum) terminator attached to its Data Out connector. You can construct terminators by following the instructions in Figure 2-3:

- 1. Obtain a male XLR connector.
- 2. Disassemble the connector.
- 3. Solder a 120 ohm resistor, minimum of 1/4 watt, between pins 2 and 3.
- 4. Reassemble the connector.
- 5. Install the terminator in the Data Out port of the last device in the link.

Figure 2-3. Constructing a data cable terminator.



Connection Rules

Before continuing, you need to understand the following rules:

- Each controller supports up to 16 unique fixtures. If you want to connect more than 16 fixtures to a controller, some of the fixtures will have to share the same fixture number, and will thus respond to the same set of control commands.
- **Note** The Technobeam fixture has several built-in random (or unsynchronized) effects which work randomly even if multiple fixtures are assigned the same fixture number. For more information, see the section titled "Synchronized and Random Effects" on page 3-2.
- You can expand your system beyond 16 independently-operating fixtures by connecting master and slave controllers together.
- A serial data distributor must be used if either of the following is true:
 - You wish to connect more than 32 fixtures to a controller or more than 32 master/slave controllers together.
 - The end-to-end cable span (the total length of all cables) on any link exceeds 500 ft. (153 m).

The serial data distributor regenerates and retimes the signal; failure to use it can result in data errors.

Examples

Example #1: One controller is connected to 16 fixtures, each of which will respond independently to control commands.



Figure 2-4. Each of the eight fixtures connected to this controller responds independently to control commands.

The example above shows one Technobeam LCD controller connected to 16 Technobeam, Technopro and Technoray fixtures. Each fixture is numbered 1 through 16 using the fixture's menus (see "Setting a Fixture Number" on page 2-2). A terminator must be attached to the Data Out connector of the last Technobeam fixture in the link (see "Terminators" on page 2-11).

Because each fixture has a unique fixture number, each one responds to commands from the controller independently from the other fixtures.

Notice that Technobeam, Technopro and Technoray fixtures are mixed on the link in no particular order. As long as the fixtures are all configured for Technobeam full protocol (as shown in "Selecting Technobeam Protocol" on page 2-2), you can order them in the link any way you like.

Since fewer than 32 fixtures are attached to the controller and because no cable spans more than 500 ft. (153 m), a serial data distributor is not required.

Example #2: Multiple controllers are linked together as masters and slaves. One link spans more than 500 ft (153 m).



Figure 2-5. This example shows three controllers interconnected via their Master and Slave ports. The master controller provides a single point of playback control.

In the example above, three Technobeam LCD controllers are connected to multiple fixtures. The first controller is designated as the master controller by setting switch B-1 to OFF. The other two controllers are slaves (switch B-1 set to ON). *Only one master controller is allowed per link.*

The master controller controls playback of programs that have already been created on the slaves. (You program the slave controllers independently, then play back the programs from the master controller.) The master controller can also be linked to a lighting console via its MIDI, serial or analog ports. *Only* the master controller (not the slaves) can accept commands from the lighting console.

The system shown in Figure 2-5 can support up to 48 independentlyfunctioning Technobeam fixtures (16 for each of the three controllers). Also notice that fixtures are numbered non-sequentially. The Technobeam LCD controller recognizes fixtures numbered in any order you wish, as long as all fixtures are numbered between 1 and 16.

Also notice that Technobeam, Technopro and Technoray fixtures are mixed on the link in no particular order. As long as the fixtures are all configured for Technobeam full protocol (as shown in "Selecting Technobeam Protocol" on page 2-2), you can order them in the link any way you like.

Linking Fixtures to the Controller

1. Start with the controller. Connect 3-pin data-grade XLR cable to its Data Out connector, as shown in Figure 2-6:



Attach a male 3-pin XLR connector

Figure 2-6. Connect the male end of a 3-pin XLR cable to the controller's female Data Out port.

- 2. Connect the female end of the XLR cable from the controller to the first Technobeam fixture's male Data In connector.
- 3. Connect the male end of another XLR cable to the first Technobeam fixture's female Data Out connector.
- 4. Continue connecting the Data Out connector from one Technobeam to the Data In connector to the next Technobeam until you have linked all of the Technobeam fixtures. It is not necessary to connect fixtures in any particular order; connect them in a way that results in the least amount of cabling.
- 5. Connect other devices to the Technobeam fixtures as desired, using the instructions in the documentation provided with those devices.
- 6. Place a male 120 ohm terminator on the female Data Out connector of the last device in the link. The procedure for making a terminator can be found in the section titled "Terminators" on page 2-11.

The controller supports the MIDI Show Control (MSC) "GO" command, a subset of the MIDI (Musical Instrument Digital Interface) specification. Typically, MSC is used either to connect different types of controllers to each other (for example, Technobeam LCD controllers and Intellabeam[®] LCD controllers), or to connect a master controller to a lighting console.



Figure 2-7. Location of MIDI In and Out ports.

Master and Slave Controllers

Each controller supports up to 16 unique fixtures (16 fixtures that can be programmed to operate independently of each other). In order to expand your system to more than 16 independently-programmable fixtures, you can interconnect master and slave controllers.

There is no limit to the number of slave controllers you can have in your system.

Designating Master and Slave Controllers

The differences between master and slave controllers are explained below:

- The *master* controller determines the modes of playback for all controllers that are slaved to it. The master controller sets all standby, advance and modulate settings. Only the master controller (not any of the slaves) communicates with a lighting console, if any. Only one master controller is allowed per link.
- The *slave* (also called *slaved*) controllers retain their programming and editing functions, but cannot play back any programs. (Programs on the slaved controllers are played back by the master controller.) The accessible function keys on the slaved controllers are the power key switch, <Home>, <Select>, <Record>, <Erase>, and all of the Construct keys.
- 1. Set personality switch B-1 on the rear panel of each slaved controller to ON. Refer to Figure 2-1 on page 2-5 for the location of the switches. The Slave LED (located above the Power key switch) turns ON.
- 2. Connect a shielded, 2-conductor cable with a 6 mm (1/4 inch) tip/ring/ sleeve connector on each end from the master controller's Master (out) connector located on the rear panel to the slave controller's Slave (in) connector.
- 3. To slave more than one controller to a master controller, continue connecting cables from one controller to the next, as shown in Figure 2-5 on page 2-14.



Figure 2-8. Location of the Master and Slave ports on the controller's rear panel.

This section describes how to connect cabling to the other connectors on the controller's rear panel. Because these other connectors are used in conjunction with advanced functions described further in Chapters 6 and 7, only a brief explanation is found here.



Figure 2-9. Locations of the other connectors on the controller's rear panel.

Serial port RS-232 (communication): Connect the male end of a standard 9-pin serial communication cable to this port for playback control using Lightwave Control Center (LCC) software, or for backing up/restoring memories, pages and presets using a personal computer. The port operates at 9600 baud, 8 data bits, no parity, and 1 stop bit. For more details about using this port with LCC, see the section titled "Lightwave Control Center" on page 6-28. For more information about backup/restore, see Chapter 7.

Analog Inputs ports: Two locking 8-pin DIN connectors that enable the remote recall of pages or presets using an analog controller. The first connector is for analog channels 1 through 6; the second connector is for analog channels 7 through 12. For more details about the usage of this port, see the section titled "Analog Inputs Ports" on page 6-12.

Remote Enable port: Use the Remote Enable signal to enable and disable the controller from a remote location. Connect a shielded 2-conductor cable with a 3.5 mm (1/8") tip/ring connector to the controller's mini-microphone jack and use it as follows:

- 0 volts DC disables the controller (all fixtures go dark and all inprogress wheel and effects moves finish immediately)
- 5 volts DC (minimum) to 16 volts DC (maximum) to enable the controller (return it to its previous state of operation)

For more details about the usage of this port, see the section titled "Remote Enable" on page 6-28.

Stereo Audio Input port: Connect a shielded 2-conductor cable with a 6mm (1/4inch) tip/ring/sleeve connector to this port to control Technobeam fixture audio playback from a stereo source. Sensitivity to the audio signal is controlled from the front panel of the controller using the <Audio> knob. For more details about the usage of this port, see the section titled "Audio Input Playback" on page 6-25.

Rack Mounting the Controller

After configuring the controller and connecting cables as described earlier in this chapter, you can mount the Technobeam LCD controller in a standard 19-inch rack as described in this section.

The Technobeam LCD controller is designed to mount into a standard 19-inch equipment rack as specified by the MIL-STD-189 and ANSI/EIA RS-310-C-77 specifications. The unit occupies four standard rack spaces.



1. Insert the unit into the front of the equipment rack. There must be at least 7 inches of available rack space. Be sure to feed the power cord in first, being careful not to pinch or otherwise damage the power cord. Do not use the unit if the power cord is damaged.

- 2. Attach the unit to the equipment rack by placing mounting screws through the two mounting holes behind the handles on each side of the controller. Attach the unit by the lower two mounting holes first as this is where the majority of weight is supported. Finish by attaching the unit through the remaining two holes.
- 3. The primary disconnect on this device is the power cord. The cord should be accessible or be placed into a power strip with an accessible on/off switch.

Powering On the Controller

Before continuing, make sure you have done all of the following:

- 1. Selected the controller's voltage and frequency as described in the section titled "Setting the Controller Voltage" on page 1-7.
- 2. Installed the correct fuse as described in the section titled "Replacing the Fuse" on page 1-8.
- 3. Configured the controller's switches as described in the section titled "Setting the Switches" on page 2-6.
- 4. Configured and connected the fixtures as described in the section titled "Linking Fixtures to the Controller" on page 2-15. (Also see the *Technobeam User Manual* for additional details, such as mounting, not covered here.)
- 5. Connected cabling to the controller as described in the sections titled "Cables and Terminators" on page 2-10 and "MIDI In and Out Ports" on page 2-16 and "MIDI In and Out Ports" on page 2-16 and "Other Connectors" on page 2-18.
- 6. *Optional.* Rack mounted the controller as described in the section titled "Rack Mounting the Controller" on page 2-19.

Procedure for Powering On

1. Connect all fixtures to suitable power outlets. Consult the documentation provided with the fixtures for details.

2. Insert the controller power key into the controller's front panel power key switch and turn the key clockwise. The location of the key switch is shown in Figure 2-10.



Keyed power switch

Figure 2-10. Locations of the power key switch, the <Standby> key and Standby LED.



Caution Do not touch the joystick when applying power to the controller; the controller uses the initial position of the joystick as a reference point.

- 3. The LCD window briefly shows the Boot version number and all LEDs flash. In a moment the Standby, Address, and any initialized or programmed Address/Preset LEDs light.
- 4. If a RAM card containing memory (memories, pages, presets, etc.) is inserted in the slot, the contents of the RAM card are checked against the contents of memory.
 - If the contents of memory and the RAM card match, the controller is placed in *mirror mode* and all future programming is automatically copied to the card.
 - If the contents of memory and the RAM card do not match, the message below is displayed. If you want to save your programming to the RAM card, you must use the backup instructions in Chapter 5.

Mirror mode card does not match memory. Use backup menu to activate mirror mode.

5. If there is a RAM card containing operating system data in the RAM card slot, the LCD display shows a message that asks you whether or not you want to replace the controller's operating system with the

operating system saved on the RAM card. Follow the instructions in the LCD display to proceed. If you do not respond within a few seconds, the controller performs its self-test.

- 6. If there is an incorrectly-formatted or blank RAM card inserted, an error message is displayed. You do not need to do anything; the controller will boot up normally.
- 7. After the RAM card operations, the controller performs a self-test. The LCD display shows: Checking memory x, Please wait. as it runs the self-test. The self-test counts through the memories from 1 to 9 slowly and then again quickly.
- 8. After the self-test, the controller's LCD display appears as shown below:



9. At the same time, the lamps of all connected fixtures turn ON and all connected fixtures are homed. Homing a fixture returns the wheels to their home (default) positions; and sets the dim, pan and tilt to their home (default) positions.

If any fixture fails to home, check its front panel display and refer to the *Technobeam User Manual* for troubleshooting suggestions.

Chapter 3 Overview of Controller Operation

This section gives you some information you need to understand about constructs before using the Technobeam LCD controller.

Multiple-Construct Control

The rotating litho wheel, color wheel and rotating effects wheel are all controlled using multiple constructs. For example, there are four constructs (Litho, Rotate, Func and Mode) that together control the function of the rotating litho wheel as shown in the section titled "Litho, Rotate and Func Keys" on page 3-8. Make sure you select values for *all* constructs using the keys and menus.

Synchronized and Random Effects

Unsynchronized (*random*) effects mean different fixtures are doing different things (random shutter "strobing" or random color changes) at the same time. These built-in effects require no additional programming.

Random (Unsynchronized) Effects

- **Shutter strobing:** Fixtures "strobe" at random intervals, at rates you set. See "Gate Key" on page 3-12.
- **Random color changes:** Fixtures "snap" to colors at random intervals, at rates you set. See "Color Key" on page 3-10.
- **Random litho changes:** Fixtures "snap" to lithos at random intervals, at rates you set. See "Litho, Rotate and Func Keys" on page 3-8.

Synchronized Effects

All other constructs (including "periodic" shutter strobing) are synchronized between multiple fixtures.

Selected Constructs

The following sections give you general information about selected constructs and their values.

Macros

Technobeam, Technoray and Technpro have 28 selectable macros to simplify programming. A *macro* is a set of preconfigured constructs you can use with any other constructs you want. The only exception is the Laser Aiming Device for Technobeam; you cannot use the Laser Aiming Device and macros at the same time.

Fixture macros should not be confused with User key macros, as shown in the section titled "Front Panel Descriptions" on page 3-4.

MSpeed vs. Fast Changes

There are two different ways you can choose to move the color wheel, rotating litho wheel and effects wheel: fast changes or MSpeed changes.

A *fast* change means the color, litho or effects movement is completed in the shortest amount of time after the wheel starts moving.

An *MSpeed* (motor/mirror speed) change occurs smoothly over the entire MSpeed time value. For example, if you choose a value of 86 for the MSpeed construct, the selected transition will occur smoothly over 2.86 seconds.

Note If the MSpeed time value you select is longer than the value for Delay, the controller may advance to the next page before the color, litho or effect change has completed.

MSpeed time values are displayed when you select a value for the MSpeed construct.

Ramp Up, Ramp Down

The Shutter construct includes parameters named "Ramp up" and "Ramp down". *Ramp up* means the shutter opens gradually at a selectable length of time; the shutter then *snaps* shut (closes quickly). *Ramp down* means the shutter snaps open, then closes gradually at a selectable length of time. A lower value always means a longer ramp time, and a higher value always means a shorter ramp time.

Forward and Reverse Spins

A *forward* spin on all wheels and positions means the wheel or position spins clockwise as you're looking at the projected image. A *reverse* spin means the wheel or position spins counter-clockwise.

Front Panel Descriptions

Figure 3-1 is the first of two drawings that show groups of keys on the controller's front panel. Descriptions of these key groups follow the figure.





Address/Preset keys:

ADDRESS

<Address>/<Preset> key: This key toggles the controller between Address mode and Preset mode, described below. The controller's current state is indicated by either the Address or Preset LED being ON.

Each of the 16 numbered keys has an LED that provides visual confirmation of active fixture numbers and presets.

- In **Address mode** (the default mode), these keys correspond to the 16 fixture numbers. You use the 16 Address keys to select one or more fixture numbers for programming, editing, or viewing parameters. An Address LED is ON to indicate a fixture corresponding to that fixture number has been programmed with its light gate (shutter) open.
- In **Preset mode**, these keys correspond to 16 programmable presets in each of the 64 *preset banks*. Each preset is capable of storing a single page or a loop of pages (up to 99 consecutive pages) for instant recall. A Preset LED is ON to indicate a stored preset. For more information, see the section titled "Preset Programming" on page 4-19.

LCD status display: Displays current selections, menu choices, help or status information.

User keys: The controller has eight keys that can function as audio advance/modulate keys, or that you can custom program as macros. A *macro* is a recording of keystrokes that you assign to one of the User keys. Pressing that User key plays back the exact same sequence of keystrokes.

For more information, see the section titled "User Key Macros" on page 6-8 and "Audio Input Playback" on page 6-25.

User key macros should not be confused with fixture macros as described in the section titled "Macros" on page 3-3.

Power/Slave/Standby:

- POWER
- The keyed power switch turns on the controller and enables any connected fixtures. The key provides protection from unauthorized users.

STANDBY

- When the Slave LED is ON, the controller is being used as a slave. For more information, see the section titled "MIDI In and Out Ports" on page 2-16.
- Pressing the <Standby> key toggles the controller in and out of Standby; in Standby, all fixtures' shutters close and any in-progress wheel or effect changes stop immediately. Controller pages continue to advance in Standby, however. The controller defaults to Standby whenever you power it up (the Standby LED is ON).

RAM card slot: Insert a RAM card (Type 1, 256KB or 512KB SRAM PC Card) into this slot to store a copy of the controller's operating system, to install an updated version of the operating system, or to transfer programs into or out of the controller's memory. For more information, see Chapter 7.

Select/Record/Erase keys:



Select key: Use this key for programming, editing, and manual control of selected fixtures. For more information about programming, see Chapter 4.



- **Record key:** In Address mode, this key records the current page/ scene for the selected fixture numbers (fixtures). In Preset mode, this key records a preset. For more information about programming, see Chapter 4.
- **Erase key:** Use this key to erase page memory, or to create an "uninitialized" page. For more information about un-initialized pages, see the section titled "Step 2: Record Un-Initialized Pages" on page 4-15.



Advance/Rate controls:



level

Auto (advance) key: When you press this key, the controller advances pages automatically at a rate set by the <Rate> knob. For more information, see the section titled "Setting Rate and Delay Time" on page 4-17.

- **Rate knob:** Use this knob to regulate the speed of page changes in auto advance. For more information, see the section titled "Setting Rate and Delay Time" on page 4-17.
- **Audio knob:** Use this knob to adjust the controller's audio sensitivity. For more information, see the section titled "Audio Input Playback" on page 6-25.
- (Audio) level LED: Displays the presence and relative strength of the audio input signal. For more information, see the section titled "Audio Input Playback" on page 6-25.



Figure 3-2. Second of two drawings showing groups of keys on the Technobeam LCD controller's front panel.

Construct/Cursor/Page control keys:



•

- **Construct Up and Down arrow keys:** Change the parameter (value) of the selected construct. For more information, see the section titled "Using the Construct Keys" on page 3-7.
- **Cursor arrow keys:** have different functions, depending on the context:



The <Up> and <Down> arrow keys change which memory you're programming pages in. For more information about programming, see Chapter 4.



- During programming, the <Left> and <Right> arrow keys move you through the list of constructs. For more information about programming, see Chapter 4.
- When you are using the menus, the <Left> and <Right> arrow keys move you through the menu options, the <Down> arrow key moves you down through the menus one level at a time, and the <Up> arrow key moves you up through the menus one level at a time. For more information, see Chapter 5.
- **Page Up and Down arrow keys:** these keys change the page number (1–99).

Construct keys: Allow you to program Technobeam fixtures. For more information, see the section titled "Using the Construct Keys" on page 3-7.

Home key: Pressing this key then pressing one or more Address keys closes the shutter and returns the selected fixtures' wheels and motors to their default (home) positions. For more information, see the section titled "Homing Fixtures" on page 4-26.

Joystick: Use the joystick to position the beams of selected fixtures during beam programming. For more information, see the section titled "Pos Key" on page 3-15.

Using the Construct Keys

There are 13 construct keys on the controller's front panel that allow you to custom program Technobeam fixture features.

The construct keys are shown in Figure 3-3. Descriptions of all keys begin on the next page. Appendix B has a complete listing of all constructs, their allowed values and their default values.



Figure 3-3. The 13 Construct keys control features of the Technobeam fixture.

Litho, Rotate and Func Keys

These three constructs (along with Mode, on the next page) together determine the function of the rotating litho wheel as shown in Table 3-1. If you have Technopro, see Table 3-2 on page 3-9. Wheel positions for the factory-installed wheels are shown in Appendix A.

Func		Litho		Rotate	
Value	Description	Value	Description	Value	Description
Indexed	Wheel snaps to center of litho.	1 to 8	Select position.	0.0° to 358.5°	Angular litho orientation from 0° to 358.5°.
Forward rotate	Litho spins clockwise.†	1 to 8	Select position.	0 to 255	Forward spin speed, none to fast.
Reverse rotate	Litho spins counter- clockwise.†	1 to 8	Select position.	0 to 255	Reverse spin speed, none to fast.
Scan	(Also called <i>shake</i>). Wheel moves back and forth, centered on base position.	1 to 8	Select base position.	0 to 255	Scan speed, slow to fast.
Blink	Same as indexed except shutter closes between positions.	1 to 8	Select position.	0.0° to 358.5°	Same as indexed.
Random	Wheel pauses on random positions.	1 to 8	Start position.	0 to 255	Random pause time, long to short.
Extra	Reserved	n/a	Reserved	n/a	Reserved
Wheel spin	Entire wheel spins, not individual lithos.	1 to 8	Has no effect.	Forward /reverse 0 to 127	Reverse 0 (none) to 127 (fast) Forward 127 (none) to 0 (fast)

Table 3-1. Litho, Rotate and Func Constructs

 † - As you view the projected image.

If you have Technopro, the Func, Litho, Rotate and Mode constructs control the second (8-position) color mixing wheel as shown in Table 3-2. Wheel positions for the factory-installed wheels are shown in Appendix A.

Func		Litho		Rotate	
Value	Description	Value	Description	Value	Description
Indexed	Wheel snaps to center of dichroic.	1 to 8	Select position.	n/a	has no effect
Blink	Same as indexed except shutter closes between positions.	1 to 8	Select position.	n/a	has no effect
Random	Wheel pauses on random positions.	1 to 8	Start position.	0 to 255	Random pause time, long to short.
Wheel spin	Entire wheel spins.	1 to 8	Has no effect.	Forward /reverse 0 to 127	Reverse 0 (none) to 127 (fast) Forward 127 (none) to 0 (fast)
Extra	Reserved	n/a	Reserved	n/a	Reserved
Forward rotate	has no effect	n/a	has no effect	n/a	has no effect
Reverse rotate	has no effect	n/a	has no effect	n/a	has no effect
Scan	has no effect	n/a	has no effect	n/a	has no effect

Table 3-2. Litho, Rotate and Func Constructs for Technopro Color Mixing Wheel

Mode Key

Determines the speed of litho wheel changes. There are two options, **Fast changes** and **MSpeed changes**. These options are explained in the section titled "MSpeed vs. Fast Changes" on page 3-3.

Color Key

Three constructs (Color, Func and Mode) together determine the function of the color wheel as shown in Table 3-3. The Func and Mode constructs are available on the menus only; the following sections explain how to access those constructs. Wheel positions for the factory-installed wheels are shown in Appendix A.

The Technopro second color mixing wheel is controlled by a different set of constructs as explained in Table 3-2 on page 3-9.

Func		Color		
Value	Description	Value	Description	
Indexed	The wheel snaps to the center of the dichroic.	1 to 13 1/2 to 13/1	Full color 1 to full color 13 Half color 1 & 2 to half color 13 & 1	
Forward spin	Wheel spins clockwise [†] .	0 to 255	Forward spin speed, none to fast.	
Reverse spin	Wheel spins counter- clockwise [†] .	0 to 255	Reverse spin speed, none to fast.	
Continuous	Continuously-variable wheel position.	See next page.	See next page.	
Slow scan	(Also called <i>shake</i>). Wheel moves back and forth, centered on base position.	1 to 13 1/2 to 13/1	Full color 1 to full color 13 Half color 1 & 2 to half color 13 & 1	
Fast scan	Same as slow scan	same as slow scan	same as slow scan	
Random	Wheel pauses on random positions.	0 to 255	Random pause time, long to short.	
Blink	Same as indexed except the shutter closes between positions.	same as indexed	same as indexed	

Table 3-3. Color Constructs

[†] - As you view the projected image.

Color: Continuous

When you select a value of **Continuous** for the Func construct, then select the Color construct, you can use the Construct <Up> and <Down> arrow keys to select full positions, half-color combinations and variations in between. The LCD display appears similar to the one below when you select the Color construct:

gate dim COLOR —func —mode focus litho -> COLOR: continuous [4.....4/5.] P:x

The wheel will be positioned on whatever is at the center of the LCD display; for example, the display above indicates the color wheel will be positioned between full color 4 and half-color 4 and 5.

Color: Func

The easiest way to access the Func construct is to press the <Color> key, then press the <Right> arrow key to select **Func**. The LCD display should then appear similar to the one shown below:



Note The dashes (—) by **Func** and **Mode** indicate they are associated with the Color construct.

Color: Mode

Use the same basic procedure to access Mode as described for Func above. The LCD display should appear similar to the one below after you select Mode:

gate dim color —func —MODE focus litho -> COLOR MODE: fast changes P:x

The Mode construct determines the speed of color wheel changes. There are two options, **Fast changes** and **MSpeed changes**. These options are explained in the section titled "MSpeed vs. Fast Changes" on page 3-3.

Gate Key

Use this key to set options for the gates (shutters) of selected fixtures. Also see "Dim Key" on page 3-14:

- **Closed:** Shutter is fully closed; no light exits the fixture. You can, however, still use the Technobeam Laser Aiming Device with the shutter closed.
- **Open:** Shutter is fully open.
- **Strobe speed 1 (slow) to 60 (fast):** Regular intervals between shutter openings.
- **Random strobe 1 (slow) to 60 (fast):** Random intervals between shutter openings.
- **Ramp up 1 (slow) to 60 (fast):** Shutter ramps open, snaps shut. Snap time is always short. For more information, see "Ramp Up, Ramp Down" on page 3-3.
- **Ramp down 1 (slow) to 60 (fast):** Shutter snaps open, ramps shut. Snap time is always short. For more information, see "Ramp Up, Ramp Down" on page 3-3.

Delay Key

Use this key to set the amount of time you want the controller to pause on the current page in the loop before advancing to the next page in the loop. You can select from 0 seconds to 99 seconds, or you can select **Hold** which will hold on the page indefinitely until you manually advance (press the Page <Up> arrow key to advance). **Hold** is between the settings of 0 and 99.

The advance rate set by the <Rate> knob changes the delay time. Turning the <Rate> knob clockwise subtracts from the Delay setting; turning the <Rate> knob counter-clockwise adds to the Delay setting.



Note If the controller is using audio advance, the Delay and Rate settings are ignored.

For more information about the <Rate> knob, see the section titled "Setting Rate and Delay Time" on page 4-17.

Effect Key

Three constructs (Effect, Rotate and Mode) together determine the function of the rotating effects wheel as shown below. The Rotate and Mode constructs are available on the menus only. Wheel positions for the factory-installed wheels are shown in Appendix A.

Effect Construct

Select a position on the effects wheel, from 1 (open) to 5.

Rotate Construct

You can select the following values for the Rotate construct:

- **Off:** Selected position does not rotate.
- **Forward 0 (none) to 120 (fast):** Selected position rotates clockwise as you view the projected image.
- **Reverse 0 (none) to 120 (fast):** Selected position rotates counter-clockwise as you view the projected image.

The easiest way to access the Rotate construct is to press the <Effect> key, then press the <Right> arrow key to select **Rotate**. The LCD display should then appear similar to the one shown below:

—mode effect —ROTATE —mode position -> EFFECT ROTATE: off P:x

Note The dashes (—) by **Rotate** and **Mode** indicate they are associated with the Effect construct.

Mode Construct

Use the same basic procedure to access Mode as described for Rotate above. The LCD display should appear similar to the one below after you select Mode:



The Mode construct determines the speed of effects wheel changes. There are two options, **Fast changes** and **MSpeed changes**. These options are explained in the section titled "MSpeed vs. Fast Changes" on page 3-3.

Focus Key

Adjust the variable focus from 0 to 255.

Note In order to precisely focus on an especially detailed image, you might need to adjust the fixture's beam angle as shown in Chapter 1 of the *Technobeam User Manual.*

XFade Key

(Crossfade.) Crossfade affects only two Technobeam, Technopro and Technoray fixture features: Dim and Focus.

Xfade is the length of time required for a value change in one of the two Xfade constructs to complete. You can select a value for Xfade from 0.1 second to 99 seconds.

For example, suppose the Dim construct is set to 99 (full bright) on page 1, and 0 (full dark) on page 2. Setting a value of 3.0 seconds for Xfade on page 2 means the fixture will fully dim out in 3.0 seconds when you advance from page 1 to page 2.

Xfade, like the Delay construct, is a page-wide construct; that is, it affects all fixture numbers (fixtures) on any particular page.

Note *Loop (sequence) only:* If you want a particular transition to be completed before the next page of a loop (sequence) begins, your selection for Xfade must be less than or equal to your selection for Delay. If Xfade is longer than Delay, the transition will not be completed before the next page begins. See "Delay Key" on page 3-12.

Dim Key

Select variable dim from 0 (full dark) to 99 (full bright). The fixture's two dim flags act as both the light gate (shutter) and the dimming mechanism.

MSpeed Key

(Can be referred to as "motor" or "movement" speed.)

The MSpeed construct determines the total length of time a change in the mirror position, rotating litho wheel, color wheel or rotating effects wheel will require to move from one position to another. Two fixtures assigned the same MSpeed value on a page will arrive at their recorded positions (not necessarily *the same* position) at the same time when that page is played back.

When two or more fixtures with the same MSpeed value move, the fixture with the longest distance to travel moves faster than the other fixture(s), but all fixtures on the page arrive at the ending position at the same time.

When you select a value for the Mode construct for the litho wheel, color wheel or effects wheel, there will be a gradual transition from one color, litho or effect to a different color as the fixture moves from one position to another, rather than a *fast* (immediate) color change at the beginning of the wheel movement.

You can select a value from 1 (slowest) to 99 (fastest). MSpeed time values are displayed on the controller.

Pos Key

Technobeam only.

Use this key to select one of 99 user-programmable position presets. (You do not need to press this key if you want to manually position the beam as described below.)

Manual vs. Preset Positioning

There are two ways to position the beam: manually using the joystick or automatically using preset positioning. Preset positioning allows you to store pan/tilt values in the pages of memory 9 for instant positioning.

Manual positioning: If you are programming a very simple show which uses a small number of fixtures and beam position is not expected to change with time (such as a nightclub), you can use *manual positioning*. Manual positioning consists of manually moving the beam with the joystick and recording the position as part of the page. Although slightly simpler than preset positioning, setting a beam position manually makes the position more difficult to change later because you would have to edit every page containing the old position.

Preset positioning: If you are programming a more complex show in which beam positioning is critical and can change with time (such as a touring act), you should use *preset positioning*. With preset positioning, you move the beam to the desired location with the joystick and assign that position to a page in memory 9 (from 1 to 99). You then recall the same position preset by pressing the <POS> key and advancing to the page number containing the preset position you wish to use.

The advantage of preset positioning over manual positioning is that you can change your position presets when the beam position changes, and all pages using that preset are automatically updated.

Note The full set of 99 position presets is available for all fixtures connected to the controller. For example, suppose you have programmed all 99 pages of memory 9 as position presets. All 99 position presets are available for fixture number 1, all 99 position presets are available for fixture number 2, etc.

Laser Construct (Menu Only)

The Laser construct—available only through the menus—allows you to choose macros (for all fixtures) as well as options for the Technobeam Laser Aiming Device. The easiest way to access the Laser construct is (while you're editing a page), press either the <MSpeed> or the <XFade> keys then use the <Right> and <Left> arrow keys to select Laser.

Fixture macros should not be confused with user key macros as shown in the section titled "Front Panel Descriptions" on page 3-4.

The LCD display looks similar to the following when you select the Laser construct using the menus:

—mode position speed LASER xfade delay LASER: off P:x Use the Construct <Up> and <Down> arrow keys to select one of the following values:

- LASER : off—The Laser Aiming Device (LAD) is OFF.
- LASER : on—The LAD is ON continuously.
- **Macro 1** through **Macro 28**—Select from 28 pre-configured sets of constructs that can ease and simplify programming. More about macros can be found in the section titled "Macros" on page 3-3.
- LASER: modulate 1 (slow) through LASER: modulate 120 (fast)— Modulate (pulse) the LAD from 4.25 times/sec to 255 times/sec.
- **Note** The "Laser" parameters apply *only* to Technobeam fixtures with the Technobeam Laser Aiming Device (LAD) installed.



Caution You must follow the important safety information relating to laser use found in the *Technobeam User Manual* (p/n 60600115, v1.0 or later) or the *Technobeam Laser Aiming Device™ (LAD™) Addendum* (p/n 60600112, v1.0).

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The Technobeam LCD controller has 9 separate memories, each containing 99 pages, for a total of 891 pages of program storage.

You can think of the controller's memory as being like a book. The book has 9 chapters (memories) and each chapter has 99 pages.

Page, Construct, Parameter, Loop

Each *page* (which can also be called a *look* or a *scene*) stores a unique combination of *constructs* (fixture features) and their *parameters* (values) which together form a particular look or effect. You can link pages together to form a *loop* (also called a *chase*, a repeating series of pages).

Address and Preset Mode

ADDRES	SS
	1
	1
PRESE	т

The controller has two fundamental modes of operation: *Address mode* (also called *Edit mode*) and *Preset mode* (also called *Playback mode*). The current state of the controller is indicated by which LED on the <Address>/<Preset> key is ON.

A	DDRESS
I	PRESET

Address (Edit) Mode: (Address LED is ON.) In Address mode you program one or more fixtures. Each program is stored as one page (a page consists of a set of constructs and their values); the page resides in one of the nine memories. You can play back the program by manually selecting the memory and page you assigned it to, or automatically using the <Auto> (auto advance) key.



Preset (Playback) Mode: (Preset LED is ON.) In Preset mode you take a program you created in address mode and assign it to one of the 1024 presets (16 presets in each of 64 preset banks). A preset can be either a single page (scene) or a loop (repeating sequence of pages).

Before beginning any programming, make sure the controller appears as shown below:



Figure 4-1. Before programming, make sure the controller's Address LED is ON, the Select and Standby LEDs are both OFF, and the controller is displaying the Intensity, Memory and Page.

Toggle the <Standby> key until the Standby LED turns OFF.

Toggle the <Address> key until the Address LED turns ON.

Toggle the <Select> key until the Select LED turns OFF.

Toggle the <Menu> key until Intensity, Memory and Page is showing in the LCD display.
This section leads you step-by-step through creating a simple fourpage program, playing back the program page-by-page, creating a loop and recording a preset. The example works best with at least one Technobeam or Technoray, but you can follow the same basic procedure for any number or combination of Technobeam, Technoray and Technopro fixtures.

Recording Page 1

- 1. Configure the controller and connect fixtures as described in Chapters 1 and 2. Power ON the controller, then power ON the fixtures if you have not already done so. Make sure the controller appears as shown in Figure 4-1 on page 4-3.
- 2. Set the controller on memory 1, page 1 using the Cursor and Page <Up> and <Down> arrow keys, respectively. The LCD display below shows a controller set for memory 1, page 1:

Page: 1

- 3. Press the <Select> key; it flashes.
- 4. Press the <Address> keys of the fixtures you want to program. For example, if you have one fixture set to fixture number 1, press the <1> key. To select a range of fixtures, press and hold the starting fixture number key then press the ending fixture number key.
- 5. Press the <Gate> key, then use the Construct <Up> and <Down> arrow keys to select **Open**.
- 6. Press the <Func> key (litho wheel function), then use the Construct <Up> and <Down> arrow keys to select Indexed.
- 7. Press the <Litho> key, then use the Construct <Up> and <Down> arrow keys to select any litho position other than 1 (open).
- 8. *Technobeam only:* Use the joystick to position the beam at any location.
- 9. Press the <Focus> key, then use the Construct <Up> and <Down> arrow keys to focus on the litho pattern. Notice how the fixture's highly-optimized optics allow you to focus at different levels of the pattern (especially if you selected one of the Fusion Fire® lithos; see Appendix A for factory-installed wheel positions).

- 10. Press the <Delay> key, then use the Construct <Up> and <Down> arrow keys to select a value of 2.0 seconds.
- Press the <Record> key to save page 1. Notice that the Address LEDs of all fixture numbers you selected are now ON. This is because the shutters of these fixtures are open (you selected **Open** for the Gate construct in Step 5.)

Recording Page 2

You will create page 2 of the sample program using the controller's macro feature, which in effect uses "pre-recorded" construct combinations to simplify and speed up programming.

1. After recording page 1, the LCD display appears as shown below:



2. Press the Page <Up> arrow key to select page 2. The LCD display then appears as shown below:

- 3. Press the <Select> key; it flashes.
- 4. Press the <Address> keys of the fixtures you want to program.
- 5. Press the <Gate> key, then use the Construct <Up> and <Down> arrow keys to select **0pen**.
- 6. The shutter (light gate) will open, and the fixture should be projecting the same litho you selected in page 1.
- 7. Use the Cursor <Right> and <Left> arrow keys to select Laser, as shown below:

—mode position speed LASER xfade delay LASER: off P:2 8. Use the Construct<Up> and <Down> arrow keys to select a macro option. The LCD display will appear similar to the one below:

```
—mode position speed LASER xfade delay
LASER: macro 1 P:2
```

Notice that after you select a macro, the mirror position and the focus both reset to default values (at the same time other constructs change). Macros use *some* but not all constructs, and always allow you to set mirror position, focus, and dim.

- 9. Use the Construct <Up> and <Down> arrow keys to select a macro you like.
- 10. Press the <Focus> key, then use the Construct <Up> and <Down> arrow keys to focus on the macro you selected. Now notice how you can focus on any element of the macro: color, litho, or effect (whichever constructs were part of the macro).

Unless you have a Technopro, most macros you select will include a litho. The next steps show that you *cannot* change constructs that are pre-recorded as part of the macro.

- 11. If the macro you selected has a litho pattern, press the <Func> key, then use the Construct <Up> and <Down> arrow keys to select Indexed.
- 12. Press the <Litho> key, then use the Construct <Up> and <Down> arrow keys to try to change the litho position. Notice that the litho does not change. That is because a litho pattern was pre-recorded as part of the macro.
- 13. If the macro you selected includes a color and/or effects, try changing those values as well.
- 14. You *can*, however, change any construct *not* part of the macro, including focus, mirror position and dim (which are *never* part of a macro).
- 15. Press the <Delay> key, then use the Construct <Up> and <Down> arrow keys to select a value of 3.0 seconds.
- 16. Change any other construct you want, then press <Record> to save the changes.

Recording Page 3

You will create pages 3 and 4 of the sample program using the controller's page copy feature, which copies constructs and parameters from one page to another.

1. After recording page 2, the LCD display appears as shown below:



- 2. Press the <Select> key; it flashes.
- 3. Press the Page <Up> arrow key to select page 3. The LCD display then appears as shown below:



- 4. Press <Record> to complete the page copy.
- 5. The controller is now set for memory 1, page 3.
- 6. Press the <Select> key; it flashes.
- 7. Press the <Address> keys of the fixtures you want to program.
- Press the <Gate> key; notice it is already set to Open; in fact, all construct parameters are now identical for those fixture numbers on pages 2 and 3. This is the result of the page copy.
- 9. Use the Cursor <Right> and <Left> arrow keys to select Laser, as shown below:



The LCD display will still be showing the number of the macro you selected for page 2. This is also the result of the page copy.

- 10. Use the Construct <Up> and <Down> arrow keys to select a value of **Off**. This turns OFF macros.
- 11. Press the <Color> key and select a different color.
- 12. *Technobeam only:* move the mirror to a different location.
- 13. Change any other constructs you want.
- 14. Select a value of **1**.**Ø** for the Delay construct.
- 15. Press <Record> to save page 3.

Recording Page 4

Use the same procedure as for recording page 3, making sure you do all of the following:

- 1. Select a value of **5**.**Ø** seconds for the Delay construct.
- 2. Select a value of **Off** for the Laser construct, which will disable macros.
- 3. Select any combination of other constructs you want.
- 4. *Technobeam only:* Reposition the beam.
- 5. Press <Record> when you're finished.

Manually Playing Back Pages 1 Through 4

1. Use the Page <Up> and <Down> arrow keys to select page 1, as shown below:

```
Intensity: 99 Memory: 1
```

Page: 1

- 2. The fixture(s) programmed for page 1 should now display the constructs you selected for them.
- Press the Page <Up> arrow key to select page 2. The fixture(s) programmed for page 2 should now display the color and position you selected for them. Do the same for pages 3 and 4.

Review

You have now created and manually played back a simple four-page program. The next sections show you how to create a loop out of those four pages and then how to record that loop or any of the pages in the loop as a preset.

Creating a Loop

A *loop* is a sequence of consecutive pages that continually plays back until you stop it.

Normally, you create a loop by bracketing the pages on either side of the loop by un-initialized pages; however, since the first page in this sample loop is page 1, only one un-initialized page is required.

- 1. Use the Page <Up> and <Down> arrow keys to select memory 1, page 5.
- 2. Press the <Select> key; it flashes.
- 3. Press the <Erase> key. The LCD display appears as shown below:



- 4. Press the <Erase> key to un-initialize page 5.
- 5. Use the Page <Down> key to select page 1.
- 6. Press the <Auto> key, located to the right of the joystick.
- 7. The pages in the loop begin playing back as you recorded them. The length of time each page "plays" is set by the Delay construct. Page 1 "plays" for 2 seconds, pages 2 and 3 advance quickly because they are set for 0 seconds, and page 4 "plays" for 5 seconds.
- 8. Turn the <Rate> knob (located under the <Auto> key) all the way clockwise. This speeds up playback, shortening the time between pages. In fact, you might not even see pages 2 and 3 because their delay times were set to zero.
- 9. Then turn the <Rate> knob all the way counter-clockwise, slowing down playback, increasing the time between pages.

Recording a Preset

You can record either the entire loop or any page within the loop as a preset for one-touch playback later.

- If you want to record the entire loop as a preset, start the loop running as described in the previous section.
- If you want to record a single page as a preset, press the <Auto> key to turn OFF the Auto LED, then select the page using the Page <Up> and <Down> arrow keys.
- 1. Toggle the <Address>/<Preset> key until the Preset LED is ON.
- 2. Press the <Select> key; it flashes.
- 3. Press the numbered Preset key where you want to record the preset. For example, to record preset number 1, press the <1> key.
 - **Note** The Technobeam LCD controller supports up to 1024 presets from the front panel through the use of *preset banking*. In this simple procedure you do not need to use it, but if you would like to learn more, see the section titled "Preset Programming" on page 4-19.
- 4. Press <Record>. You are finished recording the preset. See the section titled "Preset Playback" on page 4-22 for details about preset playback.

Steps 5—7 demonstrate the loop as a preset.

- 5. Press the <Auto> key to turn OFF the Auto LED.
- 6. Press the Preset key of any preset you have *not* recorded yet. All Preset LEDs should now be OFF. The page that was active in Step 5 should still be playing back.
- 7. Press the key of the preset you recorded in this section. Its Preset LED comes ON, the Auto LED also comes ON and your loop starts playing back.

This section gives you detailed step-by-step instructions for creating a program. For a quick step-by-step overview, see the section titled "Programming Guided Tour" on page 4-4.

Figure 4-2 below shows the programming keys that will be referenced in this section.



Figure 4-2. Programming keys.

The Six Basic Steps

The programming process can be broken down into the six steps listed below. Refer to the section titled "Using the Construct Keys" on page 3-7 and to Figure 4-2 for information not covered in this section.

Step 1: Make Sure the Controller is Ready for Programming

Figure 4-1 on page 4-3 shows how the controller looks when it is ready for programming.

Step 2: Select the Memory and Page

Use the Cursor <Up> and <Down> arrow keys to select a memory. If this is your first program, use memory 1.

Step 3: Press the Select Key

Press the <Select> key to begin programming. The Select LED flashes

and the LCD display appears as shown below:

Select fixtures to edit using A/P keys, or press SELECT to exit.

Step 4: Select Fixture Number

Press the Address keys corresponding to all fixture numbers you wish to program. You can do the following:

- Press one Address key to program a single fixture.
- Press and hold two Address keys at the same time to select a range of fixtures. For example, holding down Address keys <1> and <4> at the same time selects fixture numbers 1 through 4.
- Press multiple Address keys, one at a time, to select multiple fixtures. For example, pressing the <2>, <7> and <5> keys to program fixture numbers 2, 7 and 5 (the order is not important).
- **Note** Selecting multiple fixture numbers means all fixtures will share the same constructs and values. However, random (unsynchronized) constructs will still play back randomly. See the section titled "Synchronized and Random Effects" on page 3-2 for more information.

Step 5: Edit Constructs

Press one of the Construct keys to edit that construct. By default, with no constructs programmed, the gate (shutter) is closed so no light is emitted. Opening the shutter without changing any other constructs projects a white beam at maximum brightness. As you edit constructs, you will see first-hand what your page looks like.

For detailed descriptions of all constructs, see the section titled "Using the Construct Keys" on page 3-7.

Step 6: Press the Record Key

When you are finished editing constructs, press the <Record> key to save your page.

Note After recording the page, the address LEDs of all fixture numbers with the Gate construct set to **Open** come ON. If the Gate construct is set to **Closed**, the address LED will not be on, regardless of the other construct parameter values.

Where To Go From Here

After programming your first page, you can do the following:

- **Program additional pages the same way.** Be sure to select an unprogrammed page first.
- **Page copy:** Copy entire pages from one location in memory to another. This can save you time if you want to create pages with slight variations, such as movement or color changes. For more information, see the section titled "Page Copy" on page 4-13.
- **Create a loop:** A loop is a sequence of pages that runs continuously until you stop it. Pages you wish to run as a loop must be a contiguous block in the same memory (for example, memory 1, pages 1—10). For more information, see the section titled "Creating a Loop" on page 4-14.
- **Block copy and reverse block copy:** Similar to page copy, block copy allows you to copy ranges of pages from one location to another. Reverse block copy reverses the order of pages copied. For more information, see the section titled "Block Copy (and Reverse)" on page 4-16.
- **Preset programming:** By assigning a page or a loop to one of the numbered Preset keys, you can recall (play back) the page or loop at any time at the push of a button, or remotely using an analog controller as described in Chapter 6. For more information, see the section titled "Preset Programming" on page 4-19.

Page Copy

Use page copy to copy the entire contents of a programmed page to any other page in any other memory. This is useful for creating additional pages that contain only slight changes, such as movement changes or single-parameter changes.

Before continuing, make sure your controller is ready for programming as shown in Figure 4-1 on page 4-3. Also, make sure you have programmed at least one page.

1. Select the page (source) that you want to copy from using the Page <Up> and <Down> arrow keys.

2. Press the <Select> key. The LCD display appears as shown below:

Select fixtures to edit using A/P keys, or press SELECT to exit.

- 3. Select the destination memory and page you want to copy the contents of the current page to:
 - Press the Cursor <Up> and <Down> arrow keys to change the memory number.
 - Press the Page <Up> and <Down> arrow keys to change the page number.

When you press the Cursor or Page key for the first time, the LCD display appears similar to the one shown below:



The LCD display above would copy the contents of memory 1, page 5 to memory 2, page 1.

4. Press the <Record> key to complete the page copy.

Creating a Loop

A *loop* is a sequence of pages that repeats continuously until you stop it. You can vary the rate of playback using the <Rate> knob.

You must perform the two basic steps shown below:

Step 1. Record the pages as a contiguous block in the same memory; for example, memory 1, pages 1—10.

Step 2. Designate un-initialized pages that "bracket" (one before and one after) the pages in the loop.

Step 1: Record the Pages

Recording pages was covered previously in the section titled "Creating a Program" on page 4-11. When you are recording a loop, all pages must be contiguous in the same memory (for example, memory 1, pages 1-10).

Step 2: Record Un-Initialized Pages

An *un-initialized page* acts as a "placeholder" to indicate the beginning and end of your loop. Normally, you must create two un-initialized pages (one before the first page of your loop, one after the last page of your loop). See Figure 4-3.



Figure 4-3. The pages you wish to play as a loop are bracketed on either side by un-initialized pages.

Note The controller automatically places an un-initialized "page" between pages 99 and 1, as shown in Figure 4-4. So if the first page of your loop is page 1, you need to create only one un-initialized page after the last page of your loop. If the last page of your loop is page 99, you need to create only one un-initialized page before the first page of your loop.

Page 3	
Page 2	Ī
Page 1	
	Un-Initialized Page
Page 99	Ī
Page 98	
Page 97]

Figure 4-4. The controller automatically places an "un-initialized" page before page 1 and after page 99.

- 1. Select the first or beginning page that you want to "un-initialize." This un-initialized page should be the page before the first page of your loop (unless the first page of your loop is page 1, in which case a beginning un-initialized page is not needed).
 - Use the Page <Up> and <Down> arrow keys to select the page.
 - Use the Cursor <Up> and <Down> arrow keys to select the memory.
- 2. Press the <Select> key. The Select LED flashes. *Disregard the message on the LCD display.*

3. Press the <Erase> key. The LCD display appears as shown below:

Press ERASE to un-initialize M: x P:x or press SELECT to exit.

- 4. Press the <Erase> key again to un-initialize the page.
- 5. Repeat steps 1 to 4 for the second or ending un-initialized page. (If the last page of your loop is 99, an ending page is not needed.)

Block Copy (and Reverse)

Before continuing, make sure your controller is ready for programming as shown in Figure 4-1 on page 4-3.

Use *block copy* to copy an entire range (*block*) of consecutive pages from one location in memory to another (for example, you can copy memory 1, pages 1—10 to memory 2, pages 9—18). This function can save time in programs that have multiple repeating pages with slight parameter changes each time the loop repeats. *Reverse block copy* is an option that reverses the order of the pages you are copying.

- 1. Use the Page <Up> and <Down> arrow keys to select any page within the block of pages that you want to copy.
- 2. Press the <Select> key. The LCD display appears as shown below:



3. Press the <Auto> key, located to the right of the joystick. The LCD display then appears similar to the one shown below:



- 4. Select the memory and first page of the block of pages you want to copy from.
 - Press the Cursor <Up> and <Down> arrow keys to change the memory number.
 - Press the Page <Up> and <Down> arrow keys to change the page number.

- 5. Press the <Auto> key. Select the last page of the block of pages you want to copy from using the Page <Up> and <Down> arrow keys.
- 6. Press the <Auto> key. Select the first page of the destination block of pages you wish to copy to.

For example, the LCD display below indicates that memory 1 pages 1-10 will be copied to memory 2, pages 1-10.



- 7. Optional: Reverse block copy. Press the Construct <Up> or <Down> arrow keys to toggle between **Copy** and **Copy Reverse**. Copy Reverse reverses the order of pages that you are copying.
- 8. Press the <Record> key. After a few seconds, the Select LED turns OFF, indicating you are finished.

Setting Rate and Delay Time

Before continuing, make sure the controller is ready for programming as shown in Figure 4-1 on page 4-3.

You can control the speed of your loop using the <Rate> knob and the Delay construct. The Delay construct (also called *delay time*) determines how long each page in the loop "plays" before moving on to the next page, and the <Rate> knob lengthens or shortens the delay time.

Note The Rate and Delay settings are ignored if you are using audio advance as described in the section titled "Audio Input Playback" on page 6-25.

Using the <Rate> knob to control playback is referred to throughout this manual as *auto advance*.

Playing Back the Loop

- 1. Use the Page <Up> and <Down> arrow keys to select a page in the loop that you wish to begin with.
- 2. Press the <Auto> key located over the <Rate> knob. The Auto LED comes ON and the loop runs beginning from the page you selected.

Varying the Playback Rate



While the loop is running, turn the <Rate> knob clockwise to run the loop faster or counterclockwise to run the loop slower.

Varying the Delay Time

The Delay (time) construct sets the amount of time you want the controller to pause on the current page before advancing to the next page. Turning the <Rate> knob clockwise *subtracts from* the delay time; turning the <Rate> knob counter-clockwise *adds to* the delay time.

Note Audio advance causes the controller to ignore the Delay and Rate settings. For more information, see the section titled "Audio Input Playback" on page 6-25.

Now see one or more of the following sections:

- **Detailed description of the Delay construct:** "Delay Key" on page 3-12.
- Quick overview of programming (including using the Delay construct): "Programming Guided Tour" on page 4-4.
- **Detailed explanation of programming:** "Creating a Program" on page 4-11.

A *preset* can be a single page or a loop of pages assigned to one of the Preset keys. Pressing one of the Preset keys plays back your page(s) exactly as you recorded them.

The controller supports up to 1024 presets from the front panel through the use of *preset banking*. However, you can also play back presets remotely in the following ways (see Chapter 6 for more information):

- up to 192 presets using 12-level preset access
- up to 1023 presets using binary preset access
- **Notes** (1) Audio advance is independent of the presets. For more information about audio triggering, see the section titled "Audio Input Playback" on page 6-25.

(2) You can erase a page, but not a preset. You can, however, record another preset in its place.

Using Preset Banking

Preset banking allows you to access up to 1024 presets from the controller's front panel—16 presets in each of 64 banks.

Toggle the <Address>/<Preset> key until the Preset LED comes ON.



Preset bank 1 contains presets 1 through 16, which directly correspond to the Preset keys. Preset bank 2 contains presets 17 through 32 (the Preset <1> key corresponds to preset 9, the Preset <2> key corresponds to preset 17, and so on). See Figure 4-5.



Figure 4-5. The preset banking display shows the current preset bank number and the preset numbers within that bank.

Recording a One-Page Preset

ADDRESS PRESET 2.

1. Use the Construct and Page <Up> and <Down> arrow keys to select the memory and page you want to record as a preset.

Toggle the <Address>/<Preset> key until the Preset LED turns ON. The



- 3. Use the Cursor <Right> and <Left> arrow keys to select a bank of presets. Each bank contains 16 presets.
- 4. After you have selected a preset bank, press the <Select> key.
- 5. Press the numbered Preset key (<1> to <16>) where you want to store the preset. See Figure 4-5 on page 4-19 for an explanation of how preset bank numbering works.
- 6. *Optional.* If you are using 12-level preset access, follow the instructions in the section titled "Using Twelve-Level Preset Access" on page 6-15.
- 7. Press the <Record> key. You are then prompted to confirm your choice of a preset as shown below:

Intensity: 99 Memory: 1 Page: 1 RECORD to save Preset xxxx, SELECT=exit

- 8. Press the <Record> key again to confirm or press the <Select> key to quit without storing the preset.
- 9. You can now recall this preset by selecting the preset bank and pressing the Preset key you recorded in Step 7. See the section titled "Preset Playback" on page 4-22.

Recording a Loop as a Preset

Start the loop running, then assign the entire loop to one of the Preset keys. For more information about loops, see the section titled "Creating a Loop" on page 4-14.



1. Use the Page <Up> and <Down> arrow keys to select any page within the loop that you want to record as a preset.

Toggle the <Address>/<Preset> key until the Address LED is ON.

PRESET

3. Press the <Auto> key. The pages start advancing, playing back the loop at the rate set by the <Rate> knob and the Delay construct.



4. Toggle the <Address>/<Preset> key until the Preset LED is ON. The LCD display then appears as shown below:



- 5. Use the Cursor <Right> and <Left> arrow keys to select a bank of presets. Each bank contains 16 presets.
- 6. Press the <Select> key. The Select LED flashes and the LCD display appears as shown below:



- Press the Preset key (<1> to <16>) on the front panel to store the loop. See Figure 4-5 on page 4-19 for an explanation of how preset bank numbering works.
- 8. *Optional.* If you are using 12-level preset access, follow the instructions in the section titled "Using Twelve-Level Preset Access" on page 6-15.
- 9. Adjust the following settings; these settings are recorded as part of the preset (you can change them later).
 - Advance settings:
 - Random, Audio 1, Audio 2: see "Audio Input Playback" on page 6-25.
 - Auto: see "Setting Rate and Delay Time" on page 4-17.
 - Effects settings: Color modulate and Intensity (dim) modulate. See "Audio Input Playback" on page 6-25.

10. Press the <Record> key. You are now finished.

You can play back presets in the following ways:

- Pressing one of the numbered Preset keys on the controller's front panel. Toggle the <Address>/<Preset> key on the controller's front panel until the Preset LED is ON. Then select a preset bank using the Cursor <Right> and <Left> arrow keys and press one of the numbered Preset keys to select a preset within the bank. This instantly plays back the preset. The preset continues to play back indefinitely until you select another preset.
- **Using 12-level preset access.** This method allows to you record and play back up to 192 presets using a remote analog 0-10V controller. For more information, see the section titled "Using Twelve-Level Preset Access" on page 6-15.
- **Using binary preset access.** This method allows to you record and play back up to 1023 presets using a remote analog 0-10V controller. For more information, see the section titled "Using Binary Preset Access" on page 6-17.

Things to Remember

• To change to another preset at any time, switch to the bank containing the preset and press the corresponding Preset key.



- If a preset is playing back a loop, you can quit playback by pressing the <Auto> key until the Auto LED turns OFF. The currently-running preset stops at the page that is active when you press the <Address>/<Preset> key.
- The way that master intensity and sequencing (auto advance, audio 1 advance, audio 2 advance) are implemented depends on your choice for dependent/independent presets as described in "Switch B-6: Dependent/Independent Presets" on page 2-9.
- The following settings can be manually overridden during preset playback (see Chapter 6 for more information):

Random playback, Audio1 (audio playback), Audio2 (audio playback), Auto playback, Color modulate, Intensity (dim) modulate

Viewing and Editing Pages

Once your pages are programmed, you can view or edit the pages you programmed and change any constructs or parameters you wish. Use the same procedure you used to record the pages, making sure you press <Record> when you are finished editing.

See the section titled "Creating a Program" on page 4-11.

Viewing Fixtures

You can quickly view the current constructs and parameters of a particular fixture number by pressing and holding the Address key.

- 1. Make sure the controller is ready for programming as shown in Figure 4-1 on page 4-3.
- 2. Use the Cursor and Page <Up> and <Down> arrow keys, respectively, to select a memory and page. The Address LEDs of all fixtures on that page programmed with their gates (shutters) open come ON.
- 3. Press and hold the Address key of the fixture number you wish to view.



- Caution Holding down an Address key for longer than about 10 seconds at a time locks that fixture out of the page. To unlock the fixture, release the key then hold it in again until the fixture unlocks.
- 4. A summary of all constructs and parameters for that fixture number appears, similar to the one shown below:



Most fields are self-explanatory; below is a brief description of some of the fields:

- **Col**: In the display above, **f** means **Fast scan** and **4** indicates the base position of the scan. Other values for this construct are shown in Appendix B.
- Litho: (Litho wheel for Technobeam, Technoray; second color mixing wheel for Technopro.) In the display above, 7 means position 7, -> means forward rotation, and 48 indicates the value of the construct is 48%. Other values for this construct are shown Appendix B.
- Efct: (Effects wheel.) In the display above, 2 means position 2, <- means reverse rotation, and 63 indicates the value of the construct is 63%. Other values for this construct are shown Appendix B.
- **Sp**: Displays the MSpeed setting.
- **Po**: (Beam position.) **JS.** as shown above, indicates the beam has been positioned manually using the joystick. A value from 1 to 99 appears if a position preset is used instead. See the section titled "Using Position Presets" on page 6-2 for more information about using position presets.

Erasing Pages

You may want to erase a page when there are undesirable or old pages in memory. It is often best to clear out these pages to prevent confusion in future programming. Note the following:

- Instead of erasing the page, you could always record another page in its place.
- Erasing a page causes that page to become a "blackout" page (the Gate construct is set to "Closed", so all fixtures go dark).
- An erased page is still an initialized page.
- 1. Select the memory and page you wish to erase using the Cursor and Page <Up> and <Down> arrow keys.
- 2. Press the <Select> key. The LCD display appears as shown below:

Select fixtures to edit using A/P keys, or press SELECT to exit. 3. Press the <Erase> key. The LCD display appears similar to the one shown below:

```
Press ERASE to un-initialize M: x P: x
or press SELECT to exit.
```

- 4. **Do not press the ERASE key** again as stated in the LCD display; instead, press the <Record> key. The LCD display briefly displays: Recording.
 - **Note** If you press the <Erase> key a second time you create an uninitialized page rather than an erased or blackout page. To reinitialize the page, record a programmed page in its place.

Master Dim

The sample LCD display below shows a value of **99** for Intensity (also called *master dim*). The value of 99 is maximum intensity (full bright) and 0 is the minimum intensity (full dim).



You can change the intensity setting using the Construct <Up> and <Down> arrow keys. Master dim can also be controlled in the following ways:

- By a submaster as described in the section titled "Submasters" on page 6-22. Also see the section titled "Switch B-6: Dependent/ Independent Presets" on page 2-9.
- By a master controller as described in the section titled "Switch B-6: Dependent/Independent Presets" on page 2-9.
- Using channels 11 or 12 in binary preset access as described in the section titled "Using Binary Preset Access" on page 6-17.
- By Lightwave Control Center software. More information about Lightwave Control Center is shown in the section titled "Lightwave Control Center" on page 6-28.

Homing a fixture causes its shutter to close, and all wheels and motors to return to their home (default) positions.

- **Note** Homing a fixture will not strike the lamp, if the controller has sent either a Shutdown command or a lamp OFF command. To strike the lamp in those situations, see the section titled "Turning the Lamp On/Off" on page 5-10.
- 1. At any time, press the <Home> key on the controller's front panel. The <Home> LED flashes.
- 2. While the <Home> LED is flashing, press the Address key(s) corresponding to the fixture(s) you want to home.
- 3. The Home and selected Address LEDs now flash for another 10 seconds and the fixtures perform their homing operations.
 - **Note** You can press the <Home> key again after selecting the fixture numbers, which allows you to continue programming or playing back while the fixtures are homing.
- 4. The Address LEDs turn OFF when homing is finished.
- 5. If the fixture fails to home, refer to the *Technobeam User Manual* for troubleshooting suggestions.

Chapter 5 Using the Menus

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Figure 5-1 shows an overall view of the menu system:

Figure 5-1. The Technobeam LCD controller's menu system.

- **Help:** On-screen help for all Main menu options.
- **Backup:** Options for transferring controller memory to and from a RAM card and for backing up the controller's operating system to a RAM card. See Chapter 7.
- **Technobeam:** Options to turn the lamp on or off, as well as to capture pages from the LCD controller into the fixture's onboard memory. See the section titled "Turning the Lamp On/Off" on page 5-10 and "Remote Preset Capture" on page 6-7.
- **Submasters:** Allow you to change color and dim constructs remotely using a 0—10V analog controller. See the section titled "Submasters" on page 6-22.
- **Setup:** Set the following options:
 - **Device-ID:** Select the controller's Device ID. See the section titled "Selecting MSC or LSC" on page 5-7.
 - **Mem-Lock:** Lock out memories to prevent accidental reprogramming. See the section titled "Locking/Unlocking Memory" on page 5-13.
 - **Serial Port:** Set up the serial communication port for use with Lightwave Control Center (LCC). See the section titled "Selecting MSC or LSC" on page 5-7 and "Lightwave Control Center" on page 6-28.
 - **Edit/Copy:** Determines how the fixture (address) parameter copy command works. See the section titled "Address Parameter Copy" on page 6-4.
 - **Erase All:** Quickly erase all memories, pages and presets (except for locked memories). See the section titled "Erasing All Memory" on page 5-15.
 - **Erase User (keys):** Quickly erase any custom definitions of the User keys and return them to their default definitions. See the section titled "Erasing All User Keys" on page 6-11.
 - **Diagnostic:** Should be used only by Customer Service personnel; displays raw values from the controller's A/D (analog/digital) converters.
- **Function:** Enables or disables the following advanced programming functions (advanced programming is covered in Chapter 6):
 - Random advance
 - Audio 1 advance, Audio 2 advance
 - Color modulate
 - Litho modulate
 - Dim modulate

This section explains how to use the menu system. More information is contained in subsequent sections in this chapter.

Summary



- Press the <Menu> key to enter and exit the menu system. If you're in the menu system, pressing the <Menu> key takes you completely out of the menu system, no matter where you are, saving the options you selected.
- Press the Cursor <Up> and <Down> arrow keys to move up and down through the menu system one level at a time.
- Use the Cursor <Right> and <Left> arrow keys to move between menu options.



Use the Construct <Up> and <Down> arrow keys to change construct parameter values. (Also use the Construct <Up> and <Down> arrow keys to scroll through pages on multi-page screens.)

Getting Started

Upon powering up the controller, after its power-on self-test successfully completes, the LCD display appears as shown below:

Intensity:99	Memory: 1	Page : 1

Press the <Menu> key to access the menu system. The LCD display then appears as shown below. This is referred to as the *Main menu*.



You use the Construct, Cursor and Page arrow keys to navigate in the

menu system. These keys are shown in Figure 5-2:



Figure 5-2. The menu navigational keys: Construct, Cursor and Page.

Menu Movement Keys

The Cursor <Right> and <Left> arrow keys move side-to-side to select menu options. A selected menu option appears in ALL CAPS. For example, the figure below shows the **Technobeam** option selected:



Moving Through Menu Levels

The Cursor <Down> arrow key moves you *down* through the menu system one level at a time, while the Cursor <Up> arrow key moves you *up* through the menus one level at a time.

For example, use the Cursor <Right> and <Left> arrow keys to select **Backup** from the Main menu, then press the Cursor <Down> arrow key once. The LCD display appears as shown below:

```
MEM->CARD card->mem o/s->card
Press RECORD to save.
```

Pressing the Cursor <Down> arrow key again has no effect, since there are no menu items below MEM->CARD.

Pressing the Cursor <Right> and <Left> arrow keys select different menu options on the same level, and pressing the Cursor <Up> arrow key returns you to the Main menu.

Selecting Options

Usually the Construct <Up> and <Down> arrow keys are used to select options for the lowest-level menu items. A message appears on the LCD display If another key is required (for example, the <Address>/ <Preset> key).

For example, select **Setup** from the Main menu and press the Cursor <Down> arrow key. The LCD display appears as shown below:

DEVICE-ID mem-lock serial port edit/cop-> Device ID = Ø

Change the value for Device ID using the Construct <Up> and <Down> arrow keys. When you are done, press the Cursor <Up> arrow key or the <Menu> key.

Note The right-pointing arrow on the **Edit/Copy** menu option indicates there are more menu options than will fit on one screen. Keep pressing the Cursor <**Right**> arrow key to display more options.

Multi-Page Menus

Some of the help screens are more than one page long. You use the Construct <Up> and <Down> arrow keys to scroll through those multipage menus.

Select **Help** from the main menu, then press the Cursor <Down> arrow key to select the first option, **Help**. The LCD display appears as shown below:

Use construct arrow keys to move through the help text. Try this now (arrow down).>

Press the Construct <Down> arrow key to display the next page of the help screen, which is shown below:

```
<Correct! You can exit help at any time by pressing the menu button.
```

You now have the following options:

- Press the Cursor <Up> arrow key to return to the Help menu.
- Press the Construct <Down> arrow key to view additional help pages.
- Press the <Menu> key to exit the menu system.

Selecting MSC or LSC

MIDI Show Control (MSC) and Lightwave Show Control (LSC) are two different protocols (languages) that achieve the same effect: coordinating and controlling playback of master controllers. (MSC and LSC have no effect on slaved controllers, since playback of slaved controllers is determined by masters.)

These protocols allow you to set up cue lists to determine the order in which your programmed presets or pages are played back. Both show control protocols are supported by the full line of Lightwave Research LCD controllers, including this one. The difference between them is what "show control" program you must use, as explained below:

- MSC is an industry-standard show control protocol that is supported by a wide variety of controllers, including the Lightwave Research series of LCD controllers and the Status Cue[®] system.
- LSC is supported by Lightwave Control Center (LCC) software and works with Lightwave Research LCD controllers. You can order LCC free of charge from your High End Systems dealer/distributor (part number 80440004 for the PC version or 80440003 for the Macintosh[®] version). You can also download LCC from the Customer Service WWW site at:

http://info.highend.com/downloads/software.html

Selecting the Protocol

- 1. Press the <Menu> key to enter the menu system.
- 2. Select Setup from the Main menu, as shown below:

```
<-up technobeam submasters SETUP function
Press cursor down for setup functions.
```

3. Press the Cursor <Down> arrow key to display the menu options shown below:

```
DEVICE-ID mem-lock serial port edit/cop->
Device ID = Ø
```

4. Use the Cursor <Right> and <Left> arrow keys to select Serial port, as shown below:

device—id mem—lock SERIAL PORT edit/cop-> Use RS-232 port for Lightwave Control.

- 5. Press the Construct <Up> and <Down> arrow keys to change the selection between MIDI Show Control GO commands or RS-232 port for Lightwave Control.
- 6. Use the Cursor <Left> arrow key to select **Device-ID** and continue with the next section.

Setting the Device ID

The device ID is used by MSC and LSC to identify master controllers.

- In LSC, ID 0 (zero) means that the device responds to any ID. For example, if you were to send out commands to device ID 7 or ID 14 or ID 112, the controller with device ID 0 would respond. Device ID 0 is the default setting.
- MSC uses device ID 127 instead of ID 0 to tell a device to respond to any ID.

If you are continuing from the previous section, begin with Step 3.

1. Enter the menu system by pressing the <Menu> key.

2. Select **Setup** from the Main menu, as shown below:

```
<-up technobeam submasters SETUP function
Press cursor down for setup functions.
```

3. Press the Cursor <Down> arrow key. The LCD display appears as shown below:

```
DEVICE-ID mem-lock serial port edit/cop->
Device ID = Ø
```

- 4. The LCD display above indicates the controller is currently set for the default ID of 0.
- 5. Use the Construct <Up> and <Down> arrow keys to change the value of the Device-ID. Valid values range from 1 to 223 for LSC and 0 to 126 for MSC.
 - In LSC, ID 0 (zero) means that the device responds to any ID.
 - MSC uses device ID 127 to tell a device to respond to any signal.
- 6. Press the Cursor <Right> and <Left> arrow keys to select another menu item, or press the Cursor <Up> arrow key to return to the Main menu.
- 7. *If you selected MIDI Show Control, you must power cycle the controller.* Turn the power OFF then back ON.

Turning the Lamp On/Off

You can turn ON (strike) or turn OFF the lamp for Technobeam, Technopro or Technoray fixtures using the menu system. The following rules apply:

- 1. A lamp turns itself OFF if no data is detected on the DMX 512 link. The length of time required for the lamp to turn off is determined by your setting for the **S/DN** option on the fixture's Set menu. Consult the *Technobeam User Manual* for more information.
- 2. Selecting Lamp-Off from the controller's Technobeam menu immediately turns the lamp OFF for selected fixtures. There are two ways to turn the lamp back ON again:
 - a. Connect a controller to the link, or power cycle the controller (turn it OFF then back ON).
 - b. Select Lamp-On from the controller's Technobeam menu. Before turning the lamp on, the fixture homes. (If the lamp does not turn back ON, wait a few minutes for the fixture to cool then try again.)
- 3. Homing selected fixtures (pressing the controller's <Home> key as described "Homing Fixtures" on page 4-26) after selecting Lamp-Off will not cause the lamp to come back ON again.
- 4. Selecting Lamp-On for a fixture whose lamp is already ON has no effect.

Turning OFF the Lamp

- 1. Press the <Menu> key to enter the menu system.
- 2. Use the Cursor <Right> and <Left> arrow keys to select **Technobeam**, as shown below:

help backup TECHNOBEAM submasters setup-> Press cursor down for Technobeam menu

- 3. Press the <Down> arrow key to enter the Technobeam menu.
- 4. Use the Cursor <Right> and <Left> arrow keys to select Lamp-Off.
- 5. Press the Address keys corresponding to the fixture numbers you want to turn OFF; for example, to turn OFF the lamp for fixture number 1, press the Address <1> key.

Turning On the Lamp

- 1. Press the <Menu> key to enter the menu system.
- 2. Use the Cursor <Right> and <Left> arrow keys to select **Technobeam**, as shown below:



- 3. Press the <Down> arrow key to enter the Technobeam menu.
- 4. Use the Cursor <Right> and <Left> arrow keys to select Lamp-On.
- 5. Press the Address keys corresponding to the fixture numbers you want to turn ON; for example, to turn ON the lamp for fixture number 1, press the Address <1> key.
- 6. If the lamp(s) on the selected fixture(s) do not turn ON after the fixture homes, do the following:
 - a. Toggle the controller's <Standby> key until the Standby LED turns OFF.
 - b. Make sure the controller is on a programmed page.
 - c. The fixture may be too warm for the lamp to strike. Wait 5 to 10 minutes for the fixture to cool and try again.

This section describes how to auto advance or random advance through all 99 pages in all nine memories. (Only initialized, or programmed, pages will play back.)

Enabling All-Memory Playback

Make sure the controller is ready for programming as shown in Figure 4-1 on page 4-3.

Press the Cursor <Up> and <Down> arrow keys until the LCD display shows either: 1-all or 9-all, as shown below:

Intensity:99 Memory: 1-all Page: x

To access 1-all or 9-all, do the following:

- **1-all:** Press Cursor <Down> on memory 1.
- **9-all:** Press Cursor <**U**p> on memory 9.

If you select **1-all** and also press the <Auto> key, the initialized (programmed) pages in memory 1 begin playing back starting with page 1. When the controller completes playing back memory 1's initialized pages, it advances to memory 2, and plays back all of its initialized pages. This playback process continues through memory 9, page 99 then repeats until you disable all-memory playback.

Note Pressing the User <1> key randomizes the order of the pages being played back. For more information about the User keys, see the section titled "User Key Macros" on page 6-8.

Disabling All-Memory Playback

Press the Cursor <Up> and <Down> arrow keys until "-all" no longer appears as part of the Memory value in the LCD display.

Use the memory lock function to lock out all pages in a memory so they cannot be edited or erased without the memory first being unlocked. Locking a memory also prevents editing of any preset referring to any page in that memory.

- 1. Enter the menu system by pressing the <Menu> key.
- 2. Use the <Right> and <Left> arrow keys to select **Setup** from the Main menu, as shown below:



3. Press the Cursor <Down> arrow key to view setup options. Then use the <Right> and <Left> arrow keys to select Mem-lock from the Setup menu, as shown below:

```
device-id MEM-LOCK serial port edit/cop->
Use A/P keys 1-9, off = locked
```

- Press the <Address>/<Preset> keys of the memories that you want to lock out to prevent unwanted editing. Locking a memory causes the numbered LED to turn OFF (for example, locking memory 2 causes the <2> LED to turn OFF).
- 5. Press the <Menu> key to lock the selected memories.
This feature sends a shutdown command to a fixture, which temporarily removes it from all pages. This might be necessary in the event of a fixture malfunction or if you want to remove a fixture for a special event or effect. Removing a fixture in this manner requires no reprogramming because no memory is actually changed.

1. Press and hold for 15 seconds the Address key of the fixture that you want to lock out. The LCD display shows the current parameter settings for that fixture, similar to the one shown below:



2. After 15 seconds the bottom line in the LCD display appears as shown below:



Unlocking a Fixture

If you lock a fixture as shown above, you must do the following to bring it back to normal operation:

- 1. Repeat the procedure shown in the previous section to undo the fixture lock.
- 2. Send the fixture a lamp ON command as shown in the section titled "Turning the Lamp On/Off" on page 5-10. Once the fixture receives the command, it will home and join the currently page or loop, if any.

The Erase All function provides a quick way to clear all programming (all unlocked memories, all pages, all presets, all User key macros). This operation does *not* affect any locked memories, the controller's operating system, menu choices (for example, device ID) or submasters.

- **Note** You may want to back up the controller before you perform this operation. For more information, see Chapter 7.
- 1. Enter the menu system by pressing the <Menu> key.
- 2. Use the Cursor <Right> and <Left> arrow keys to select **Setup** from the Main menu, as shown below:

<-up technobeam submasters SETUP function Press cursor down for setup functions.

3. Press the Cursor <Down> arrow key to view Setup options, then use the Cursor <Right> and <Left> arrow keys to select **Erase All** from the Setup menu, as shown below:

<-port edit/copy ERASE ALL erase user ba->
Hold SELECT, press ERASE to clear memory

 Press and hold the <Select> key, then press the <Erase> key. Do not release the <Select> key. The LCD display then appears as shown below:

> <-port edit/copy ERASE ALL erase user ba-> SELECT & ERASE confirms, SELECT cancels.

5. While still holding the <Select> key, press the <Erase> key again. The system performs a power-on restart to complete the operation.

Setting the Backlight Intensity

You can set the intensity (brightness) of the LCD display backlight to high (the default), low, or off.

- 1. Enter the menu system by pressing the <Menu> key.
- 2. Select **Setup** from the Main menu, as shown below:



3. Press the Cursor <Down> arrow key, then press the Cursor <Right> arrow key until **Backlight** is selected, as shown below:

<-dit/copy erase all erase user BACKLIGHT
LCD backlight is set to high.</pre>

4. Use the Construct <Up> and <Down> arrow keys to set the intensity.

Chapter 6 Advanced Programming

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Who Should Use this Chapter

This chapter is intended for users already familiar with controller operation and with the basics of programming. In many cases, details such as how to enter or exit the controller's menu system have been omitted.

Consult the sections shown below for details of controller operation not covered in this chapter:

- "Rear Panel Descriptions" on page 2-5
- "MIDI In and Out Ports" on page 2-16
- "Other Connectors" on page 2-18
- "Front Panel Descriptions" on page 3-4
- "Using the Construct Keys" on page 3-7
- "Using the Construct Keys" on page 3-7
- "Creating a Program" on page 4-11
- "Preset Programming" on page 4-19
- "Viewing and Editing Pages" on page 4-23
- "Navigating the Menus" on page 5-4
- "Selecting MSC or LSC" on page 5-7
- "All-Memory Playback" on page 5-12

Using Position Presets

This section applies to Technobeam only.

The controller has a time-saving feature called position preset (also called *position memory* or *preset positioning*). Position presets allow one page to refer to another page for pan and tilt (position) information.

You first move the beam to the desired location using the joystick, then assign that position to a preset number (from 1 to 99). You can recall the same position preset in other pages. If you later change the position preset, all other pages referencing that preset are automatically changed, eliminating the need to reprogram the pages individually.

Memory 9 is designated as "position memory." You can program all 99 pages as position presets, and you can still use all pages in memory 9

not reserved for position presets for page programming.

The following is a typical example of position presets: your show is programmed for a specific focus—the lead singer is downstage center, the drummer is upstage center, and the keyboard player is stage left. Memory 9, page 1 is programmed with all fixtures directed at the lead singer (downstage center). This is position preset 1. You use position preset 2 (memory 9, page 2) with all fixtures directed at the drummer and position preset 3 for the keyboard player.

If you want to use position preset 1 (lead singer, downstage center) on memory 1, page 1, press the <POS> construct key and then use the Cursor <Up> and <Down> arrow keys to select **PRESET 1**.

As you move from venue to venue, your stage layout changes slightly. So for example if the singer's focus at upstage center is 6 feet to the right of the last venue, you would change position preset 1 (memory 9, page 1). Do the same for the other band members, if necessary. That's all you have to do.

The full set of 99 position presets is available for all fixtures connected to the controller. For example, suppose you have programmed all 99 pages of memory 9 as position presets. All 99 position presets are available for fixture number 1, all 99 position presets are available for fixture number 2, etc.

Recording Position Presets

1. Use the Cursor <Up> and <Down> arrow keys to select memory 9, then use the Page <Up> and <Down> arrow keys to select a page. This page becomes the position preset number (from 1-99). For example, the LCD display below shows memory 9, page 1 (preset 1) being selected:



- 2. Press the <Select> key. The Select LED flashes.
- 3. Press the Address keys of all fixtures you want to include in this position preset. To open the gate (shutter) if it isn't open already, press the <Gate> key and select Open.
- 4. Use the joystick to position the beam.
- 5. Press the <Record> key. The pan and tilt (position) information for this position preset is now recorded, and you can reference this position in other pages as shown in the next section.

Recalling Position Presets

- 1. Select the memory (from 1—8) and page you want to program.
- 2. Press the <Select> key. The Select LED flashes.
- 3. Press the Address keys of all fixtures you wish to use a position preset for.
- Press the <POS> (Position) construct key and use the Construct <Up> and <Down> arrow keys to select a position preset. (A value of JOYSTICK indicates you are using manual positioning, not preset positioning.) For example, the LCD display below selects position preset 1 (memory 9, page 1):



5. Edit any other constructs you wish, then press the <Record> key to save your selections and continue.

Use the same procedure to change your position presets as needed. Once you have changed a preset position, all pages that refer to the preset position will also change automatically.

Address Parameter Copy

You can copy some or all of the construct parameters from one fixture to other fixtures on the same page, or to another page. This saves time when you want many fixtures on a page or within a loop of pages to share the same or similar constructs.

You can configure how address parameter copy works using the Edit/ Copy menu option, as shown in the next section.

Note The two constructs that are not copied using the address parameter copy command are: Xfade (crossfade) and Delay. These constructs affect the entire page; you must set their values on each page.

Edit/Copy

The Edit/Copy feature has two options:

- **"Share all Constructs until selected"** (*the default*): Copies all of a fixture's construct parameters to the fixture(s) you have selected to "copy to". You can override this by pressing one or more Construct key(s) to copy *only* those constructs.
- **"Don't share constructs until selected":** Copies *only* the constructs you select manually by pressing the desired Construct key so the LED indicator above the key lights.
- 1. Select **Setup** from the Main menu, as shown below:

```
<-up technobeam submasters SETUP function
Press cursor down for setup functions.
```

2. Select Edit/Copy from the Setup menu, as shown below:

<-ck serialport EDIT/COPY erase all era-> Share all constructs until selected

- 3. Press the Construct <Up> and <Down> arrow keys to select an edit/copy function.
- 4. Press the <Menu> key to exit the menu system.
- 5. Now see one of the sections listed below:
 - "Copy Parameters to Another Fixture, Same Page" on page 6-5
 - "Copy Parameters From One Page to Another Page" on page 6-6

Copy Parameters to Another Fixture, Same Page

- 1. Select the memory and page containing the fixture with the parameters you wish to copy.
- 2. Press the **<Select>** key, then press the Address key with the construct parameters you want to copy.

- 3. Take one of the following actions:
 - If you selected "Share all constructs until selected" (the default), do nothing to copy all constructs. If you *do* press one or more Construct keys, you will copy *only* the selected construct(s).
 - If you selected "Don't share constructs until selected", press the Construct keys of the constructs you *do* wish to copy.
- 4. Press one or more address keys to copy construct parameters to.
- 5. Press the <Record> key to save the changes or press the <Select> key to cancel.

Copy Parameters From One Page to Another Page

- 1. Select the memory and page containing the fixture with the parameters you wish to copy.
- 2. Press the **<Select>** key. The LCD display appears as shown below:



- 3. Press the Address key(s) corresponding to the fixture(s) you wish to copy. Remember the page number containing these fixtures.
- 4. Press the Page <Up> and <Down> arrow keys to select the destination page. The destination page value is displayed in the lower right corner of the LCD display.



- 5. Take one of the following actions:
 - If you selected "Share all constructs until selected" (the default), do nothing to copy all constructs. If you *do* press one or more Construct keys, you will copy *only* the selected construct(s).
 - If you selected "Don't share constructs until selected", press the Construct keys of the constructs you *do* wish to copy.
- 6. Press the <Record> key to perform the copy or press the <Select> key to cancel without copying.

Each Technobeam, Technopro and Technoray fixture has built-in storage for up to 8 pages (called *presets* or *scenes* on the fixture). You can program these 8 scenes in one of two ways:

- Manually onboard the fixture as described in the *Technobeam User Manual.*
- By remote capture: first program a page on the Technobeam LCD controller, then remotely store that page as a scene onboard the fixture. You can use remote preset capture to store a single page created on the controller to any or all fixtures connected to the controller simultaneously.
- **Note** If you select an un-initialized page on the controller, it creates a *zeroed* scene on the fixture. (A zeroed scene on the fixture marks the last scene of a loop, same as an un-initialized page on the controller.)

The procedure below explains how to use remote preset capture:

- 1. Make sure no one is trying to record or play back presets on any fixture on the link. (If you are in the PRST->EDIT menu, the fixture will not accept data from the controller.)
- 2. The controller must be set on a static scene, not a loop, so toggle the <Auto> key to turn OFF the Auto LED.
- 3. Set the controller for a memory and page that contains what you want to capture to the fixture(s).
- 4. Select **Technobeam** from the Main menu.
- 5. Select **Capture** from the Technobeam menu; the LCD display appears similar to the one shown below:

lamp-on lamp-off CAPTURE SCENE: 1, select fixtures, then RECORD

- 6. Use the Construct <Up> and <Down> arrow keys to select the scene number (on the fixture) you want to capture the page to. *The selected fixture scene will be erased*!
- 7. Press the Address key(s) corresponding to the fixture(s) you want to capture the page to.
- 8. Press <Record> to complete the remote capture.

The controller has eight front panel User keys that can be used to store custom *macros* (a recorded series of up to 256 keystrokes); the first six keys have pre-programmed definitions that you can use or record over. (You can access the default definitions even after you record over the keys.)

User keys 1 through 8 are factory programmed as follows:

- User 1 Random (time) advance
- User 2 Color modulate
- User 3 Audio advance 1
- User 4 Litho modulate
- User 5 Audio advance 2
- User 6 Dim modulate
- User 7 Undefined (not programmed)
- User 8 Undefined (not programmed)



Eight User Keys

Note User key macros should not be confused with fixture macros as explained in the section titled "Macros" on page 3-3.

Recording or Editing User Key Macros

A *macro* is a recording of up to 256 keystrokes that you can assign to any of the eight User keys. Simply pressing the assigned User key immediately plays back the macro.

Note Press the User key to toggle off and on the key function.

1. Press and hold the User key you wish to record until **Edit user key** appears on the LCD display, then release the key. The LCD display then appears as shown below:

CANCEL playback record function Press cursor down to cancel macro recall

2. Select **Record** from the menu.

- 3. The selected User key's LED flashes, indicating you are recording. Every keystroke you make from now on is recorded in this macro. The macro accepts up to 256 keystrokes. See the example below.
- 4. When you have completed your macro, repeat Step 1 then select **Stop Record** from the menu.

Example Macro: Turn Lamps OFF

This sample macro will turn OFF the lamps of fixtures connected to the controller.

1. Press the User key <7> until **Edit user key** appears on the LCD display, then release the key. The LCD display then appears as shown below:

CANCEL playback record function Press cursor down to cancel macro recall

- 2. Select **Record** from the menu.
- 3. The User key <7> LED flashes, indicating you are recording.
- 4. Press the <Menu> key, then select **Technobeam** from the Main menu.
- 5. Select Lamp-off from the Technobeam menu, as shown below:

lamp-on LAMP-OFF capture Use A/P keys to turn OFF selected lamps

- Press the individual Address keys corresponding to the fixture(s) whose lamp you want to turn off. To turn off the lamps of all fixtures, press the Address <1> key, then the <2> key, then the <3> key, and so on.
- 7. Press the <Menu> key again to exit the menu system.
- 8. Press the User key <7> until **Edit user key** appears on the LCD display, then release the key. The LCD display then appears as shown below:

CANCEL playback stop record function Press cursor down to cancel macro recall

9. Use the Cursor <Right> and <Left> arrow keys to select **Stop Record** from the menu, then press the Cursor <Down> arrow key.

 The User <7> LED goes off, indicating the macro has been recorded. Now when you press the User <7> key, selected fixtures' lamps turn OFF.

Erasing a Single User Key

To erase one of the User keys, record a zero-keystroke macro over the old macro using the instructions in this section.

- **Note** Erasing an individual User key does not return it to its default definition. However, you can restore all six User keys to their default definitions as shown in the section titled "Erasing All User Keys" on page 6-11.
- 1. Press and hold the User key you wish to erase until **Edit user key** appears on the LCD display, then release the key. The LCD display then appears as shown below:

CANCEL playback record function Press cursor down to cancel macro recall

- 2. Select **Record** from the menu.
- 3. The selected User key's LED flashes, indicating you are recording.
- 4. Press and hold the same User key until **Edit user key** appears on the LCD display, then release the key.
- 5. Select **Stop Record** from the menu.
- 6. The key stops flashing to indicate you are through recording. Pressing the User key again displays the following message: This userkey is empty. Playback stopped.

Accessing Default Definitions

This section describes how to access the six default User key definitions after any or all of these keys have been redefined as macros.

- **Note** You can restore all six User keys to their original preprogrammed state by erasing all User keys. See the section titled "Erasing All User Keys" on page 6-11.
- 1. Select **Function** from the Main menu, then press the Cursor <Down> arrow key.

2. The LCD display appears as shown below:

```
RANDOM audio1 audio2 color-mod litho-mo->
Random page advance is off.
```

- Select the desired option with the Cursor <Right> and <Left> arrow keys, then use the Construct <Up> and <Down> arrow keys to enable or disable the option.
- 4. To complete the operation, press the <Menu> key. A slowly-blinking message on the LCD display reminds you this function is enabled.



The sample LCD display above appears when you enable random advance. The words **Random on** blink slowly to remind you the feature has been enabled.

5. Use the same procedure to disable the function.

Erasing All User Keys

Erasing all User keys deletes any custom macros you have programmed and returns the eight User keys to their default definitions. (Memories, pages, presets, submasters, menu choices and the controller's operating system are not affected.) For more information about User keys, see the section titled "User Key Macros" on page 6-8.

1. Select **Setup** from the Main menu, as shown below:

<-up technobeam submasters SETUP function Press cursor down for setup functions.

2. Select **Erase User** from the Setup menu, as shown below:

<-dit/copy erase all ERASE USER backlight di->
Hold SELECT & ERASE to clear userkeys.

 Press and hold the <Select> key, then press the <Erase> key. Do not release the <Select> key. The LCD display then appears as shown below:

> ← serial port edit/copy erase all ERASE USER SELECT & ERASE confirms, SELECT cancels.

4. While still holding the <Select> key, press the <Erase> key again. (Press either <Select> or <Menu> to exit without erasing the User keys.)

Analog Inputs Ports

You can attach an analog controller to the two Analog Inputs ports located on the Technobeam LCD controller's rear panel to perform any of the following functions:

- **Remote page access:** Remotely play back pages from memory. For more information, see "Remote Page Access" on page 6-13. Set switch B-3 on the Technobeam LCD controller's rear panel to OFF.
- **Remote preset access (binary or 12-level):** Remotely record and play back presets using either twelve-level preset access or binary preset access. For more information, see "Remote Preset Access" on page 6-15. Set switch B-3 on the Technobeam LCD controller's rear panel to ON.
- **Submasters:** Use an analog controller(s) to adjust in real-time the Dim and Color construct parameters. For more information, see "Submasters" on page 6-22.

Figure 6-1 shows pinouts for the ports.



Figure 6-1. Pinouts of the two Analog Inputs ports.

Remote Page Access

The remote page access feature allows you to remotely play back pages from the memory that you first select on the controller's front panel. (You cannot remotely select or change memories.)

- 1. Connect the analog controller as described in the section titled "Analog Inputs Ports" on page 6-12. Set switch B-3 on the Technobeam LCD controller's rear panel to OFF.
- 2. Select the memory containing the pages you want to remotely access using the Cursor <Up> and <Down> arrow keys.
- 3. From the analog controller perform the applicable procedure, a through c, to select the desired page. Table 6-1 summarizes the channel functions.

0V = Disabled 5V-10V = Enabled

a. Channels 1 through 12 on the analog controller correspond directly to pages 1 through 12 on the Technobeam LCD controller.

Thus, if you enable channel 1 on the analog controller, you call up page 1 on the Technobeam LCD controller, channel 2 calls up page 2, and so on.

- b. Simultaneously enabling any combination of two channels on the analog controller calls up the page number corresponding to the combination of the two channel numbers (lowest number first). For example, if you simultaneously enable channels 1 and 2, you call up page 12. Enabling channels 7 and 3 calls up page 37.
- c. Channels 10, 11, and 12 when used in combination with other channels become function keys as explained below:
 - Channel 10 is a ten-times multiplier. For example, if you simultaneously enable channels 5 and 10, you call up page 50.
 - Channel 11 is an eleven-times multiplier. For example, if you simultaneously enable channels 2 and 11, you call up page 22.
 - Channel 12 is a number inverter. For example, if you simultaneously enable channels 2, 4, and 12, you call up page 42 rather than page 24.

Channels 1-12	Directly access pages 1-12.						
Channel 10 + one other channel	Ten-times multiplier for channels 2-9 to allow access to pages 20, 30, 40, 50, 60, 70, 80, and 90.						
Channel 11 + one other channel	Eleven-times multiplier for channels 2-9 to allow access to channels 22, 33, 44, 55, 66, 77, 88, and 99.						
Channel 12 + two other channels	Inverts the order of the two lowest channels enabled simultaneously. For example 23 becomes 32.						
0V = Disabled 5V-10V = Enabled							

Table 6 1	Domoto Dog	a 1 aaaaa	Channal	Eurotiona
	Remote Pag	e Alless	Channel	FUNCTIONS

Note If enabling analog controller channels does not call up pages in memory, make sure there are no submasters assigned. See the section titled "Submasters" on page 6-22.

Twelve-level preset access and binary preset access allow you to do one or both of the following:

- Play back individual pages or loops (even individual pages within loops).
- Play back the same loop with different settings for: auto advance, audio 1 and 2 advance, random advance, color modulate or dim modulate.

More detail about each kind of preset access is shown below:

- **Twelve-level preset access:** Record and play back up to 192 presets (16 presets for each of 12 channels). This is a "hands-on" method, since you need to first enable an analog controller channel then press a Preset key on the Technobeam LCD controller's front panel.
- **Binary preset access:** Record and play back up to 1023 presets (each of 10 analog channels is a binary digit). This mode offers the greatest flexibility for total remote, "hands-off" control since all input is done on the analog controller.

Setting Up the Controller

Connect the analog controller as described in the section titled "Analog Inputs Ports" on page 6-12. Set switch B-3 on the Technobeam LCD controller's rear panel to ON. Then do one of the following:

- 12-level preset access: Set switch B-5 to OFF.
- Binary preset access: Set switch B-5 to ON.

Using Twelve-Level Preset Access

Twelve-level preset access allows you to record and play back up to 192 presets (12 sets or levels of 16 presets each).

Recording in Twelve-Level Preset Access

- 1. Toggle the <Address>/<Preset> key on the Technobeam LCD controller until the Preset LED comes ON.
- 2. Press the Page <Up> and <Down> arrow keys on the Technobeam LCD controller to select the page that you want to record as a preset. If you want to record a loop as a preset, select any page within the loop.

- 3. *This step applies to loops only.* Press the <Auto> key. The pages start advancing, playing back the loop.
- 4. Press the <Select> key. The Select LED flashes.
- 5. Enable the analog controller channel corresponding to the level you wish to use. (The signal that you use can be momentary or latching.)
- 6. For example, for level 1 (the first 16 presets), enable channel 1 on the analog controller. For level 2 (the second set of 16 presets, 17 to 32), enable channel 2 on the analog controller, etc.

0V = Disabled 5V-10V = Enabled

7. Use the Cursor <Right> and <Left> arrow keys to set the controller for preset bank 1 as shown below:

- 8. Press the Preset key (1 through 16) on the front panel on the Technobeam LCD controller where you want to store the preset. Adjust the settings for auto advance (page 4-17), audio 1 and 2 advance (page 6-25), color modulate (page 6-25), litho modulate (page 6-25) and dim modulate (page 6-25) as needed. These settings are stored with the preset.
- 9. Press the <Record> key. The Select LED stops flashing, indicating the preset is now recorded.
 - **Note** If enabling analog controller channels does not call up presets in memory, make sure there are no submasters assigned. See the section titled "Submasters" on page 6-22.

Playing Back in Twelve-Level Preset Access

- 1. Enable the analog controller channel corresponding to the preset level you wish to access. For example, to access one of the first level of 16 presets, enable analog controller channel 1. To access one of the second level of presets (17 through 32), enable controller channel 2.
 - **Note** The highest-numbered channel takes precedence if you simultaneously enable two channels.

0V = Disabled 5V-10V = Enabled

- 2. Toggle the <Address>/<Preset> key on the Technobeam LCD controller until the Preset LED is ON.
- 3. Press one of the 16 Preset keys on the Technobeam LCD controller's front panel to play back that preset.
- 4. The preset continues to play back until you:
 - press another Preset key
 - change to another preset level by activating another channel on the controller
 - press the <Standby> key until the Standby LED comes ON
 - manually change the memory or page

Using Binary Preset Access

Binary preset access allows you to record and play back up to 1023 presets (the first 10 analog controller channels act as binary digits).

The controller supports mixing binary presets with submasters; however, the same channel cannot serve as both a submaster and a preset at the same time. The submaster takes precedence over the preset.

If want to mix submasters and binary presets, you should assign submasters from the top down in order (for example, channel 12 first, then 11, then 10, and so on) to simplify the binary preset addressing scheme because binary preset access begins with the least significant bit (left to right in binary). Also see "Submasters" on page 6-22.

Binary "819"

1100110011 1 00110011 Least significant bit Most significant bit

Figure 6-2. The least significant bit in binary is the leftmost digit.

Recording in Binary Preset Access

- 1. Press the <Address>/<Preset> key until the Preset LED comes ON.
- 2. Use the Page <Up> and <Down> arrow key to select the page that you want to record as a preset. If you want to assign a loop to a preset, select any page within the loop.
- 3. *This step applies to loops only.* Press the <Auto> key. The pages start advancing, playing back the loop.
- 4. Press the **<Select>** key. The Select LED flashes.

- 5. Press any of the numbered Preset keys—the key that you press is not important; this action only alerts the controller that you are about to record presets. Adjust the settings for auto advance (page 4-17), audio 1 and 2 advance (page 6-25), color modulate (page 6-25), litho modulate (page 6-25) and dim modulate (page 6-25) as needed. These settings are stored with the preset.
- 6. Convert the preset number you wish to use to a binary number.
- 7. Remember that most scientific calculators display binary numbers from most significant (left) to least significant (right). If that is the case, you need to invert the number because in binary preset access, the leftmost digit must be least significant and the rightmost digit must be most significant (see Figure 6-3 on page 6-22).
- 8. Enable all analog controller channels corresponding to binary 1s and disable controller channels corresponding to binary 0s.

0V = Disabled 5V-10V = Enabled

"Calculating Binary Numbers, Preset Levels and Preset Keys" on page 6-19 has instructions to calculate the binary number. A complete binary preset access table, showing all of the possible combinations (and which channels to enable and disable) can be found on the Customer Service Product Support WWW page at:

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

Analog controller channels 11 and 12 control blackout and standby, as shown below:

- Channel 11 (blackout): closes all fixtures' shutters but wheels and effects continue to run.
- Channel 12 (standby): activating channel 12 when the controller is in standby (Standby LED is ON) takes the controller out of standby. Activating channel 12 when the controller is *not* in standby (Standby LED is OFF) has no effect. When the controller is in standby, all fixtures' shutters close and any in-progress wheel changes stop immediately. Controller pages continue to advance.
- 9. Press the <Record> key. The Select LED stops flashing and one of the Preset LEDs on the front panel comes ON, indicating that you recorded a preset. "Calculating Binary Numbers, Preset Levels and Preset Keys" on page 6-19 has instructions to calculate the binary number.
 - **Note** If enabling analog controller channels does not call up presets in memory, make sure there are no submasters assigned. See the section titled "Submasters" on page 6-22.

Playing Back in Binary Preset Access

Enable channels corresponding to binary 1's and disable channels corresponding to binary 0's as discussed in the previous section.

The selected preset continues to play back until you:

- press another Preset key
- change to another preset level by activating another channel on the controller
- toggle the <Standby> key until the Standby LED comes ON
- manually change the memory or page

Calculating Binary Numbers, Preset Levels and Preset Keys

This section explains how to translate a preset number into a binary number, how to calculate the preset level and how to determine which Preset key LED will be ON when you record or play back a particular preset.

Table 6-3 on page 6-21 lists the first 32 presets. A complete listing of all 1023 presets, their levels and Preset LED states can be found on the Customer Service Product Support WWW page at:

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

- 1. Determine which preset number you want to record or play back.
- 2. Do one of the following:
 - a. If you have a calculator that converts decimal numbers to binary numbers, you can easily perform the conversion yourself. *Remember that the Technobeam LCD controller reads binary numbers from least significant (left) to most significant (right);* you will probably need to invert the binary number your calculator displays. (See Figure 6-2 on page 6-17.) Skip to Step 3.
 - b. If you do not have a calculator, see Table 6-2 on page 6-20.
- 3. Enable analog controller channels that correspond to binary 1s and disable channels that correspond to binary 0s.

Examples:

- Preset 1: the controller recognizes preset 1 in binary as 1000000000. Enable controller channel 1 but do not enable channels 2 through 10.
- Preset 948: the controller recognizes preset 948 in binary as 0010110111. Enable channels 3, 5, 6, 8, 9 and 10 but do not enable channels 1, 2, 4 or 7.

4. Calculate the preset level by dividing the decimal preset number by 16. *Always round up to the next-highest preset number.*

For example, preset number 17 is in level 2 because 17 / 16 = 1.0625Preset number 248 is in level 16 because 248 / 16 = 15.5

5. Calculate the number of the Preset LED that will come ON using the following formula:

[preset no.] modulo 16

(*Modulo* is abbreviated "Mod" on many scientific calculators. You can also manually calculate the modulo by repeatedly subtracting 16 from the preset number until you get the smallest non-negative remainder; the remainder is the modulo. A modulo of 0 equates to the preset 16 LED.)

Binary numbers:

Table 6-2 below shows a quick way to calculate the binary equivalent of a decimal preset number. Find a unique combination of numbers in the "Binary equivalent" row (without repeating any) that add up to the preset number you want. Each of the numbers you selected corresponds to a binary 1; the rest are binary 0s. Examples follow.

Controller channel	1	2	3	4	5	6	7	8	9	10
Binary equivalent	1	2	4	8	16	32	64	128	256	512

Table 6-2. Quick Binary Calculation

Example #1: Preset number 11

8 + 2 + 1 = 11

8 corresponds to analog controller channel 4; 2 to channel 2 and 1 to channel 1.

Solution: Enable analog controller channels 4, 2 and 1; disable all other channels.

Example #2: Preset number 650

650 = 512 + 128 + 8 + 2

512 corresponds to analog controller channel 10; 128 to channel 8; 8 to channel 4; and 2 to channel 2.

Solution: enable channels 10, 8, 4 and 2; disable all other channels.

Sample table:

Table 6-3 is a partial binary preset access table. The "No." column shows the preset number. "Key" shows which Preset key LED will be ON when you record or play back that preset. "Lev" shows the preset level; 16 presets are in each level. "Analog Controller Channel Number" shows the binary equivalent of the preset number. Enable analog controller channels corresponding to 1s and disable channels corresponding to 0s.

No.	Key	Lev.		Analog Controller Channel Number								
1	1	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
2	2	1	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
3	3	1	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
4	4	1	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø
5	5	1	1	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø
6	6	1	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø
7	7	1	1	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø
8	8	1	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø
9	1	1	1	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø
10	2	1	Ø	1	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø
11	3	1	1	1	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø
12	4	1	Ø	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø
13	5	1	1	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø
14	6	1	Ø	1	1	1	Ø	Ø	Ø	Ø	Ø	Ø
15	7	1	1	1	1	1	Ø	Ø	Ø	Ø	Ø	Ø
16	8	1	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø
17	1	2	1	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø
18	2	2	Ø	1	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø
19	3	2	1	1	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø
20	4	2	Ø	Ø	1	Ø	1	Ø	Ø	Ø	Ø	Ø
21	5	2	1	Ø	1	Ø	1	Ø	Ø	Ø	Ø	Ø
22	6	2	Ø	1	1	Ø	1	Ø	Ø	Ø	Ø	Ø
23	7	2	1	1	1	Ø	1	Ø	Ø	Ø	Ø	Ø
24	8	2	Ø	Ø	Ø	1	1	Ø	Ø	Ø	Ø	Ø
25	1	2	1	Ø	Ø	1	1	Ø	Ø	Ø	Ø	Ø

Table 6-3.	Sample Bil	nary Preset	Access	Table
	•••••••••			

No.	Key	Lev.		Analog Controller Channel Number								
26	2	2	Ø	1	Ø	1	1	Ø	Ø	Ø	Ø	Ø
27	3	2	1	1	Ø	1	1	Ø	Ø	Ø	Ø	Ø
28	4	2	Ø	Ø	1	1	1	Ø	Ø	Ø	Ø	Ø
29	5	2	1	Ø	1	1	1	Ø	Ø	Ø	Ø	Ø
30	6	2	Ø	1	1	1	1	Ø	Ø	Ø	Ø	Ø
31	7	2	1	1	1	1	1	Ø	Ø	Ø	Ø	Ø
32	8	2	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø

Table 6-3. Sample Binary Preset Access Table

Submasters

A *submaster* is an analog 0-10 V controller you can use to remotely adjust (override), in real time, the dim and color construct parameters for selected fixtures. You can define up to 12 submasters and control them using one or more analog controllers.

The Technobeam LCD controller supports mixing binary presets with submasters; however, the same channel cannot serve as both a submaster and a binary preset at the same time. The submaster takes precedence over the preset.

If want to mix submasters and binary presets, you should assign submasters from the top down in order (for example, channel 12 first, then 11, then 10, and so on) to simplify the binary preset addressing scheme because binary preset access begins with the least significant bit (left to right in binary).

Binary "819"

1100110011 1 Least significant bit

Most significant bit

Figure 6-3. The least significant bit in binary is the leftmost digit.

Selecting a Submaster Mode

There are two submaster modes: Proportional level or Remote level.

• **Proportional Level submasters (typical setting):** Traditional submaster control. The submaster value is multiplied by the programmed fixture value. For example, if the recorded dim value for the selected fixture is at 50 percent and a submaster is at 50 percent, the fixture will be dimmed at 25 percent.

If there are two or more submasters, the submaster with the higher setting has control. For example, suppose you assigned 2 submasters to one fixture. You set submaster 1 at 20 percent dim and submaster 2 at 50 percent dim. The 50 percent submaster has control because it is the larger value.

- **Remote Level submasters:** The device with the higher level has control. For example, if you program the fixture for 50 percent dim and the submaster for 60 percent dim, the submaster has control.
- 1. Select **Submasters** from the Main menu, as shown below:

<-up technobeam SUBMASTERS setup function Press cursor down for submaster function

2. Select Mode from the Submasters menu, as shown below:

MASTER 1 2 3 4 5 6 7 8 9 10 11 12[MODE] Proportional level submasters selected.

- 3. Use the Construct <Up> and <Down> arrow keys to make a selection.
- 4. Press the <Menu> key to save your selection and exit the menu system.

Assigning a Channel for Master Dim

This section explains how to use a submaster as the "master dim controller". Once you assign a channel for master dim, the same channel cannot be used to control fixtures. For example, if you select channel 1 for master dim, you cannot use channel 1 to control fixtures.

Note When the master dim is assigned to a channel, you should *not* use the Technobeam LCD controller for master dim control; master dim should be controlled by the submaster "master dim controller".

1. Select **Submasters** from the Main menu, as shown below:

<-up technobeam SUBMASTERS setup function Press cursor down for submaster function

2. Press the Cursor <Down> arrow key. The LCD display then appears similar to the one shown below:

[MASTER] 1 2 3 4 5 6 7 8 9 1Ø 11 12 MODE No channel assigned to master dim

- 3. Use the Construct <Up> and <Down> arrow keys to select a channel for master dim. Remember that the channel you assign to master dim cannot also be assigned as a submaster.
- 4. After you set the channel for master dim, you can assign submaster channels as shown in the next section.

Assigning Fixtures to a Submaster

To have a particular submaster control the dimming or color of a particular fixture(s), you have to assign that fixture(s) to that submaster. There are 12 submasters available (or eleven if you assigned one channel to master dim).

You can skip the first two steps below if you are continuing from the previous section.

1. Select Submasters from the Main menu, as shown below:

<-up technobeam SUBMASTERS setup function Press cursor down for submaster function

2. The LCD display then appears similar to the one shown below:

[MASTER] 1 2 3 4 5 6 7 8 9 10 11 12 MODE No channel assigned to master dim 3. Use the Cursor <Right> and <Left> arrow keys to select the submaster number as shown below (submaster 1):

Master [1] 2 3 4 5 6 7 8 9 10 11 12 MODE Use A/P keys to assign submaster 1

- Press the <Address> keys of a fixture you want to assign to that submaster. (You must select only one fixture at a time.) The selected address LED comes ON to indicate that it is assigned to that submaster.
- 5. Do one of the following:
 - a. To control Dim: this is the default; you do not have to do anything.
 - b. To control Color: press the <Dim> key to toggle Dim control OFF, then press the <Color> key to toggle color control ON.
 - c. To control both Dim and Color: press the <Color> key.

You can assign multiple fixtures to each submaster and you can also assign any particular fixture to multiple submasters.

6. Continue selecting one fixture at a time for submaster control. When you're done, press the <Menu> key to save your settings.

Audio Input Playback

You can use an external stereo source to control playback through any or all five playback modes listed below. Audio input playback affects how initialized pages play back, regardless of whether those pages are part of a loop or not.

To enable audio input playback, plug your stereo source into the Stereo Audio Input connector on the controller's rear panel as shown in the section titled "Other Connectors" on page 2-18.

Also see the section titled "Random Advance" on page 6-27.

- **Audio 1 advance (User 3 key):** Pages advance with the amplitude of the audio signal.
- **Audio 2 advance (User 5 key):** Page advance pauses with the amplitude of the audio signal.

- **Color modulate (User 2 key):** Cycles through the 13 positions on the color wheels of all active fixtures with the beat of the audio signal, overriding the color construct settings.
- **Litho modulate (User 4 key):** Cycles through the 8 positions on the rotating litho wheels of all active fixtures with the beat of the audio signal, overriding the litho construct settings. (Technopro only: the second color mixing wheel is affected.)
- **Dim modulate (User 6 key):** Light intensity of all active fixtures changes with the amplitude of the audio signal. You can adjust how much the dim varies (from full dim to full bright, or a small dim change resulting in a "flickering" effect) using the <Audio> knob, as shown in Figure 6-4:



Figure 6-4. Adjusting the sensitivity of the dim modulate effect to the audio signal.

Varying the Audio Sensitivity

Adjust the sensitivity of the audio advance modes to the audio signal using the <Audio> (level) knob located directly to the right of the <Rate> knob. See Figure 6-5.



Figure 6-5. Adjusting the sensitivity of audio effects to the audio signal.

Note If the Level LED does not come ON, or if you are having difficulty triggering audio effects, check the audio connections then increase the volume of your audio source. If the volume is already high, reduce the volume significantly then bring it back up again.

Random advance when used with auto advance, manual advance or audio advance (and optionally all-memory playback) plays initialized pages in random order. (Random advance when enabled by itself does nothing.)

First press the <Auto> key, then enable random advance. By default, the User <1> key is defined as random advance. If you have already programmed a macro on the User <1> key, see the section titled "Accessing Default Definitions" on page 6-10.

Note Random Advance will sequence through initialized pages in different memories if you have selected all-memory playback as described in the section titled "All-Memory Playback" on page 5-12.

Live Control of Auto Playback

This section explains how to have "live" control (override) over all of the constructs of one or more fixtures. For example, an activity occurs that you want to track with a "live spot". You could quickly select a fixture to use as a spot and manually control its position with the joystick.

- 1. Press the <Select> key. The Select LED flashes.
 - **Note** You must press the <Select> key to stop the controller on a page that is *not* using a preset position or else you will not be able to change the beam position using the joystick.
- 2. Press the <Address> keys corresponding to the fixtures you wish to control. You can now change (override) any of the fixtures' constructs; however, you cannot record the changes made during "live" control.
- To return from "live" control press the <Select> key. The Select LED stops flashing and the selected fixtures return to their original programmed settings.

Located on the rear panel of the controller is a Remote Enable connector that allows you to remotely enable and disable the controller as described below:

- Sending a voltage of 0 V DC disables the controller (all fixtures go dark, all wheels stop moving, and all in-progress moves finish immediately).
- Sending a voltage between +5 V to +16 V DC to returns the controller to its previous state. If the controller was previously in Standby (with the Standby LED ON), the controller returns to Standby; if the controller was *not* previously in Standby, the controller resumes operation.

The female 3.5 mm (1/8 in) mini-phone jack accepts a 3.5 mm miniphone connector (male). (The controller functions normally with nothing attached to the Remote Enable connector.)



Figure 6-6. Polarity of the remote enable connector.

Lightwave Control Center

Selecting Lightwave Show Control (LSC) as described in the section titled "Selecting MSC or LSC" on page 5-7 means you must use the Lightwave Control Center (LCC) software for playback control using binary preset access. (The 16 preset keys on the controller's front panel are not used with binary preset access.)

LCC allows you to set up cue lists so you can access your 1023 presets in any order.

Note LCC must be used in conjunction with binary preset access. For more information about binary preset access, see the section titled "Using Binary Preset Access" on page 6-17.

You can order LCC free of charge from your High End Systems dealer/ distributor (part number 80440004 for the PC version or 80440003 for the Macintosh version).

You can also download LCC from the Customer Service WWW site at: http://info.highend.com/downloads/software.html

Chapter 7 External Memory Storage and Transfer

This chapter describes options for backing up and restoring the controller's internal memory and operating system. You have different options depending on whether you use a RAM card or a personal computer.

You can also crossload memories, pages and presets directly from one controller to another controller. See the section titled "Crossloading" on page 7-17 for more information.

RAM Card Options

You can use a RAM card to back up and restore all of the controller's internal memory: memories and pages (programs), User keys, submasters, menu choices; or the operating system. You can back up internal memory or the operating system to have a spare copy or to transfer data from one controller to another.

Restoring internal memory from a RAM card overwrites *all existing data*, including pages in locked memories. If you want to preserve (*not* overwrite) locked memories, you should use the personal computer method described on the next page.

One RAM card holds either the contents of a controller's internal memory or a controller's operating system, but not both. If you want to back up both memory and the operating system, you will need two RAM cards.

The controller ships with one RAM card; you can order additional RAM cards from your High End Systems dealer/distributor (part number 90303082). The RAM card shipped with the controller is a Type 1 SRAM PC Card, 512KB. (The controller uses 256KB on the RAM card.)

Personal Computer Options

In addition to backing up and restoring controller memory using a RAM card, you can also back up (download) and restore (upload) memories, pages and presets using a personal computer.

The differences between backing up and restoring memory via RAM card and personal computer are summarized below:

• You cannot back up or restore the controller's operating system using a personal computer.

- Backing up to a personal computer backs up pages, memories and presets only, while backing up to a RAM card backs up pages, memories, presets, submasters, menu choices, and User keys.
- Backing up to a personal computer backs up locked memories, but restoring memories from a personal computer to the controller does not overwrite locked memories.

NiCad Battery Protection

The controller's self-recharging Nickel Cadmium (NiCad) battery protects memory during power down or power failure. A fully-charged battery will preserve data for at least 6 weeks with the controller powered down the entire time.

Each NiCad battery is fully charged when your Technobeam LCD controller is shipped from the factory. Should a battery lose its charge, plug in your controller, power it ON and allow the battery at least 24 hours to fully recharge.

RAM Card: Memory

This section explains how to:

- Copy all of the controller's internal memory to a RAM card
- Load or restore the controller's memory from a RAM card

See also:

- "Backing up to a Computer" on page 7-11
- "Macintosh" on page 7-12
- "Crossloading" on page 7-17
- **Note** When you are not using a RAM card, you should write-protect it to avoid accidental data erasure. See the section titled "RAM Card: Write-Protection" on page 7-10.

Backing Up to a RAM Card

Use this procedure to save all of the controller's internal memory to a RAM card (memories—including locked memories—, pages, user keys, menu choices and submasters). You can then use the RAM card to transfer this controller's memory to another controller or you can put the RAM card away for safekeeping.

- **Note** One RAM card can contain either a copy of the controller's memory or operating system, but not both. To back up both the internal memory and operating system, you will need two RAM cards. See the section titled "Optional Accessories" on page 1-6 for ordering information.
- Insert a RAM card into the RAM card slot on the controller's front panel. The RAM card is designed to go in the slot only one way; *do not force the card into the slot*. If you feel resistance, turn the card over and reinsert it.
- 2. Press the <Menu> key to enter the menu system.
- 3. Use the Cursor <Right> and <Left> arrow keys to select **Backup** from the Main menu, as shown below:

help BACKUP technobeam submasters setup-> Press cursor down for backup functions.

 Press the Cursor <Down> arrow key to view the possible selections, then use the Cursor <Right> and <Left> arrow keys to select Mem->Card as shown below:

```
MEM->CARD card->mem o/s->card
Press RECORD to save.
```

If the message "**Press RECORD to save**" does not appear on the LCD display, see the explanation below:

- If there is no card in the RAM card slot, or if the RAM card is not fully inserted, the message appears: "Card is not inserted." Fully insert a RAM card into the slot (but *do not force it* into the slot—turn it over if you feel resistance); the LCD display message changes to: "Press RECORD to save."
- If the RAM card's write-protect switch is turned on, the message appears: "Card is locked." Unlock the RAM card as shown in "RAM Card: Write-Protection" on page 7-10.
- 5. Press the <Record> key.

The LCD display then appears as shown below:

```
MEM->CARD card->mem o/s>card
Are you sure? RECORD=save, SELECT=cancel
```

- 6. If you want to cancel the backup operation at this time press the <Select> key or the Cursor <Up> arrow key. Otherwise, press the <Record> key again if you are sure that you want to complete this backup operation.
- 7. After memory has been backed up, the controller is automatically placed in *mirror mode*, causing subsequent programming to be recorded to both the RAM card and to the controller's memory.
 - If you wish to use mirror mode, leave the RAM card in the slot.
 - If you do not wish to use mirror mode, write-protect the RAM card as shown in the section titled "RAM Card: Write-Protection" on page 7-10, then remove the RAM card and put it in a safe place.

Restoring Memory from a RAM Card

Use this procedure to load (or restore) all of the controller's memory from a RAM card to the controller.



Caution This procedure completely replaces the current contents of the controller's memory (including locked memories) with the RAM card. You might want to back up the controller's memory first to another RAM card or to a personal computer as shown in the section titled "Backing Up to a RAM Card" on page 7-4, "Backing up to a Computer" on page 7-11 or "Macintosh" on page 7-12.

- Insert a RAM card into the RAM card slot on the controller's front panel. The RAM card is designed to go in the slot only one way; *do not force the card into the slot*. If you feel resistance, turn the card over and reinsert it.
- 2. Enter the menu system by pressing the <Menu> key.
3. Use the Cursor <Right> and <Left> arrow keys to select **Backup** from the Main menu, as shown below:

```
help BACKUP technobeam submasters setup->
Press cursor down for backup functions.
```

 Press the Cursor <Down> arrow key to view the menu items, then use the Cursor <Right> and <Left> arrow keys to select Card->Mem, as shown below:

```
mem->card CARD->MEM o/s->card
Press ERASE to load.
```

- 5. Press the <Erase> key to load the contents of the RAM card to the controller, or press the <Menu> key to exit without loading from the RAM card.
- 6. After pressing the <Erase> key, the LCD display appears as shown below:

```
mem->card CARD->MEM o/s->card
Are you sure? ERASE=load, SELECT=cancel
```

- Press the <Erase> key again to begin the load operation, or press the <Select> key to cancel the operation. The controller restarts after memory has been restored.
- 8. After memory has been restored, the controller is automatically placed in *mirror mode*, causing subsequent programming to be recorded to both the RAM card and to the controller's memory.
 - If you wish to use mirror mode, leave the RAM card in the slot.
 - If you do not wish to use mirror mode, write-protect the RAM card as shown in the section titled "RAM Card: Write-Protection" on page 7-10, then remove the RAM card and put it in a safe place.

This section explains how to back up, replace or update the controller's operating system from a RAM card.

Note When you are not using a RAM card, you should write-protect it to avoid accidental data erasure. See the section titled "RAM Card: Write-Protection" on page 7-10.

Backing Up the Operating System to a RAM Card

Use this procedure to back up the contents of the controller's operating system to a RAM card. You might want to do this before upgrading to a new operating system version, or to have a copy of the controller's operating system on a RAM card for safekeeping.

- **Note** One RAM card can contain either a copy of the controller's memory or operating system, but not both. To back up both the internal memory and operating system, you will need two RAM cards. See the section titled "Optional Accessories" on page 1-6 for ordering information.
- Insert a RAM card into the RAM card slot on the controller's front panel. The RAM card is designed to go in the slot only one way; *do not force the card into the slot*. If you feel resistance, turn the card over and reinsert it.
- 2. Press the <Menu> key to enter the menu system.
- 3. Press the Cursor <Right> and <Left> arrow keys to select **Backup** from the Main menu, as shown below:

help BACKUP technobeam submasters setup-> Press cursor down for backup functions.

 Press the Cursor <Down> arrow key to view the menu options, then select 0/S->Card, as shown below:

```
mem->card card->mem O/S->CARD
Press RECORD to copy O/S.
```

If the message "Press RECORD to copy O/S" does not appear on the LCD display, see the explanation below:

- If there is no card in the RAM card slot, or if the RAM card is not fully inserted, the message appears: "Card is not inserted." Fully insert a RAM card into the slot (but *do not force it* into the slot—turn it over if you feel resistance); the LCD display message changes to: "Press RECORD to copy O/S."
- If the RAM card's write-protect switch is turned on, the message appears: "Card is locked." You can unlock the card without removing it from the controller. See the section titled "RAM Card: Write-Protection" on page 7-10.
- 5. Press the <Record> key to replace the RAM card's current contents with the controller's operating system (O/S).
- 6. After you press the <Record> key, the LCD display appears as shown below:

```
mem->card card->mem O/S->CARD
Are you sure? RECORD=copy, SELECT=cancel
```

- 7. Press the <Record> key to copy the controller's operating system (O/S) to the RAM card, or press the <Select> key to cancel without copying.
- 8. After backing up the operating system, write-protect the RAM card as shown in the section titled "RAM Card: Write-Protection" on page 7-10.

Restoring the Operating System from a RAM Card

This section describes how to install an operating system from a RAM card to the controller. You should use this procedure if you are installing an updated or replacement (same version) operating system. You can obtain updated operating systems from your High End Systems dealer/distributor.

- 1. Turn OFF the controller.
- 2. Insert the RAM card with the newer or replacement (same) operating system version into the RAM card slot on the front panel. The RAM card is designed to go in the slot only one way; *do not force the card into the slot*. If you feel resistance, turn the card over and reinsert it.
- 3. Turn the controller back ON.

4. The LCD display briefly shows the controller's boot version number and then appears as shown below:



- **Note** If the RAM card has the same operating system version, or if you are restoring a lost operating system, different messages are displayed.
- 5. The controller waits a short time for you to respond. If you do not press either the <Erase> key or the <Select> key, the controller boots up normally with the existing operating system.
- 6. Press the <Erase> key to install the newer version of the operating system. The LCD display then appears as shown below:



 Press the <Erase> key again to continue, or press the <Select> key to cancel. If you press the <Erase> key, the LCD display appears as shown below:

```
Erasing the flash ROM. DO NOT Interrupt!
```

Copying ramcard to Flash ROM. Do NOT interrupt!



Caution Do not turn controller power off while the RAM card is transferring information. If you want to repeat the operation, wait until it is completed and then turn the controller's power off.

8. When the copying is finished the LCD display appears as shown below:

Copy complete. Turn power off, remove ramcard, and power on to continue.

- 9. Turn the controller OFF, remove the RAM card and put it in a safe place.
- 10. Turn power back ON to continue with the updated operating system.
- 11. Write-protect the RAM card as shown in the next section.

RAM Card: Write-Protection

After backing up either the operating system or memory to the RAM card, you should write-protect that card to prevent it from being inadvertently erased.

Note Figure 7-1 below shows the RAM card shipped with the Technobeam LCD controller (part number 90303082). Because of the wide variety of compatible RAM cards available, you should consult the documentation provided with your RAM card if you are unsure of the location of its components.

Figure 7-1 shows the locations of the write-protect tab and the battery release on two versions of RAM cards that High End Systems has used up to the time of this writing. (The newer-style RAM card is 512KB in size and has no battery compartment because it is self-charging):



Figure 7-1. Slide the write-protect bar as shown to lock or unlock it.

Note (Older-style RAM card only.) Note the battery release, typically located near the battery compartment. *Do not disengage the battery release, since that could cause the battery to fall out of the RAM card.*

You can optionally back up the controller's pages, memories and presets to an IBM®-compatible or Macintosh® personal computer for added security against data loss. You can also restore from a computer to the controller.

Using LWBACKUP

If you wish to backup or restore controller memory using an IBMcompatible computer, you need to follow the steps listed below:

1. Download the free backup software, LWBACKUP.EXE, and instructions from the Customer Service Web site at:

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

- 2. Copy LWBACKUP.EXE to a local hard or floppy disk.
- 3. Obtain serial communication cabling and adapters (if needed) as shown in the instructions to connect the controller to your computer.
- 4. If you use Windows[®], exit to a DOS prompt. (If you use Windows NT, you must restart your computer with DOS loaded only.)
- 5. Start the backup software by typing A:LWBACKUP, if you are running the program from a diskette in Drive A:
- 6. Select **Setup** from the Main menu to choose the COM port you want to use.
- 7. Toggle the <Standby> key on the controller's front panel until the Standby LED comes ON.
- 8. Follow the prompts on your screen or consult the program's online help to complete the backup or restore.

Advanced Users Only

Instead of using LWBACKUP.EXE, you can use any communications application capable of sending and receiving plain ASCII text. Set the application for 9600N81, full duplex. *Make sure the software is set up so that CR/LF characters are neither added nor stripped.*

The backup procedure is similar to that shown in the section titled "Backing Up the Operating System to a RAM Card" on page 7-7. Consult the documentation provided with your communications application for specific procedures.

This section describes how to back up and restore the controller's pages, memories and presets using a Macintosh personal computer. See also:

- "RAM Card: Memory" on page 7-3
- "Crossloading" on page 7-17

Hardware/Software Requirements



- Hard or floppy drive with at least 531KB available space.
- One Macintosh-to-modem cable (male serial 8-pin connector on one end and a male DB25 connector on the other end).
 - Female DB25-to-male DB9 adapter (*do not use a null modem adapter* because that will prevent the data from being transferred).
 - White Knight[™] or any other commercially-available Macintosh communication software. White Knight is recommended, since the procedure that follows is based on White Knight.

Connecting the Computer and Controller

- 1. Connect the 8-pin end of the Mac-to-modem cable to your computer's free modem/printer port. If all modem/printer ports are currently being used, you will have to disconnect one port in order to proceed.
- 2. Connect the male DB9 end of the adapter to the controller's communication port, located on its rear panel.
- 3. Connect the Mac-to-modem cable to the DB25 end of the adapter. See Figure 7-2:



Figure 7-2. Connecting a Macintosh to the controller for download/upload.

Setting Up the Software

You must follow the procedure in this section before either backing up controller memory to your computer, or restoring memory from the computer to the controller.

Setup Summary

The detailed procedure that follows is based on White Knight only; if you have another communication program, make sure you set it for all of the following:

- 9600 baud
- 8 data bits, 1 stop bit
- Ignore parity
- Full duplex
- VT100 terminal emulation

White Knight v11.14 Setup Procedure

The procedure that follows is based on White Knight v11.14. Consult the documentation provided with your copy of White Knight if you are using a different version.

Make sure you have already connected the cabling as described in the section titled "Connecting the Computer and Controller" on page 7-12.

- 1. Start White Knight. Press **Command+U** to open the Serial Port Settings dialog box and set the serial port for all of the following:
 - Serial port type: **Modem** (click the telephone icon)
 - Baud rate: **9600**
 - Parity: Ignore
 - Databits: 8
 - Stopbits: 1
 - Duplex: Full
- 2. Click **OK** to accept the serial port settings.
- 3. Press **Command+O+E** to open the Emulation Options dialog box and set the following:
 - Terminal Emulation: **VT100**
 - Pre-Emulation filter and Post-Emulation filter: make sure both filters are off as indicated by the absence of an "X" mark in the adjacent boxes.
- 4. Click **OK** to accept the emulation options.

Backing Up (Downloading) Memory from Controller to Computer

The procedure that follows is based on White Knight v11.14. Consult the documentation provided with your copy of White Knight if you are using a different version.

Make sure you followed the procedure in both the following sections before continuing:

- "Connecting the Computer and Controller" on page 7-12
- "Setting Up the Software" on page 7-13
- 1. Toggle the <Standby> key on the controller's front panel until the Standby LED turns ON.
- 2. Press and hold the <Record> key on the controller's front panel until the LCD display appears as shown below:

Download to RS-232 port. Prepare to receive ASCII file, then press RECORD

3. Your computer screen should display the following message:

Save from controller to PC. Set PC to receive, then press RECORD to begin. Press SELECT to quit anytime.

- 4. On your computer, press **Command+F+N** to start the file capture. Enter a file name in the Capture File to Save text field and click **Save**.
- 5. Press the <Record> key on the controller's front panel to start the transfer. The controller's LCD display appears as shown below while the transfer is taking place:

Download to RS-232 port. sending M: x P:xx

- **Note** If you use White Knight, at the bottom of your screen you will see a long series of characters that increments as data is being sent. This is normal.
- 6. The controller's LCD display returns to normal when the transfer is complete. Press the <Select> key on the controller's front panel to stop the download.
- 7. Press **Command+F+C** on your computer to end the file capture.

7-14 Macintosh

Technobeam LCD Controller

Verifying the Transfer

Open the Get Info window on the file you just captured to make sure the file is about 531KB in size. If the file was 531KB, you are finished.

- If the file was larger than 0KB but less than 531KB, the most likely cause was that something interrupted the transfer. Check the cable connections on both ends, verify the cable or replace it with a known working cable. Begin again with the section titled "Setting Up the Software" on page 7-13, making sure you do not press the <Select> key on the controller or close the file capture until the transfer is complete.
- If the file was 0KB, the most likely reason is a faulty cable or connection. Check the cable connections on both ends, verify the cable or replace it with a known working cable. Begin again with the section titled "Setting Up the Software" on page 7-13.

Restoring (Uploading) Memory from Computer to Controller

Make sure you followed the procedure in both the following sections before continuing:

- "Connecting the Computer and Controller" on page 7-12
- "Setting Up the Software" on page 7-13
- 1. Press and hold down the <Erase> key on the controller's front panel (about 10 seconds) until its LCD display shows the following:

Upload from RS-232 port. Send file Now, press SELECT when done

2. Your computer screen should display the following message:

Restore to controller from PC. Send data to controller now. Press SELECT to quit anytime.

3. Press **Command+Y** to send a text file. Use the Please Select A File dialog box to locate the file containing backed-up memory, then click **Select** to start the upload.

4. While the upload is underway, the controller's LCD display appears as shown below:

```
Upload from RS-232 port.
receiving M:x P:xx
```

- **Note** You can press the <Select> key on the controller's front panel at any time to stop the transfer.
- 5. The controller's LCD display shows the following when the transfer is complete:

```
Upload from RS-232 port.
receiving M:9 P: **
```

6. Press the controller's <Select> key to complete the operation.

Verifying the Transfer

Make sure the transfer was successful by checking the programming on several pages in different memories you know should have been changed. If the pages are programmed as you expected, you are finished.

If the pages are not programmed as you expected, first open the Get Info window on the backup file. If the file was less than 531KB in size, it did not contain all of the controller's memories and pages. Check both of the following:

- Check the cable connections on both ends, verify the cable or replace it with a known working cable.
- Repeat the procedure, making sure not to press the <Select> key on the controller until the transfer is complete.

This section explains how to transfer memories, pages and presets directly from one controller to another controller. The first controller (the *source* controller) will transfer all of its memory to the second (*destination*) controller. The memory of the source controller will not be affected by the transfer.

Any locked memories on the destination controller will remain intact; they will not be overwritten.

Note Because of the differences between LCD controllers, you should use this procedure only to crossload between two Technobeam LCD controllers.

Required Hardware

One DB9 male-to-DB9 male null modem cable. If you have this cable, you do not need the other materials listed below.

If you do *not* have a null modem cable, you will need the following (see Figure 7-3 on page 7-18):



- One standard DB9 female-to-DB9 male serial cable.
- One DB9 male-to-DB9 male null modem adapter, or both of the following:
 - One DB9 male-to-DB9 female null modem adapter
 - One DB9 male-to-DB9 male gender changer
- **Note** A gender changer looks exactly like a null modem adapter. It would be a good idea to label them so you don't get them confused later.

The top diagram in Figure 7-3 shows the simplest connection, using a male DB9-to-male DB9 null modem cable. This type of cable is probably *not* commonly available. The bottom diagram shows a

connection using standard, off-the-shelf cabling and adapters:

Using a customized null modem cable



Male DB9 to male DB9 null modem cable

Using standard cables and adapters





Crossload Procedure

The *source* controller is the one you want to transfer data *from*; the *destination* controller is the one you want to transfer data *to*.

- 1. Toggle the <Standby> keys on each controller until their Standby LEDs come ON.
- 2. Press and hold the <Record> key on the source controller (about 10 seconds) until its LCD display shows the following:

Download to RS-232 port. Prepare to receive ASCII file, then press RECORD 3. Press and hold the <Erase> key on the destination controller (about 10 seconds) until its LCD display shows the following:

```
Upload from RS-232 port.
Send file Now, press SELECT when done
```

4. Press the <Record> key on the source controller to start the transfer. While the transfer is taking place, the LCD display on the destination controller appears similar to the one shown below:

```
Download to RS-232 port.
sending M: x P:xx
```

- **Note** Press the <Select> key on each controller (in any order) at any time to stop the transfer. No data corruption will result; stopping the transfer only limits the amount of data you crossload.
- 5. The destination controller restarts itself when the transfer is complete.

Verifying the Transfer

Make sure the transfer was successful by checking the programming on several pages in different memories you know should have been changed. If the pages were programmed as you expected, you are finished.

If the pages were not programmed as you expected, something interrupted the file transfer. Do both of the following:

- Check all cable and adapters to make sure they are firmly attached, verify the cable or replace it with a known working cable.
- Repeat the procedure, making sure not to press either controller's <Select> key until the transfer has completed.

Glossary

Access Modes

The controller offers the following two remote access modes:

- **Page access:** An attached analog controller accesses pages in • memory. See Chapter 6 for more information.
- **Preset access:** An attached analog controller access presets, either by 12-level preset access or binary preset access as described in Chapter 6.

Address Mode



ADDRESS A mode of the controller that allows you to directly access fixtures for programming pages. The Address LED on the <Address>/<Preset> key is ON to indicate the controller is in this mode.

Advance Modes

The controller offers the following four ways to advance the pages in memory:

- **Manual advance:** Use the Page <Up> and <Down> arrow keys to • manually advance through pages in memory.
- Auto advance (loop playback): Pressing the <Auto> key on the • controller's front panel causes pages to advance sequentially at the rate determined by the Delay construct and the <Rate> knob.
- **Audio advance:** Vary the rate of page advance; stop page • advance; and modulate color and dim changes using an external audio source. See Chapter 6 for more information.
- **Random advance:** When used with auto advance (and optionally all-memory playback), sequences through initialized (programmed) pages in random order.

All-Memory Playback

When used with auto advance, allows you to play back all 99 pages in all nine memories. (Only initialized, or programmed, pages will play back.) If used with random advance, pages play back in random order.

Binary Preset Access

See "Presets".

Blackout

See "Standby".

Blackout Page

A page that is erased or reset to its default parameters (with the shutter closed). A blackout page is still an initialized page.

Chase

See "Loop".

Constructs

Fixture features; for example, Color, Litho, Effect, Dim, Crossfade, Position, and so on. When you program the controller you record pages with construct parameters (values).

The meanings of individual constructs are given in Chapter 3. Appendix C has a complete listing of constructs and parameters.

Crossfade

A fixture construct that determines how fast a particular change occurs. For more information, see Chapter 3.

Crossloading

Transferring memories, pages and presets directly from one controller to another. Also refers to transferring firmware from one Technobeam fixture to other fixtures on the same DMX link. See Chapter 7 for more information about crossloading between controllers. See the *Technobeam User Manual* for information about crossloading firmware between fixtures.

Delay Time

The value of the Delay parameter, which determines how long one page in a loop "plays" before moving on to the next page in the loop. For example, selecting 2.0 seconds for the Delay construct equates to a *delay time* of 2.0 seconds. The delay time is affected by the <Rate> knob as described in the section titled "Setting Rate and Delay Time" on page 4-17.

Dichroic filters

A *dichroic* (from Greek, meaning "two-color") filter achieves a richlysaturated 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 set of colors) is reflected or cancelled out, and one color is allowed to be transmitted through the dichroic filter.

The dichroics used in Technobeam are all manufactured at the High End Systems Optical Coating and Assembly Laboratory in Austin, Texas. They are made from a base of Pyrex[®]-like 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 Pyrex-like 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.

Dichroics are currently used for all Technobeam color mixing wheels and the color wheel dichroic filters. Before installing a dichroic in Technobeam, make sure you read the *Technobeam User Manual*.

Dim

The brightness of light emitted by the fixture. Gradual dimming is controlled by a mechanical iris, as opposed to the shutter, which is used for quick blackouts as well as strobing.

See also "Master Dim".

DMX 512

DMX 512 is a standard method of controlling lighting fixtures and other devices (such as lasers and hazers). Developed by the United States Institute of Theatre Technology (USITT), DMX 512 is supported by leading entertainment industry equipment manufacturers, such as High End Systems, Inc.

DMX 512 (*D* for *digital*, *MX* for *multiplex* and *512* is the number of channels per link) is a reliable, efficient and well-understood method of controlling lighting devices. Its strength lies in the ability to control a large number of different types of devices made by various vendors on the same link using any DMX-compatible controller.

Fixture

A generic term that describes a wide variety of lighting devices, including automated luminaries like Technobeam.

Fixture Number

A unique number, 1 through 16, that you assign to each fixture connected to the controller. You use the fixture number to program each fixture uniquely. More than one fixture can be assigned to the same number as long as you want those fixtures to respond to the same set of constructs in exactly the same way.

Gate

The construct that controls whether the fixture's shutter is open or closed. It also selects the method and the rate of shutter strobing.

```
See also "Dim" and "Shutter".
```

Homing

A function of a fixture that returns its constructs to known or default states (defined as their *home positions*).

Laser Aiming Device[™] (LAD[™])

Available for Technobeam only, the LAD makes it easy for you to position the mirror during daylight or high ambient light conditions. This in turn allows you the additional flexibility to set up or verify mirror preset positions in conditions that would otherwise make positioning difficult or impossible.

Lightwave Show Control

Used with Lightwave Control Center software. See the section titled "Lightwave Control Center" on page 6-28 for more information.

See also "Show Control".

Link

(Also called *daisy chain*.) A DMX 512 *link* is a logical bus (serial) connection between devices. A link can connect one controller to many fixtures, or it can interconnect controllers via their Master and Slave ports.

For example, Figure 2-5 on page 2-14 shows two different types of links: each controller connected to fixtures represents one link (for a total of three links in the figure) and the Master/Slave connections between controllers counts as a separate link.

Each DMX 512 link can have up to 32 devices or span 500 ft (153 m). A serial data distributor must be used to extend any link beyond those limits.

See also "DMX 512" and "Serial Data Distributor".

Look

See "Page".

Loop

A sequence or series of programmed pages that repeats continuously until you stop it.

Luminaire

See "Fixture".

Macro

This term is used in two different contexts:

- 1. A series of up to 256 keystrokes you can assign to one of the User keys for one-touch playback. For more information, see Chapter 6.
- 2. A set of pre-recorded fixture constructs you can play back either onboard the fixture or using the Technobeam LCD controller. See the section titled "Laser Construct (Menu Only)" on page 3-16.

Master

The *master controller* determines the playback of all controllers and fixtures connected to it. Using master/slave controllers is one way of expanding your system beyond 16 independently-functioning fixtures.

See also "Slave".

Master Dim

A setting for fixture intensity (dim) that affects all connected fixtures. Master dim can be set in one of the following ways:

- By setting the Intensity value on the controller's front panel.
- By a submaster as described in the section titled "Submasters" on page 6-22.
- By a master controller as described in the section titled "Switch B-6: Dependent/Independent Presets" on page 2-9.
- Using channel 11 (blackout) in binary preset access as described in the section titled "Using Binary Preset Access" on page 6-17.

Memory

The controller's internal storage space, consisting of: the 891 programmable pages (99 pages in each of 9 memories); presets; User key definitions; submaster definitions; and menu choices.

See also "Page".

MIDI

Musical Instrument Digital Interface. MIDI is the communications protocol for nearly every microprocessor-based musical instrument.

MIDI Show Control (MSC)

A subset of the MIDI specification. See "Show Control".

Mirror Mode

After backing up or restoring user memory using a RAM card, subsequent programming is recorded to both the RAM card and to user memory. See Chapter 7 for details of RAM card usage.

See also "Memory" and "RAM Card".

MSpeed

(Mirror or motor speed.) This parameter, controlled by the Mode construct, determines how fast particular changes occur among multiple fixtures as the controller moves from page to page. For more information, see the section titled "MSpeed vs. Fast Changes" on page 3-3.

Non-initialized Page

See "Un-initialized Page".

Page

The basic programming unit, consisting of addresses (fixtures), constructs and their parameters (values). The controller's memory can contain up to 891 pages—99 pages in each of 9 memories.

Page Access

See "Access".

Parameter

The value you assign to a construct. For example, selecting a parameter (value) of 99 for the Dim construct causes the fixture to project a beam of maximum brightness. Appendix B has a complete listing of constructs and parameters.

PCMCIA, PC Card

PCMCIA stands for Personal Computer Memory Card International Association. The official name of adapters that comply with standards issued by the PCMCIA is now *PC Card*.

See "RAM Card".

Position Memory

(Also called *preset focus* or *preset positioning*.) Allows one page to refer to another page for pan and tilt (position) information. When you alter the reference page, all pages that refer to it reflect the change.

Memory 9 is designated as "position memory." You can program all 99 pages as position presets, and you can still use all pages in memory 9 not reserved for position presets for page programming.

See the section titled "Using Position Presets" on page 6-2 for more information.

Preset Access

See "Access Modes".

Preset Banking

Allows you to access up to 1024 presets from the controller's front panel. The controller has 64 banks of presets; each of the 16 Preset keys can be used as a separate preset in each bank for a total of 1024 presets.

Preset bank 1 contains presets 1 through 16, which directly correspond to the Preset keys. Preset bank 2 contains presets 17 through 32 (the Preset <1> key corresponds to preset 17, the Preset <2> key corresponds to preset 18, and so on).

Preset Focus

See "Position Memory".

Preset Levels

A group of 16 presets used with 12-level preset access; see Chapter 6 for more information.

Preset Mode



Play back loops or individual pages you recorded as presets. The Preset LED on the <Address>/<Preset> key is ON to indicate the controller is in this mode.

See Chapter 6 for more information about 12-level or binary preset access.

Preset Positioning

See "Position Memory".

Presets

A programmed page or loop assigned to a Preset key for one-touch playback. Presets can also be recorded and played back in 12-level and binary access modes. Presets are covered in Chapter 4; preset access is covered in Chapter 6.

See also "Preset Levels", "Access" and "Preset Mode".

RAM Card

Another name for a PC Card (*nee* PCMCIA, Personal Computer Memory Card International Association). The Technobeam LCD controller uses a Type 1, 512KB SRAM PC Card. (You can also use a 256KB SRAM PC Card.) The RAM card provides you with the means to backup or store the controller's memory in a removable device. You can then restore the controller's memory to the same or other controllers.

See also "PCMCIA".

Ramp

The term *ramp* is a parameter of the Gate construct that allows you to select a time for the gradual opening or closing of the shutter (light gate).

Ramp up means the shutter opens gradually at a time you select; ramp down means the shutter closes gradually at a time you select. For more information, see the section titled "Gate Key" on page 3-12.

See also "Snap".

Remote Enable

The controller's Remote Enable connector that allows you to remotely enable and disable the controller as described below:

- Sending a voltage of 0 V DC disables the controller (all fixtures go dark, all wheels stop moving, and all in-progress moves finish immediately).
- Sending a voltage between +5 V to +16 V DC to returns the controller to its previous state. If the controller was previously in Standby (with the Standby LED ON), the controller returns to Standby; if the controller was *not* previously in Standby, the controller resumes operation.

Scene

See "Page".

Sequence

See "Loop".

Serial Data Distributor

A device used to retime and regenerate the DMX 512 signal in order to extend your cable run. A serial data distributor is required whenever either of the following is true:

- You wish to connect more than 32 fixtures to a controller (or more than 32 controllers together) on a single link.
- The end-to-end cable span (the total length of all cables) on any link exceeds 500 ft. (153 m).

See also "Link".

Show Control

A protocol (language) that allows a variety of different types of devices to be controlled from a central source, such as a lighting console. Typically, a show control protocol will allow you to set up cue lists on a lighting console that play back pages or presets on any controller connected to it.

Show control protocols differ from the DMX 512 protocol in that DMX 512 is typically used to control devices such as lighting fixtures.

The two types of show control protocols covered in this manual are MIDI Show Control (MSC) and Lightwave Show Control (LSC). See Chapter 5 for more information.

Shutter

(Also called *light gate.*) The Technobeam fixture has a mechanical shutter that is used to black the fixture out quickly, for dimming (using the Dim construct) and for strobing (using the Gate construct).

See also "Dim" and "Gate".

Slave

A *slave* or *slaved controller* accepts all of its playback commands from the master controller. All programming is done on the slaved controller, however.

See also "Master".

Snap

The term *snap* is a parameter of the Gate construct that describes a rapid opening or shutter of the shutter (light gate). Snap time is always short. For more information, see the section titled "Gate Key" on page 3-12.

See also "Ramp".

SRAM

Static Random Access Memory. The type of memory used for backup and restore functions using a RAM card.

See also "RAM card".

Standby

In Standby, all fixtures' shutters close and any in-progress wheel or effect changes stop immediately. Controller pages continue to advance in Standby, however.

You can put the controller into Standby by pressing the <Standby> key on the controller's front panel.

See also "Remote Enable".

Submaster

A *submaster* is an analog 0-10 V controller you can use to remotely adjust (override), in real time, the dim, color, and litho construct parameters for selected fixtures. You can define up to 12 submasters and control them using one or more analog controllers.

Tip/Ring connector

The type of connector typically used for monaural audio sources. A connector of this type is shown in Figure 6-6 on page 6-28.

Tip/Ring/Sleeve connector

The type of connector typically used for stereo audio sources. This type of connector is diagrammed above the Stereo Audio Input port located on the controller's rear panel.

Twelve-Level Preset Access

See "Presets".

Un-initialized Page

An un-initialized page acts as a "placeholder" to indicate the beginning and end of a chase or loop.

User-Defined Keys

These eight keys allow you to access the five audio advance modes or to record and play back custom macros.

See also "Advance Modes" and "Macro".

User Memory

See "Memory".

Appendix A Factory-Installed Wheels

This appendix shows how the litho wheel, rotating litho wheel, color wheel and effects wheels are configured by the factory when Technobeam, Technoray and Technopro are shipped. The numbers shown around the outside of the wheels are the position numbers used by the Technobeam LCD Controller to select that effect. For example, choosing position 6 on the Technobeam rotating litho wheel (shown in Figure A-1 below) with a controller selects the "Rip Wheel" litho.

Technobeam™ Wheels

Technobeam rotating litho wheel:



Figure A-1. Factory configuration of the Technobeam rotating litho wheel.

Position	Litho Name	Position	Litho Name
2	3-D blocks	6	Rip wheel
3	Round triangle	7	Technowedges
4	Silcsquare	8	Gatlin
5	TB-lumoil (2 lithos, one rotating, one stationary)		

Technobeam and Technoray color wheel:



Figure A-2. Factory configuration of the Technobeam and Technoray color wheel.

Technobeam rotating effects wheel:



Figure A-3. Factory configuration of the Technobeam rotating effects wheel.

Position	Effect Name	
2	Prism	
3	Lenticular	
4	Slow glass	
5	Frost	

Technoray rotating litho wheel:



Figure A-4. Factory configuration of the Technoray rotating litho wheel.

Position	Litho Name	Position	Litho Name
2	TR-lumoil [†]	6	Small chip Fusion Fire®
3	Structure	7	Moire swirl [†]
4	Round triangle	8	Iris twist
5	Warp		

 $^{\dagger}\,$ - Both of these are combinations of two lithos: one rotating, one stationary.

Technoray color wheel: same as the Technobeam color wheel, shown in 1-2 on page 1-2.

Technoray rotating effects wheel:



Figure A-5. Factory configuration of the Technoray rotating effects wheel.

Position	Effect Name	
2	Prism	
3	Lenticular	
4	Hammered	
5	Frost	

Technopro™ Wheels

Technopro color wheel 1:



Figure A-6. Factory configuration of the 13-position Technopro color wheel.

Note CTB means *color temperature blue* and is used on tungstenfilament fixtures (such as Trackspot®) to color-correct tungsten color temperature (3200K) to daylight (5600K). On Technopro (which uses a lamp with stable operation at 6500K), this filter is included to give you a very light blue. Technopro color wheel 2 (mixing wheel):



Figure A-7. Factory configuration of the Technopro 8-position color wheel (color mixing wheel).

Technopro rotating effects wheel:



Figure A-8. Factory configuration of the Technopro rotating effects wheel.

Position	Effect Name	
2	Hammered	
3	Lenticular	
4	Slow glass	
5	Frost	

Appendix B Construct Parameters

Table B-1 below lists the available constructs for the Technobeam LCD controller, their parameter values and defaults. Constructs are ordered by the way they appear *on the controller's menu system*, not by construct key.

Construct	Value Range	Default	
Gate	Open, Closed, Strobe speed 1 (slowest) thru 60 (fastest) Random strobe 1 (slowest) thru 60 (fastest) Ramp up 1 (slowest) thru 60 (fastest) Ramp down 1 (slowest) thru 60 (fastest)	Closed	
Dim	0 (dark) thru 99 (bright)	99	
Color constructs	See Table B-2 on page B-2 for Technobeam and Technoray See Table 3-2 on page 3-9 for Technopro		
Focus	0 thru 255	0	
Litho constructs	See Table B-3 on page B-3		
Effect	1 (open) thru 5	1	
Effect rotate	Off, Forward 0 (slow) thru 120 (fast) Reverse 0 (slow) thru 120 (fast)	off	
Position	Joystick Preset 1—99	Joystick	
Speed	1 (slowest) thru 99 (fastest)	99	
Laser	Off (LAD and macros are both off) On (LAD is on continuously) Macro [†] 1 thru 28 Modulate 1 (LAD modulate slow) thru 120 (fast)	off	
Xfade	0.1 sec thru 99.0 sec	0.1 sec	
Delay	0.0—99.0 Hold for manual advance	0.0	

[†] - not to be confused with User key macros as explained in Chapter 6.
Table B-2 below lists the values for the Color constructs and how those values are displayed when you "view" a fixture as described in the section titled "Viewing Fixtures" on page 4-23.

Func	Color	Address View Display	
Indexed	1 thru 13 (full colors) 1/2 thru 13/1 (half colors)	1 through i13 (Capital "I" means centered on full color, lowercase "i" means centered on half-color)	
Forward spin	Fwd spin speed 0 thru 255	-> I through-> FF ([0-FF] = spin speed in percent, FF = 100%)	
Reverse spin	Rev spin speed 0 thru 255	<- I through <- FF ([0-FF] = spin speed in percent, FF = 100%)	
Continuous	Color wheel is centered on whatever is at center of LCD display	C 1 through c 13 (Uppercase "C" means wheel is centered on or close to a full color; lowercase "c" means wheel is centered on or close to a half- color)	
Slow scan	1 thru 13 (full colors) 1/2 thru 13/1 (half colors)	\$ 1 through \$13 (Capital "S" means centered on full color, lowercase "s" means centered on half- color)	
Fast scan	1 thru 13 (full colors) 1/2 thru 13/1 (half colors)	F1 through f13 (Capital "F" means centered on full color, lowercase "f" means centered on half- color)	
Random	Random, speed 0 thru 255	5 R J through RFF ([0-FF] = random pause tir in percent, FF = 100%)	
Blink	1 thru 13	B 1 through b13 (Capital "B" means centered on full color, lowercase "b" means centered on half- color)	

Table B-2. Color Construct Values

Note The Technopro 8-position color mixing wheel is controlled by the Litho set of constructs as described in the section titled Table 3-2 on page 3-9. The address view display for the second color mixing wheel will match the display for the litho constructs.

Table B-3 below lists the values for the Litho constructs and how those values are displayed when you "view" a fixture as described in the section titled "Viewing Fixtures" on page 4-23.

Func	Litho	Rotate	Address View Display	
Indexed	1 thru 8	0.0 thru 358.5	11 Ø through 18FF (I = indexed; [1-8] = position; [0-FF] = rotation angle in percent, FF = 100%)	
Forward rotate	1 thru 8	Forward 0 thru 255 1->Ø thru 8->FF ([1-8] = position; [0-FF] = rotatio speed in percent, FF = 100%)		
Reverse rotate	1 thru 8	Forward 0 thru 255	1<-9 thru 8<-FF ([1-8] = position; [0-FF] = rotation speed in percent, FF = 100%)	
Scan	1 thru 8	Scan speed 0 thru 255	6S0 thru 8SFF ([1-8] = position; S = scan; [0-FF] = speed)	
Blink	1 thru 8	0.0 thru 358.5	1B I through 8BFF ([1-8] = position; B = blink; [0-FF] = rotation angle in percent, FF = 100%)	
Random	1 thru 8	Random speed 0 thru 255	1RJ thru 8RFF ([1-8] = position; R = blink; [0-FF] = random pause time in percent, FF = 100%)	
Wheel spin	has no effect	Wheel reverse 0 thru 127	1<8 thru 8<ff< b=""> ([1-8] = position, which is ignored; [0- FF] = wheel spin speed in percent, FF = 100%)</ff<>	
		Wheel spin forward 0 thru 127	<pre>1>0 thru 8>FF ([1-8] = position, which is ignored; [0- FF] = wheel spin speed in percent, FF = 100%)</pre>	

Table B-3. Litho Construct Values

Appendix C Technopro™ Color Selection

This Appendix shows how to use Technopro to display either a continuous spectrum from blue to red, or Rosco[®] or Lee[®] gel colors.

Table C-1 shows the possible color combinations arranged from blue to red. Each color is listed from lightest to most saturated. Because judgment of color is subjective, because lamp throughput can vary, and because your expectations might be different, you should try some of the color combinations before using them in a show.

Table C-2 on page C-3 shows Rosco/Lee gel colors; you can use this information to mix Technopros with conventional lights.

Color	Color wheel 1 position	Color wheel 2 position	Color	Color wheel 1 position	Color wheel 2 position
Blue - very light	1	2	Blue - saturated	12	4
	2	1		6	4
	2	2		5	8
	13	3		10	4
	6	3	Purple	9	3 or 4
cyan	1	3		13	4
	12	3	Green - <i>p</i> ale	3	5
	3	8		8	6
	3	1		8	1
	3	2 or 3		8	8
	2	3		8	2 or 3
medium	3	4	medium	8	4
	4	1, 2, 3 or 4		4	7
	1 or 2	4		8	7
	4	8		4	6
	11	3	Green-yellow	3	7
saturated	11	4		3	6
	5	1, 2, 3 or 4		10	3

Table C-1. Technopro Color Spectrum

Color	Color wheel 1 position	Color wheel 2 position	Color	Color wheel 1 position	Color wheel 2 position
Yellow - <i>l</i> ight	1	7	Red - saturated	7	1
	2	7		7	2
medium	2	6		10	5, 6 or 7
	1	6		9	5, 6 or 7
saturated	2	5		7	5, 6, 7 or 8
	1	5			
Yellow-orange	13	5, 6 or 7			
Orange - very light	1	8 (CTO)			
light	6	6 or 7			
	6	5			
	12	5, 6 or 7			
saturated	11	5, 6 or 7			
Pink - very light	13	1 or 2			
	13	8			
	6	8			
light	6	1			
	6	2			
	11	2			
	12	2			
lavender	11	1			
medium	12	8			
	11	8			
saturated	10	1 or 2			
	9	8			
magenta	9	1			
	10	8			

Table C-1. Technopro Color Spectrum

Table C-2 shows color wheel combinations you can use to approximate Rosco or Lee gel colors. An *L* preceding a color number means it is a Lee gel; *LHT* means Lee high-temperature gel; and an *R* preceding a color number means it is a Rosco gel.

Color Name	Color No.	Technopro color wheel 1 position	Technopro color wheel 2 position
Medium Yellow	L010	12	5
Medium Amber	L020	11	6
Gold Amber	L021	10	5
Scarlet	L024	7	6
Dark Magenta	L046	7	6
Deep Amber	L104	11	6
Orange	L105	10	5
Magenta	L113	7	6
Light Blue	L118	8	2
Mauve	L126	10	8
Medium Blue	L132	4	4
Primary Green	LHT139	4	5
Deep Orange	L158	10	5
Chrome Orange	L179	11	6
Dark Lavender	L180	11	3
Bermuda Blue	R376	3	1
Light Sky Blue	R67	3	2
Sky Blue	R68	4	4
Nile Blue	R70	3	8
Sea Blue	R71	3	1
Azure Blue	R72	3	1
Light Green Blue	R76	8	4
Green Blue	R77	5	8
Primary Blue	R80	5	2
Urban Blue	R81	5	1

Table C-2. Rosco/Lee Gel Approximations

Appendix D Important Safety Information

WARNING: For Continued Protection Against Fire

- 1. This equipment is designed for connection to a branch circuit having a maximum overload protection of 20 A.
- 2. Replace fuses with the specified type and rating ONLY.

WARNING: For Continued Protection Against Electric Shock

- 1. Refer servicing to qualified service personnel. No user serviceable parts inside.
- 2. Do not expose to rain or moisture.
- 3. 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
- 4. 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 \bigoplus , 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.
- 5. THIS EQUIPMENT MUST BE EARTHED.

Appendice D Important: Informations De Sécurité

MISE EN GARDE: Pour Une Protection Permanente Contre Les Incendies

- 1. Cet équipement est conçu pour connexion à un circuit de dérivation ayant une protection de surcharge maximum de 20 A.
- 2. Remplacez les fusibles UNIQUEMENT par le type et la puissance précisés.

MISE EN GARDE: Pour Une Protection Permanente Contre Les Chocs Électriques

- 1. L'utilisateur ne peut pas accéder aux pièces à l'intérieur de cet appareil. Seul du personnel qualifié est habilité à réparer cet appareil.
- 2. Ne pas exposer l'appareil à la pluie ou l'humidité.

- 3. Si l'appareil n'a pas été livré avec une prise de cordon électrique, attacher la prise de corde électrique conformément au code suivant:
 - BRUN- BRANCHE
 - BLEU- NEUTRE
 - VERT/JAUNE TERRE
- 4. L'EQUIPEMENT DOIT ETRE MIS A LA TERRE.

Anhang D Wichtige Sicherheitshinweise

WARNUNG: Zum Schutz vor Brandgefahr

- 1. Dieses Gerät ist für den Anschluß an ein Stromnetz mit einem Überlastungsschutz von höchstens 20 A bestimmt.
- 2. Ersatzsicherungen müssen den angegebenen Spezifikationen und Kennwerten entsprechen.

WARNUNG: Zum Schutz gegen gefährliche Körperströme

- 1. Das Gerät enthält keine wartungsfähigen Teile. Service sollte stets nur von Fachpersonal durchgeführt werden.
- 2. Vor Feuchtigkeit und Nässe schützen.
- 3. Falls dieses Gerät ohne Netzstecker geliefert wurde, schließen Sie bitte ein Netzstecker nach folgendem Farbschlüssel an:
 - Braun—stromführend
 - Blau—neutral
 - Grün/Gelb—geerdet
- 4. DIESES GERÄT MUSS GEERDET WERDEN.

Apéndice D Información Importante De Seguridad

ADVERTENCIA: Para Protección Continua Contra Incendios

- 1. Este equipo está diseñado para conectarse a un circuito derivado con protección máxima contra aflujos de al menos 20 amperios.
- 2. Reemplace *SOLAMENTE* con fusibles que sean del tipo y potencia indicados.

ADVERTENCIA: Para La Protección Continua Contra Electrocuciones

- 1. El interior de la unidad no contiene repuestos que puedan ser reparados por el usuario. Solicite el servicio de reparación de personal califícado.
- 2. No exponga la unidad a la lluvia o a la humedad.

- 3. Si se ha recibido este equipo sin un enchufe macho de cable de alimentación, conecte el enchufe macho de cable alimentación adecuado según los códigos siguientes:
 - MARRÓN CON CORRIENTE
 - AZUL NEUTRO
 - VERDE/AMARILLO TIERRA
- 4. ESTE EQUIPO DEBE CONECTARSE A TIERRA.

Appendice D Información Importante De Seguridad

AVVERTENZA: Per Prevenire Incendi

- 1. Questo apparecchio può essere connesso ad un circuito ramificato con una protezione di massima di 20A.
- 2. Sostituire i fusibili SOLO di tipo e di amperaggio comeda specifica.

AVVERTENZA: Per Prevenire Le Scosse Elettriche

- 1. L'utente non deve riparare nessuna parte dentro l'unita'. Per qualsiasi riparazione rivolgersi al personale specializzato.
- 2. Questa apparecchiatura non deve essere esposta ne alla piogga ne all' umidita'.
- 3. Nel caso in cui questa apparechiatura fosse riccevuta senza il debito cavo completo di spina, collegarne uno apropriato seguendo i sucessivi codici:
 - MARRONE-SOTTO TENSIONE
 - BLU-NEUTRALE
 - VERDE/GIALLO-A TERRA
- 4. QUESTA APPARECCHIATURA DEVE METTERSI A TERRA.

Vigtig Sikkerhedsinformation - DANMARK

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt!

Ledere med gul/groen isolation maa kun tilsluttes en klemme maerket

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