

CD80 Advanced Electronics Rack

User's Manual

Strand Lighting

Manual Part #:	2-450079-010
Revision Level:	B0
Revision Date:	9/28/92
Written By:	Don Lammers

Introduction and Assistance

This manual provides information on the operating procedures for CD80 Advanced Electronics Dimmer Racks.

Manual Organization

This manual contains the chapters shown below, plus an Index.

Introduction (chapter 1) - tells you about the organization of this manual, plus definitions and conventions used. Also tells you how to get technical help if necessary

Operational Features (chapter 2) - gives an overview of the operational features of this console.

Hardware Description (chapter 3) - gives an overview of the hardware and how it works together.

Installation (chapter 4) - tells you about the installation requirements for the console and peripherals. This chapter shows pinouts for externally accessible connectors, cable types and lengths, and (where applicable) setup information.

Basic Trouble-shooting (chapter 5) - tells you how to begin trouble-shooting if you have problems with the console. Since actual internal repair of the console is beyond the scope of this manual, this chapter shows only the basic steps you can take without having to replace parts, and before you call for help from Strand Lighting.

Periodic Maintenance (chapter 6) - lists the steps which should be taken to keep the equipment running at its best.

Reference (chapter 7) - shows the command and actions possible with the console. This chapter is organized alphabetically by display for easy reference, and describes the function of every key.

Index

Definitions

This manual uses the following definitions throughout:

- Circuit** Connection device and wiring for powering a lighting fixture from a dimmer.
- Dimmer** Device controlling power to a lighting fixture. Two lights on the same dimmer cannot be separately controlled.
- Channel** Device controlling a dimmer or group of dimmers. Historically, there is a physical controller (such as a slider) for each channel. On most current control systems, channels are numbers accessed by a numeric keypad. Each channel can control multiple dimmers.
- Patch** Historically, the process of physically connecting circuits to dimmers. Now usually refers to electronic assignment of dimmers to channels. "Patch" does not refer to assignment of channels to cues or submasters.
- Preset** A pre-defined setup of intensities for a set of channels, stored in memory for later replay.
- Memory** Storage location for preset information.
- Cue** The process of recalling a preset from its memory location and putting the result on stage.
- Preset, Memory, and Cue are often used interchangeably.*
- Submaster** A controller (usually a linear slider controller) which allows manual control of groups, effects, cues, or channels.
- Fade** A gradual change in stage levels from one set of intensities ("look") to another.
- Up-fade** The portion of a fade which involves only channels which are increasing in level.
- Down-fade** The portion of a fade which involves only channels which are decreasing in level.
- Crossfade** A fade which contains both an up-fade and a down-fade. Also may refer to any fade where the levels of one cue are replaced by the levels of another cue.
- Bump** An instantaneous change in stage levels from one set of intensities ("look") to another.
- 20A Dimmer** = 2.4Kw dimmer at 120VAC
- 50A Dimmer** = 6Kw dimmer at 120VAC
- 100A Dimmer** = 12Kw dimmer at 120VAC

Conventions

The following additional conventions are used in this manual.

Analog

Shows the actual push-button labelled "ANALOG." This is used wherever possible without requiring special text formatting

[channel list]

(text in square brackets) refers to something you must enter as a series of keystrokes - in this case on the numeric keyboard.

ON

(all capital text) shows to the status of a function or switch, as in "Turn the switch ON."

Live

(text with first letter capitalized) shows the name of a function or mode of operation, as in Live mode, Group function, or Preview display.

Technical Assistance

CD80 Advanced Electronics Dimmer Racks require a minimum of maintenance and servicing.

Problems If equipment fails to operate properly upon installation, or under normal load and temperature conditions, and basic trouble-shooting procedures are not effective, please contact Strand Lighting Field Service at the office serving your area. Strand Lighting will issue a Return Goods Authorization before the return of any defective materials. This allows tracking of returned equipment, and speeds its return to you.

Technical Questions For technical questions regarding setup, operation, or maintenance of this equipment, please contact the Strand Lighting Field Service office serving your area.

Parts Purchases For purchase of spare parts or documentation, please contact the Strand Lighting office serving your area.

Comments and Suggestions For comments regarding equipment functions and/or possible improvements, or for comments on this manual, please call or write to the Marketing Manager at the Strand Lighting office serving your area.

Addresses Addresses for all of the Strand Lighting offices are shown on the reverse side of the manual title sheet.

Operational Features

This chapter presents the basic operational features of the CD80 Advanced Electronics Dimmer Rack.

Configuration One set of advanced electronics can drive up to 192 dimmers (2 CD80 Advanced Electronics racks). Dimmer rack configuration is factory and/or user assignable through the use of a hand held programmer or personal computer. The following configurations items are usually programmed at the factory but can be easily reprogrammed in the field using the hand held programmer.

- Two input ports let you partition the dimming system between two discrete control consoles.
- Individual dimmers are assignable to each port in any configuration.
- Each dimmer space is programmable to any dimmer number.
- You can assign up to sixteen 0-10 volt discrete analog inputs per 192 dimmers to any dimmer in the system and operate them on a highest-takes-precedence manner with the multiplexed input signal. You can assign multiple dimmers to each analog input, though each dimmer can only be assigned to a single input.

Programming Several additional functions (generally programmed by the end user in the field) are also available in the CD80 Advanced Electronics system.

- Each rack can memorize 100 cues by saving the current dimmer levels. These cues can be assigned time, previewed, and initiated through the hand held programmer without a console being connected to the dimmer system.
- The first 8 cues can also be initiated through a Strand Lighting LiteScene push-button control station for immediate access. To prevent accidental access, all dimmer rack cue functions except Preview are automatically locked out when the system control console is ON.
- Each individual dimmer can be brought to full using the hand held programmer.
- Dimmers can be assigned as "dim" or "non-dim" using the hand held programmer.

Protocol CD80 Advanced Electronics will accept and decode AMX192 multiplexed analog signals or DMX512 digital dimmer signals. Since protocol type selection can be automatic you can present the input port with different protocol data at different times if required (via external switching). You can present each port with only one protocol at a time but each input port in your system can have a different protocol input if required.

Regulation Each dimmer, with circuitry in the Control module, regulates output voltage with changes in the AC line from 108 to 130 volts RMS (120VAC Dimmer Modules - 100VAC and 220VAC models are also available).

Dimmers will maintain output RMS voltage within +/- 2% with changes in load from 10 watts to full rated load at any point on the dimming curve.

Output Curve The output RMS voltage versus setting follows a modified square law dimming curve. The modified curve has been adjusted from the standard square law curve to more closely match the characteristics of the human eye under real-world conditions.

Because the human eye is more sensitive to changes in the lower end of the dimming curve, the control voltage to dimmer step mapping has also been adjusted to concentrate a larger portion of the 256 level steps into this part of the curve. This eliminates the "stepping" effect apparent in some digital dimmers.

Houselight Control Houselights can be wired to any dimmer and controlled by the main control console. If separate analog control is required, they can be controlled using one or more of the 16 analog inputs to the rack. Each set of 16 analog inputs controls dimmers in 2 CD80 racks. If there are more than 2 racks in the system, each 2 rack pair has its own set of 16 analog inputs.

Dimmer Level Retention The microprocessor will maintain current dimmer levels ("Status Quo" memory) for a selected length of time if there is a loss of control signal (i.e., when you turn the console OFF). The length of retention is user programmable from ZERO to 25 minutes in one minute increments. When the selected retention time is over the CD80 Advanced Electronics Racks will revert to the last internal cue accessed through the hand held programmer or LiteScene station.

When the console is ON it will take over control of the CD80 Advanced Electronics rack hand held programmer and LiteScene cues. The rack will go to blackout once the selected retention time is over.

Hardware Description

The CD80 Dimmer Bank is a UL and CSA listed, free standing, factory assembly of dimmer rack(s) (see drawing) constructed of 3/16" (5mm) steel angle top and bottom frames, 14 gauge roll formed posts and a 0.125" (3mm) aluminum back panel. It may also contain one or more power cubicles for auxiliary wiring (not shown).

Each dimmer rack includes removable dimmer trays, Advanced Electronics Command module, top and bottom vent grills, and a hinged latching front door. Rack components are designed for easy removal and installation so that the dimmer bank is completely open and empty while being wired by the contractor.

CD80 Multiplexed Analog racks can be retrofitted with CD80 Advanced Electronics if required. This retrofit requires a field service trip. Once retrofitted, the rack is identical to a CD80 Advanced Electronics rack.

Dimmer Rack

Each dimmer rack has provisions for up to 48 plug-in Dimmer Modules, each containing two 20A dimmers (2.4Kw at 120VAC), one 50A dimmer (6Kw at 120VAC), or one 100A dimmer (12Kw at 120VAC). Dimmer racks containing 100A dimmers are limited to 24 100A dimmers (due to cooling constraints), which are usually placed in the bottom half of the rack. CD80 "Half-racks" are the same dimensions as full racks but with only one half of the dimmer receptacles and wiring. Half racks are available as either a "top half" rack, or a "bottom half" rack. This allows two CD80 Racks side by side to provide the equivalent of a full rack of 100A dimmers.

Guides in the dimmer trays allow easy insertion and withdrawal of Dimmer Modules. A tapered housing on the rack and Dimmer Module connectors assures positive alignment of the module and protects the connector pins from insertion damage. All power and signal connections are factory wired. All contractor load connections are made directly to the appropriate dimmer receptacles. Adequate space is provided for contractor wiring next to factory installed wiring. A tubular screw termination point (maximum wire size - #6) is provided for each contractor load and neutral wire. An adapter lug for #4 through #1/0 AWG is provided when required. Terminals are also provided for the multiplexed signal wires, overtemp wires and auxiliary wires as defined by the contracted installation requirements.

Three fans in the base of the rack maintain the temperature of all components at proper operating levels with all dimmers under full load as long as ambient room temperature does not exceed 40°C. An automatic fan shut off, activated 5 minutes after loss of a dimmer control signal, is provided to extend fan life.

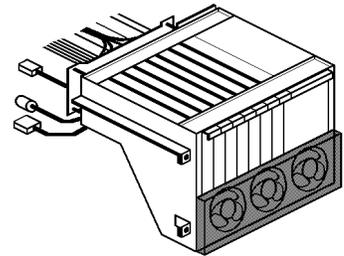
Each rack has an overtemperature thermostat and indicator which shows when rack temperature exceeds 131°F (55°C). A separate shutdown circuit turns the rack OFF if rack temperature exceeds 149°F (65°C).

All terminals are clearly marked and all connectors and wiring are accessible from the front of the rack.

The space in which this equipment is located must be maintained at temperatures not exceeding 40°C while the equipment is in operation.

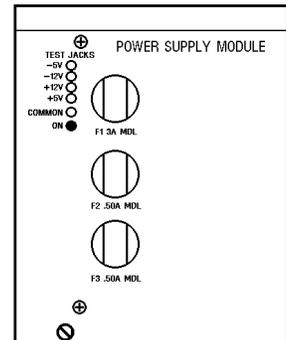
Command Module

A removable Command module at the bottom of the CD80 Rack contains a Power Supply module, A Smart Fan Controller, an Input Processor module, 3 or 6 Dimmer Processor modules, and 3 fans. Each Dimmer Processor module controls up to 32 dimmers. This circuitry determines the type of input signal and converts it to appropriate signals for Dimmer module power control.



Power Supply Module

The Power Supply Module provides conditioned +12V, -12V, +5V, and -5V power for the Input Processor and Dimmer Processor modules. Front panel test jacks allow easy access for checking these voltages. A front panel indicator shows when the +5V is present. 3 front panel fuses protect against short circuits. A neon light in each fuse illuminates when power is ON but the fuse is open. The Power Supply module can be easily removed and replaced by the end user if required.



Smart Fan Control

The Smart Fan controller turns fans ON whenever any dimmer in the rack is at a level of 5% or greater. The fan power fuse on this controller can be accessed by removing the Power Supply module. The Smart Fan controller is mounted directly behind the Power Supply module and requires removal of the Command module from the rack for replacement.

Input Processor Module

The Input Processor module analyzes the incoming signal(s) to determine their protocol and decodes them, adds the information from the LiteScene input ports and the 16 analog inputs, and outputs discrete analog signals for each dimmer to the Dimmer Processor modules.

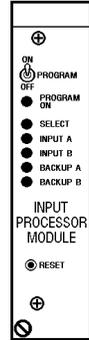
The Input Processor module has a switch to turn the configuration programming ON or OFF and a Reset switch to manually reset the processor if required.

Front panel indicators show the following:

- "Program On" shows the pair of racks which is available for programming.
- "Select" shows the pair of racks available for previewing.
- "Input A" shows when there is an active MUX signal for Port A.
- "Input B" shows when there is an active MUX signal for Port B.
- "Backup A" shows when a backup cue is active for Port A dimmers.
- "Backup B" shows when a backup cue is active for Port B dimmers.

Active MUX signals mean that a control console is on. The Backup LED(s) will remain on until an Input MUX signal is sensed.

The Input Processor module can be easily removed and replaced by the end user if required.



Dimmer Processor Module

There are either 3 (for single rack operation) or 6 (for dual rack operation) Dimmer Processor Modules in a CD80 Advanced Electronics Control Module. These modules provide conversion from the dimmer level signals provided by the Input Processor module to the pulse width modulated signals required by the Dimmer modules.

Each Dimmer Processor module controls all dimmers in a rack that are on a single phase. Dimmers are staggered in the rack to avoid phase imbalances.

The only controls on the Dimmer Processor module are adjustments for the ramp. These control the upper and lower limits of the dimmer output curve, and should only be adjusted after repairs to the module.

The Dimmer Processor modules can be easily removed and replaced by the end user if required.



Dimmer Modules

Dimmer modules are the rugged high power switching section of the CD80 dimming system. The Solid State Relay (SSR) in this module is the interface between high power A.C. and low power control signal since it is driven by low level signals (10mA, 3-24V) and switches high level signals (up to 100A, 120/220VAC).

Dimmer modules are factory wired plug-in units which slide into the dimmer rack. Components are enclosed by a 0.125" (3mm) formed aluminum chassis. Power and signal pins are oversized and recessed in a self-aligning phenolic housing to avoid damage. A contoured handle allows easy insertion and withdrawal.

Dimmer modules of the same capacity are interchangeable. Connectors and receptacles of different capacity modules are polarized so that they cannot be interchanged. 20A Dimmer modules, however, can be plugged into 50A or 100A slots, since all wiring is still properly protected. Only the left-hand 20A dimmer in the module will function.

The major components of the power switching section are the SSR block, inductor, load, circuit breaker, and interconnection wiring.

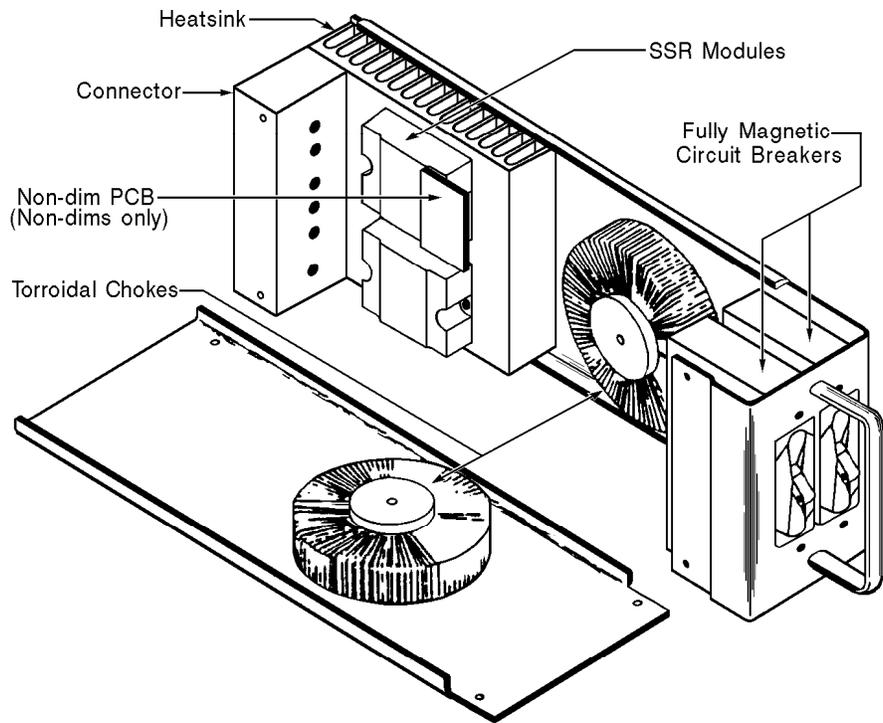


Figure 1. Typical CD80 Dimmer (2.4Kw shown)

Efficiency The power efficiency of the dimmer is a minimum of 95% at full load.

Quiet Dimmers For locations where noise levels are critical, CD80/8 Dimmer Modules (2.4Kw and 6Kw only) provide reduced dimmer noise through the use of high performance chokes. Nominal rise time for 2.4Kw dimmers using these chokes is greater than 800 microseconds. These modules are interchangeable with standard dimmers, and can be mixed in the same dimmer rack.

Dimmer Types Dimmer modules are available in the following configurations for 120VAC. Consult Strand Lighting for 100VAC and 220VAC applications.

- n 2.4Kw Dual Dimmer (S.L. #3-081060-010)
- n 2.4Kw Non-Dim/Dimmer (S.L. #3-081062-010)
- n 2.4Kw Dimmer/Non-Dim (S.L. #3-081062-020)
- n 2.4Kw High Performance Choke Dual Dimmer (S.L. #3-081112-010)
- n 6.0Kw Dimmer (S.L. #3-081061-010)
- n 6.0Kw Non-Dim (S.L. #3-081064-010)
- n 6.0Kw High Performance Choke Dimmer (S.L. #3-081114-010)
- n 12.0Kw Dimmer (S.L. #3-081122-010)
- n 12.0Kw Non-Dim (S.L. #3-0810092-010)

Installation

Preparation

Before installing your CD80 Racks, you should carefully consider the environment in which the equipment is to be installed, the power feeding the equipment, and the required conduit and/or cable runs.

Environmental Considerations

To maximize equipment life, and minimize the chance of failures, the following environmental requirements should be met:

- **Temperature** -- 40°C (104°F).
- **Humidity** -- 5%-80% relative humidity maximum, no condensation.

Caution



Dimmer rack efficiency is at least 95%. Since the remainder of the energy is dissipated as heat, they should be installed in a room with adequate ventilation to dissipate a heat load equivalent to 5% of the maximum load the dimmer racks will handle.

Power Requirements

A three phase power source (120VAC 50/60Hz for 120VAC units or 220VAC 50/60Hz for 220VAC units) must be provided for dimmer and Command module power. Please consult Strand Lighting on the actual main feed size required for specific installations.

Warning

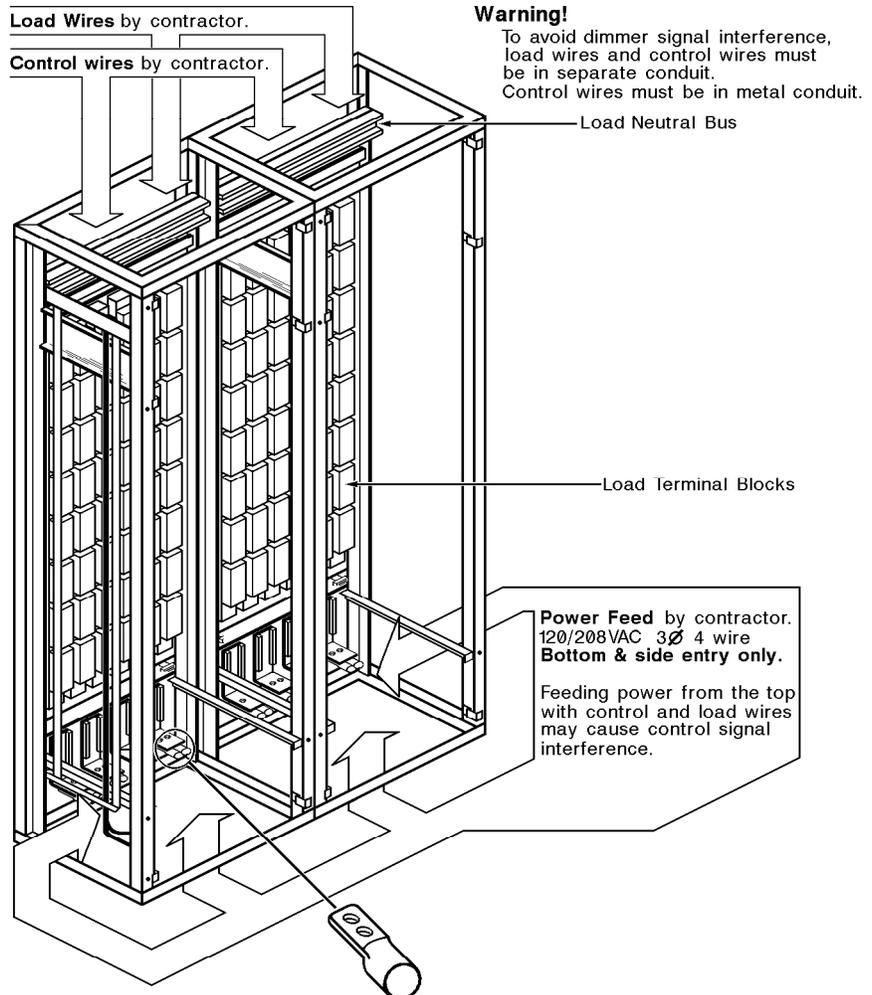


Do not install this equipment with power applied. Make sure that your incoming power is disconnected before proceeding.

Do not provide a 220VAC power to a 120VAC dimmer rack, or a 120VAC power to a 220VAC dimmer rack, as damage may result. When ordering spare parts or replacements, make sure you specify the required voltage.

Plan Conduit Layout

The location of conduit runs and their entrance to the dimmer cabinet is important and should be carefully planned before cutting holes or attaching conduit. Figure 2 shows the allowed entry areas for the various types of wiring.



U.L. Listed for copper conductors only

Power Feed Lugs

(2) Square-D cat #VHSC-500-12
compression lugs provided per phase
& neutral (wire range 4/0 thru 500MCM).

Ground Lug

(1) Square 'D' cat #VHSC-1/0-14
compression lug provided (wire range
#6 thru 1/0).

Figure 2. Conduit Entry Areas

Caution



Do not run power feed or load wires in the same conduit or wireway as control wiring.

Do not run wiring from other unrelated equipment in the same conduit with CD80 wiring.

Do not enter control wires from dimmer rack locations marked for load or power wires, and vice versa. These locations are chosen to minimize electrical interference between various sections of the system.

Do not run wiring in ways other than shown on system riser diagram. CD80 systems are designed to be installed in a specific manner.

Do not substitute plastic conduit for metal where conduit is called for. Metal conduit acts as a ground and shield.

Do not substitute shielded wiring for unshielded wiring or conduit. Changes in transmission line capacitance can cause problems with the control signals.

Installation

Once you have determined that all required conditions for the installation will be met, you can install and wire the racks.

Install Dimmer Racks

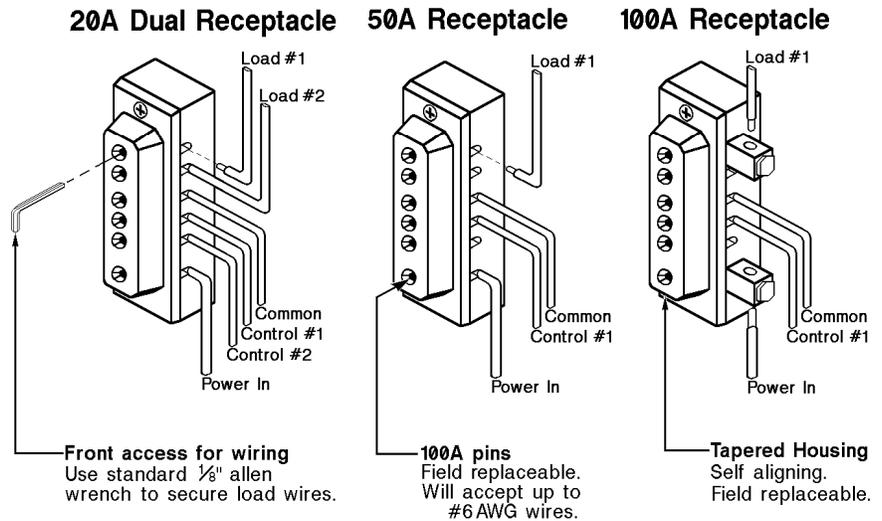
Once you have planned the conduit layout, install the dimmer racks and run the conduit to the appropriate panels.

1. Unpack the dimmer racks and remove all dimmer trays.
2. Make sure that any conduit work which will be covered up is completed.
3. Set racks in place as shown in system drawings.
4. If racks were shipped in more than one piece, bolt rack sections together and connect control wiring between racks.
5. Cut required conduit holes and install conduit.
6. Vacuum out any metal chips resulting from making conduit holes.

Install Load Wiring

Load wiring is terminated directly to the dimmer receptacle. Wires can be routed down channels next to the dimmer receptacles so that they are out of the way once the rack is assembled.

Connect load wiring according to your system drawings at this time. The set screws in the dimmer receptacles require a standard 1/8" Allen wrench (see figure 3 on page 16).



Notes:

1. All load wiring is by contractor.
2. All control and power wiring to receptacles is by Strand Lighting.

Figure 3. CD80 Dimmer Receptacle

Connect Power Wiring

Power wiring between dimmer rack components is pre-wired at the factory. External connections should be made at this time.

1. Connect system ground to ground lug provided.
2. Connect power neutral and feed wires as shown in system drawings.
3. Connect load neutrals to load neutral bus(es) at top(s) of dimmer rack(s), and load wires directly to the appropriate dimmer receptacle at the back of the dimmer rack(s).

Connect Control Wiring

Control wiring between dimmer rack components is pre-wired at the factory. External connections should be made at this time.

CD80 Advanced Electronics Dimmer Racks accept control signals conforming to the USITT AMX192 or DMX512 Dimmer Signal Specification, or to the Strand Lighting SMX protocol. In addition, they accept up to 16 analog inputs (0-10VDC) and input from Strand Electro Controls LiteScene stations.

Control wiring connections are made to the terminal strip block in the upper left of the "A" rack in each rack pair. The "B" rack in each pair does not have control connections. Please follow your system engineering drawings when making these connections.

Connect Auxiliary Wiring

Auxiliary wiring depends on the system configuration and is shown in the system drawings you received from Strand Lighting.

Auxiliary wiring connections are made to the terminal strip block in the upper left of the "A" rack in each rack pair. The "B" rack in each pair does not have auxiliary connections. Please follow your system engineering drawings when making these connections.

Connect Hand Held Programmer Control Wiring

The CD80 AE Hand Held Programmer is generally used in the dimmer room and plugged directly into the connectors provided in the rack. However, you may need to hook up a wall box or provide an extension cable for the unit. Remember that you need separate inputs hooked up if you wish to access both input port A and input port B.

Table 1. Hand Held Remote Control Inputs

Cable:	Belden 9829 or equal.				
Max Length:	1000 ft.				
Connector:	Terminal block in rack. "XLR" style connector on control consoles.				
XLR Pin #	Terminal Label	DMX Signal	Comments	Pairs	Wire Color
1	HHA(B)NC	COMMON	Common (shield)		shield
2	HHA(B)N-	Tx	RS232 Transmit	pair 1	black
3	HHA(B)O-	Rx	RS232 Receive		red
4	Not used			pair 2	black
5	HHR Power	+12 VDC	+12 VDC phantom power		white

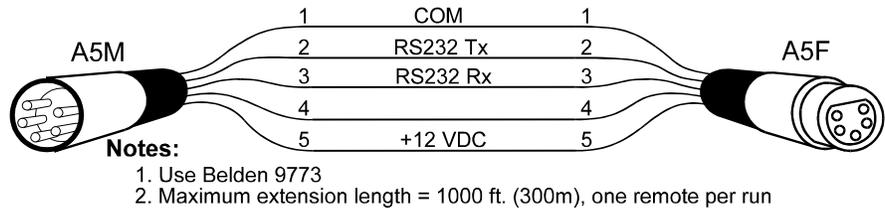


Figure 4. Hand Held Programmer Extension Cable

Connect Racks

Each CD80 Advanced Electronics system consists of a "Rack A" and a "Rack B," and uses one set of electronics for up to 192 20A dimmers.

Each Hand Held Programmer can control up to three Advanced Electronics systems (6 racks total) by using the ♦ key on the programmer to select one system at a time. You can view dimmer patching information and assign non-dims with the **PROGRAM** switch on the dimmer rack OFF (down), and can patch dimmers with the **PROGRAM** switch on the dimmer rack ON (up). Dimmer banks with more than two racks require a cable harness (part #3-381180-010) between each pair of "A" racks. This harness is connected between P3 in the first "A" rack and P2 in the second "A" rack. A second harness is required for systems with 3 "A" racks.

Each rack has its own OverTemp sensors. If there is a console OverTemp indicator, these are usually connected so that activating any one of the sensors will activate the indicator in the console. If a single control console output is to drive dimmers in more than one system, the multiplexed control signal must be daisy-chained to all of the systems in which it is to be used.

Connect AMX192 Control Wiring

The three types of connections provided in Strand Lighting equipment for the AMX192 signal are the XLR style connector, the TA4/TY4 Series Mini-SwitchCraft connector, and terminal blocks. Unless otherwise specified, dimmer cabinets use terminal block connections and consoles use XLR style connectors (see table 2 for pin assignments).

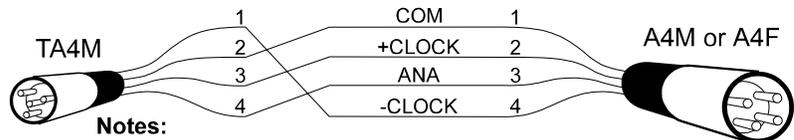
Table 2. AMX192 Control Inputs

Cable:	Belden 9156 or equal. May use Belden 8723 for adapters under 100 feet (30m) long.					
Max Length:	1000 feet (300m). must be Daisy chained - no branching runs.					
Connector:	Terminal block in fixed cabinets and racks. "XLR" style connector, or SwitchCraft TA4/TY4 series connector on moveable racks and packs, and on control consoles.					
XLR Pin #	TA4/TY4 Pin #	Terminal Pin #	Signal	Comments	Belden 8723	Belden 9156
4	1	AMX CLK-	CLOCK -	Clock Complement	Green	Black
2	3	AMX CLK+	CLOCK +	Clock True	White	White
1	2	AMX COM	COMMON	Analog Common	Black	Black
3	4	AMX AMUX	ANALOG	Multiplexed Analog	Red	Red

CLOCK+ and CLOCK- are one twisted pair. Analog and Common are one twisted pair.

There are two AMX192 inputs. One is labelled "A" and the other is labelled "B." Use only the "A" terminals in systems with 192 AMX192 dimmers or less. Use both the "A" and "B" terminals for AMX192 systems with more than 192 dimmers.

Interconnection between equipment with different plug types requires an adapter cable. The plugs on this adapter are not connected pin to pin (see figure 5).



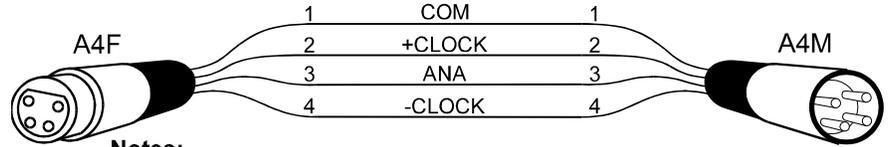
Notes:

1. Use Belden 8763 cable
2. Maximum adapter length = 100 ft. (30m)
3. Sex of "XLR" style connector varies with application

Figure 5. XLR to TA4 Series Adapter

Short extensions of the multiplex signal, where TA4/TY4 connectors are used, are made with Belden cable #8723 (2 pairs of shielded 24 gauge

wire). Do not use this cable for runs greater than 100 feet. All other runs (in or out of conduit) are made with Belden #9156 (2 pairs of unshielded 18 gauge wire). The maximum allowable distance from the control console to the last dimmer cabinet is 1000 feet.



- Notes:**
1. Use Belden 9156 cable
 2. Maximum extension length = 1000 ft. (300m) including all adapters

Figure 6. AMX192 Extension Cable

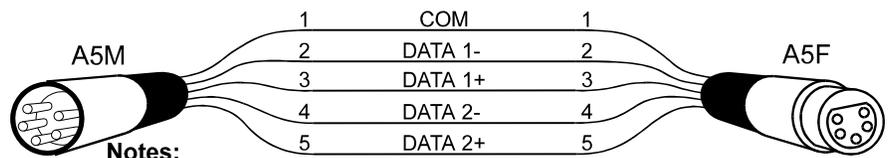
Connect DMX512 Dimmer Control Wiring

The two types of connections provided in Strand Lighting equipment for DMX512 dimmer control signals are the XLR style connector and terminal blocks. Unless otherwise specified, dimmer cabinets use terminal block connections and consoles use XLR style connectors (see table 3).

Table 3. DMX512 Control Inputs

Cable:	Belden 9829 or equal.				
Max Length:	Standard RS485 electrical characteristics apply, including line driver and receiver characteristics, line loading, and multi-drop configurations.				
Connector:	Terminal block in fixed cabinets and racks. "XLR" style connector on moveable racks and packs, and on control consoles.				
XLR Pin #	Terminal Label	DMX Signal	Comments	Pairs	Wire Color
1	D-GND	COMMON	Dimmer Common (shield)		shield
2	DATA- OUT	DATA 1-	Dimmer Drive Complement	pair 1	black
3	DATA+ OUT	DATA 1+	Dimmer Drive True		red
4	Not used	DATA 2-	Optional #2 Data Link Complement	pair 2	black
5	Not used	DATA 2+	Optional #2 Data Link True		white

DATA 1- and DATA 1+ are one twisted pair. Common is tied to the cable shield.



- Notes:**
1. Use a cable approved for RS485
 2. For electrical characteristics, including driver and receiver selection, line loading, and multi-drop configurations, see RS485 specification.

Figure 7. DMX512 Dimmer Control Extension Cable

**Wire Version 1
Command Module(s)**

Install the Command Module/Fan assemblies as shown in figure 8.

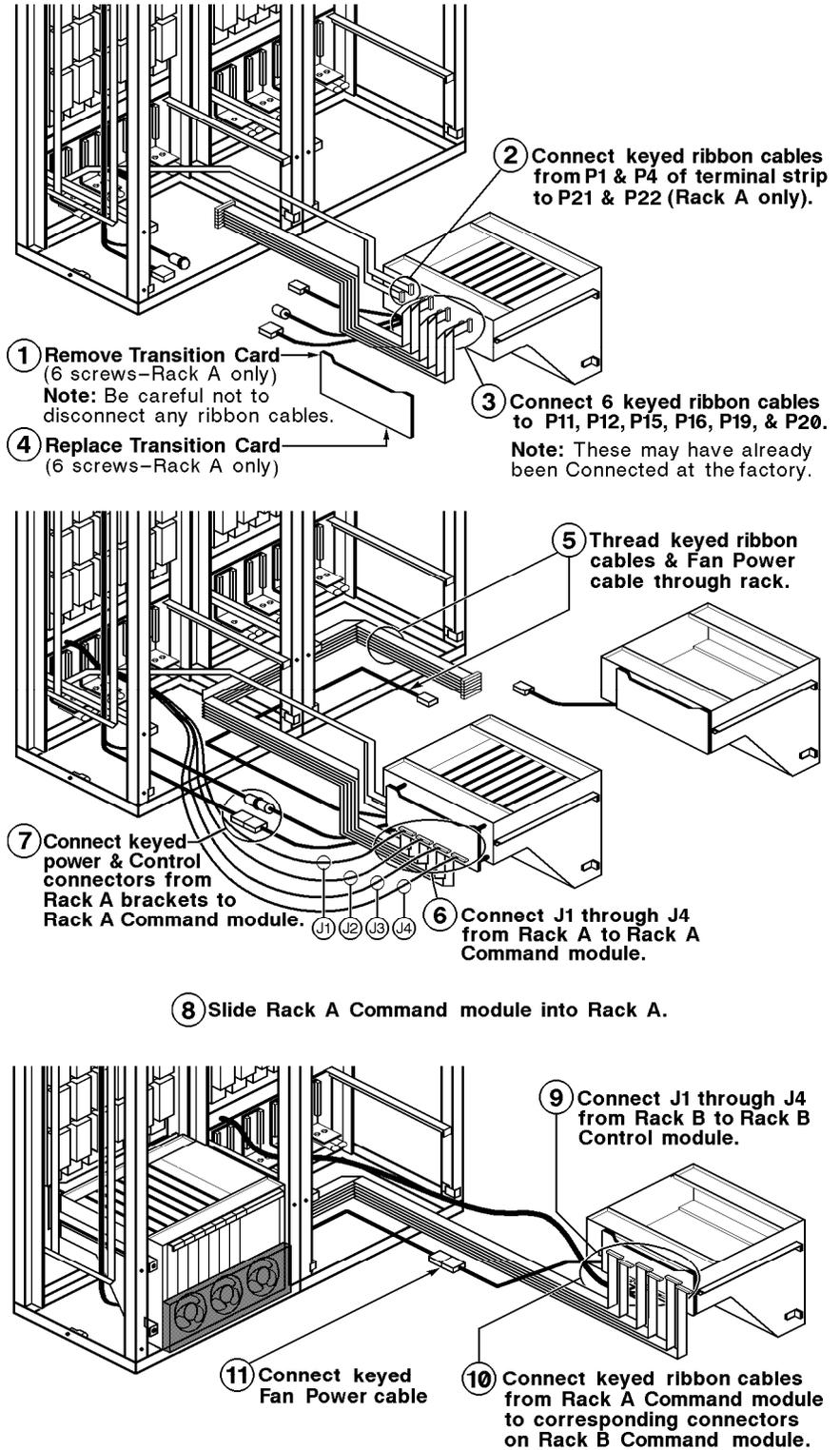


Figure 8. Command Module Wiring

Install Command Module(s)

Install the Command Module/Fan assembly as shown in Figure 9 and secure with finger bolts.

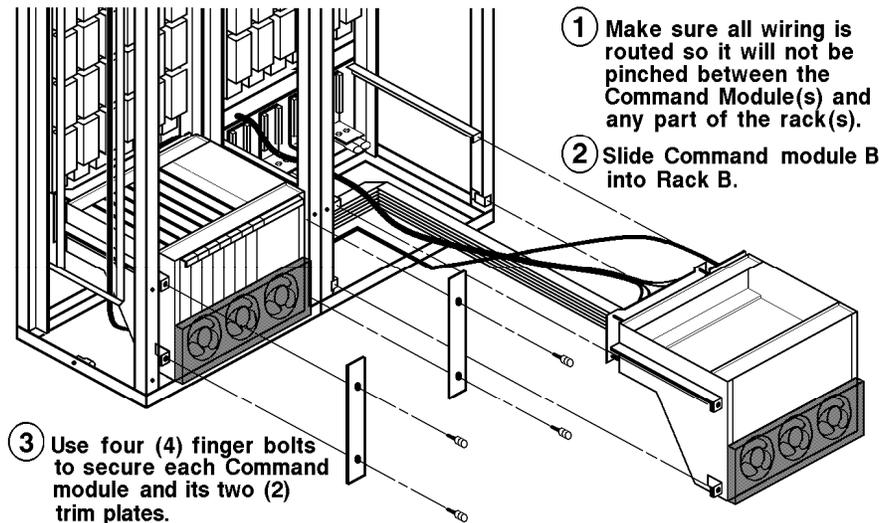


Figure 9. Command Module Installation

Turn System On

If a field turn-on by Strand Lighting personnel is scheduled, do not power up the system at this time. Otherwise, do the following.

1. Make sure that the main power switch is OFF.
2. Remove 3 fuses and 1 relay from the lower terminal strip bracket in the upper left of the CD80 Rack.
3. Remove the Power Supply module from the Rack A Command module.
4. Remove the fan power fuse from behind the Power Supply slot.
5. At the incoming power feed busses, check between all 3 power phases and neutral and between each phase combination for short circuits. Find and clear any short circuits before proceeding. This will not catch short circuits in the load wiring.
6. Replace all fuses, the relay, and the Power Supply module.
7. Make sure that your control console is OFF
8. Apply system power. All indicators on the Power Supply module should illuminate. Fans should be OFF.
9. Measure the incoming line voltage between each phase and neutral to confirm that it is correct for your system (100VAC, 120VAC, or 220VAC). All measurements should match.
10. Measure between phases and confirm the following phase to phase voltages:
 - 173VAC for 100VAC 3 phase systems.
 - 208VAC for 120VAC 3 phase systems.
 - 382VAC for 220VAC 3 phase systems.
 - 200VAC for 100VAC single phase systems.
 - 240VAC for 120VAC single phase systems.
 - 440VAC for 220VAC single phase systems.
11. Measure between earth ground and neutral. This should be less than 5VAC.

Close Up Rack

The rack can be closed up and dimmers installed at this time.

1. Install remaining side panels.
2. Install 8 dimmer trays by pushing the rear of each tray onto alignment pins and securing the self-aligning bolts on the front of the tray.
3. Install Dimmer and blank modules as shown in your system drawings.
4. Install Upper Vent Screens and secure them with the attached finger bolts.

If your Remote Programmer connections are in the rack, there will be a special Upper Vent Screen for Rack A. Make sure that you get the correct screens on the correct racks.

5. Attach the hinged door.

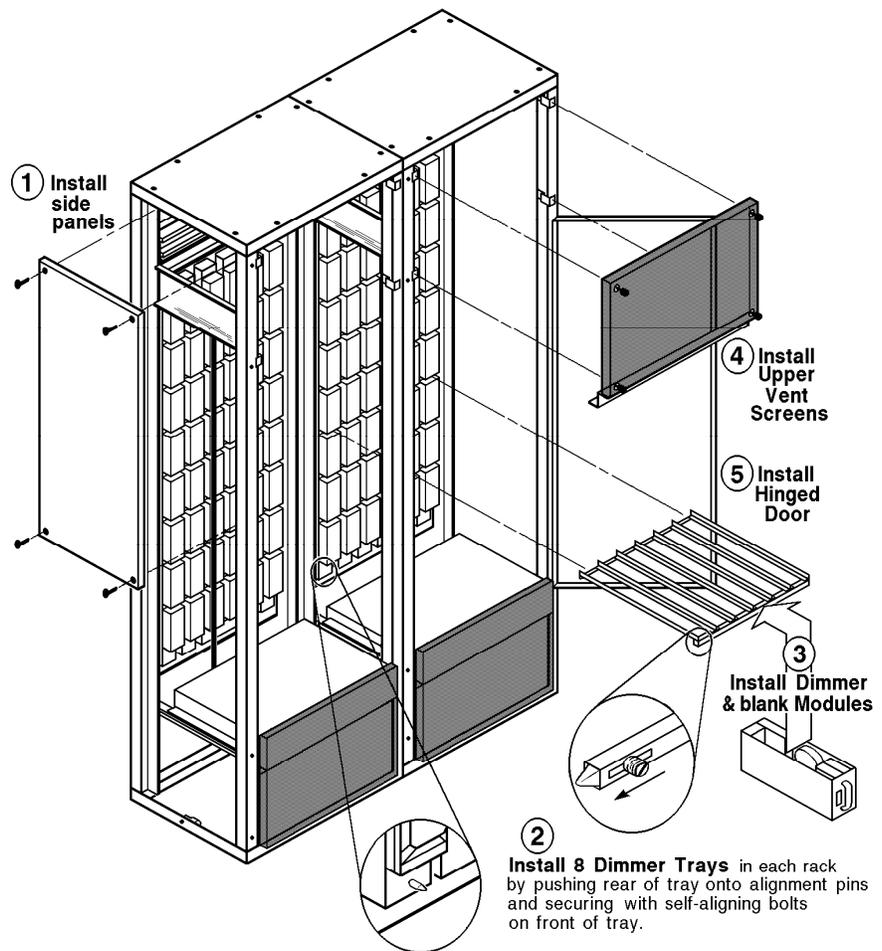


Figure 10. Close Up Dimmer Rack

Basic Trouble-shooting

This chapter provides basic trouble-shooting procedures for the CD80 Rack. It does not provide comprehensive maintenance data, but allows you to solve simple problems which may occur, and helps to provide Strand Lighting with initial data when these procedures are not effective.

For best system operation, do a routine check and cleaning once each year unless the operating environment is unusually harsh or dirty. Please consult Strand Lighting field Service if you are in doubt about the frequency of maintenance required for your system. Service and maintenance operations other than this cleaning are seldom required. In case of problems, and in order to save time and aggravation, follow the procedures outlined here before calling Strand Lighting. Observe what happens at each step. These steps answer the first questions a Strand Lighting Service Representative will ask. The person actually doing the tests should call Strand Lighting in order to avoid miscommunication. All service except dimmer and mechanical components should be performed by subassembly replacement.

The first section of this chapter provides information on parts replacement for swapping components or replacing defective units. The second part of this chapter provides a basic fault isolation procedure.

Component Replacement

Dimmer modules can easily be repaired in the field. The Power Supply module, Input Processor module, and Dimmer Processor modules are field replaceable subassemblies. You should not attempt to repair these assemblies in the field. Software updates can be done in the field by replacing EPROMS on the Input Processor module.

Dimmer Servicing

Dimmers can be serviced by turning their circuit breaker OFF and removing them from the rack. Dimmer components can easily be replaced in the field. To maximize SSR service life, use a heat transfer compound between the SSR and heat sink (2.4Kw & 6Kw dimmers) or chassis (12Kw dimmers) when replacing SSRs. It is not necessary to shut the dimmer rack power OFF to remove a dimmer.

Caution



To avoid arcing if a load is attached, the dimmer circuit breakers should be turned OFF before dimmer modules are removed or replaced.

Input Processor Module Servicing

The Input Processor module (part #3-258516-010) is not field repairable. You can remove the Input Processor module by turning power to the rack OFF, loosening the finger screw on the front of the unit, and pulling it straight out of the Command module. For software updates, replace the appropriate EPROM chips on the unit and install it back in the Command Module. For defective Input Processor modules, install a spare and return the defective unit to Strand Lighting for repair.

Before handling the Input Processor, make sure that you ground yourself to bleed off static electricity by touching some earth grounded item such as a conduit. If you cannot turn off the mains power to the rack before removing the module, turn all dimmer module circuit breakers OFF and use alligator clip leads to activate the thermal shutdown relay (short out the leads on the left hand button thermostat on the upper back wall of the rack).

Warning



Do not try to remove power from the Fan Housing by removing the power feed plug from under the Fan Housing. This plug is too close to power bussing to be safely unplugged while power is applied to the rack.

Dimmer Processor Module Servicing

Dimmer Processor modules (part #3-258515-010) are not field repairable. You can remove a Dimmer Processor module by turning power to the rack OFF, loosening the finger screw on the front of the unit, and pulling it straight out of the Command module. Replace the unit with a spare and return the defective unit to Strand Lighting for repair.

Before handling the Input Processor, make sure that you ground yourself to bleed off static electricity by touching some earth grounded item such as a conduit. If you cannot turn off the mains power to the rack before removing the module, turn all dimmer module circuit breakers OFF and use alligator clip leads to activate the thermal shutdown relay (short out the leads on the left hand button thermostat on the upper back wall of the rack).

Warning



Do not try to remove power from the Fan Housing by removing the power feed plug from under the Fan Housing. This plug is too close to power bussing to be safely unplugged while power is applied to the rack.

Power Supply Module Servicing

Other than simple fuse replacement the Power Supply module (part #3-258517-010) is not field repairable. You can remove the Power Supply module by loosening the finger screw on the front of the unit and pulling it straight out of the Command module. Replace the unit with a spare and return the defective unit to Strand Lighting for repair.

Before handling the Input Processor, make sure that you ground yourself to bleed off static electricity by touching some earth grounded item such as a conduit. If you cannot turn off the mains power to the rack before removing the module, turn all dimmer module circuit breakers OFF and use alligator clip leads to activate the thermal shutdown relay (short out the leads on the left hand button thermostat on the upper back wall of the rack).

Warning



Do not try to remove power from the Fan Housing by removing the power feed plug from under the Fan Housing. This plug is too close to power bussing to be safely unplugged while power is applied to the rack.

Fault Isolation

In case of failures in the system, you can expedite fault isolation by considering the system subject to the following categories of possible malfunctions:

- Major system malfunctions common either to all dimmers or to a single phase.
- Dimmer problems common to a single Dimmer Processor module.
- Dimmer problems not related by phase or Dimmer Processor module.

Establish fault location by interchanging Dimmer Processor modules, Input Processor modules, Power Supply modules, or Dimmer modules as required. You can swap modules between racks (Input and Dimmer Processor modules) or within a rack (Dimmer Processor modules). Correct the problem by module replacement once you have identified the defective component.

Warning



The dimmer rack must be powered down before removing or inserting Power Supply modules, Input Processor modules, or Dimmer Processor modules. See under "Component Replacement" earlier in this chapter for removal and installation procedures.

Problems Affecting the Entire Rack

Total or major part of system does not power up load circuits correctly. Failures will be by entire columns (phases) of dimmers. 2 columns fail per failed phase.

Power Supply Indicator is OFF

- Main power may not be ON. Check your main power feed.
- The dimmer rack may have overheated and shut down. If the OverTemp light is on in addition to the unit being shut down, let the system cool down before attempting to use it again. Make certain that there are no obstructions which impede airflow, and that the dimmer rack fans are functional.
- If there is no OverTemp indication, the thermal shutdown relay or the thermal shutdown thermostat may be stuck ON. Pull one lead off of the thermal shutdown thermostat (left hand button thermostat). If the relay does not de-energize, replace the relay. Otherwise replace the thermostat.

Power Supply indicator is ON. Fans are OFF

- Your console may be OFF, or may not have any dimmers ON at over 10%. Turn the console ON and bring at least one dimmer up to FULL.
- A control cable may be disconnected, broken, or incorrectly wired (no signal getting to the dimmer rack). Repair, connect, or replace the control cable as required.

Power Supply indicator is ON. Fans are ON. Lights do not go ON.

- A control cable may be incorrectly wired. In AMX192 the Analog line is probably shorted or reversed. Repair or replace the control cable as required.

Power Supply indicator is ON. All lights float to FULL (AMX192 systems only)

- A control cable Analog line is broken or disconnected. Try the control cable for the defective rack in a different console output. Remember that this changes the dimmer numbers and it may be necessary to reset the number of dimmers in the system or do some repatching. If swapping the cables does not move the problem, the cable is bad.
- There is no Analog output from the console. Try the control cable for the defective rack in a different console output. Remember that this changes the dimmer numbers and it may be necessary to reset the number of dimmers in the system or do some repatching. If swapping the control cables moves the problem, the console output is bad.

One or more Power Supply fuses are illuminated.

The illuminated fuse is open and needs to be replaced. You should check for the cause of fuse failure. The following types of problems could cause fuse failure:

- Defective Power Supply module. Swap the Power Supply module with a known good unit from another system. If the problem moves, replace the bad power supply.
- A ribbon cable may be bad on the transition board. Check ribbon cable attachments against schematics and correct as necessary.
- AC power may be getting to the module. Check all AC wiring going to the Command module.

Dimmer addressing from the Console is consistently Off by some amount.

- J1-J4 in the rack may be incorrectly plugged. One or more of the ribbon cables between racks may be incorrectly plugged.
- In AMX192 systems, the 6Kw/12Kw assignments in Patch may be incorrect. Check to make sure that you repatching is correct.

Dimmers in one full rack will not go to FULL.

- Ramps on all Dimmer Processor modules are incorrectly adjusted.
- In AMX192 systems the +Clock and Common wire may be reversed.

Dimmers in one full rack will not go to ZERO.

- Ramps on all Dimmer Processor modules are incorrectly adjusted.
- In AMX192 systems the -Clock and Common wire may be reversed.

Dimmer Problems Affecting a Single Phase

Dimmer problems which affect all dimmers in a single phase, but not any dimmers in another phase, are typically related to incoming power problems or Dimmer Processor module problems.

Dimmers "Ghost," or a dimmer erroneously follows another, or is ON when it should not be.

- The Dimmer Processor module may be incorrectly adjusted.

Dimmers in a single phase will not go ON.

- You may have lost one incoming phase. Check to make sure that all power is getting to the rack correctly.
- The Dimmer Processor module may be defective. Replace it with a spare and return the defective unit to Strand Lighting for repair.

Dimmers for one phase will not go to FULL.

- Ramps on one Dimmer Processor module are incorrectly adjusted.

Dimmers for one phase will not go to ZERO.

- Ramps on one Dimmer Processor module are incorrectly adjusted.

Dimmers for one phase will not track other dimmers correctly.

- Ramps on one Dimmer Processor module are incorrectly adjusted.

Individual Dimmer Problems

Problems related to individual dimmers are due to one of the following:

- Dimmer Circuit Breaker is OFF
- Burned out lamp in fixture.
- Defective dimmer module (probably the SSR)
- Defective Dimmer Processor Module (probably the output driver section)
- Defective control or load wiring in the rack.
- Problems in the discreet analog circuitry or the LiteScene controller.

Check for a bad dimmer by swapping it with a know good unit. If the problem moves, replace or repair the dimmer.

Check for a bad Dimmer Processor module by swapping it with a known good unit. If the problem moves, replace the defective Dimmer Processor module and return it to Strand Lighting for repair.

Check for a wiring problem after the dimmer module by using the CD80 Channel Test Chassis to make sure that everything is OK up to the Dimmer module.

Check for problems in the discreet analog circuitry by measuring the DC voltage from the suspected input to COM. When the dimmer is supposed to be ON, this voltage should be +10VDC.

CD80 Channel Test Chassis

This test module is optional with CD80 Advanced Electronics Rack dimming systems. It replaces a 20A, 50A, or 100A dimmer or non-dim chassis and verifies that the dimmer space is properly controlled by the control console. Indicating lights on the test module respond to signals from the control console.

The actual lighting load connected to the dimmer wiring space will not respond to console commands when the test chassis is in use.

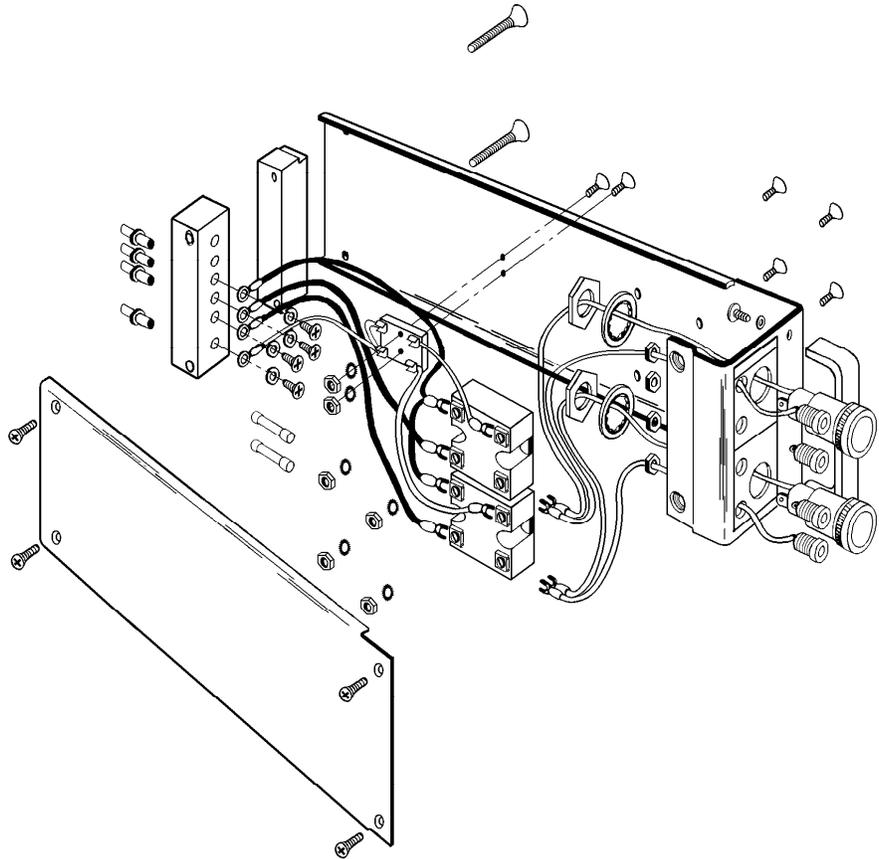


Figure 11. CD80 Channel Test Chassis

1. Set control for channel under test to ZERO.
2. Remove CD80 dimmer from slot in dimmer rack.
3. Place tester in vacated slot and push all the way in.
4. Connect test lead between white neutral jack on tester face plate and rack frame (ground).
5. Operate console controls in normal manner and observe tester pilot lights. These should track console operations.
6. An RMS iron vane volt meter or true RMS reading digital voltmeter may be connected to test jacks to monitor output voltages.

Dimmer Processor Card Calibration

The calibration for the Dimmer Processor card should not be attempted unless you have a schematic of the board.

Refer to the schematic. There are 4 adjustable pots; R1, R2, R10, and R32. Only R1 (Ramp gain) and R2 (Ramp Bias) are accessible from the front of the system. Adjusting R10 (Line Center) and R32 (Line Compensation) requires that the PC board be outside the rack on an extender board or cable and should be done only by Strand technicians.

Ramp Gain and Bias Adjustment in the Field

The Ramp gain and bias for a Dimmer Processor module should be checked whenever a spare is put into the system or a repaired unit returned from Strand. You will be repeating the following procedure while viewing the output of the odd dimmer in the following dimmer slots:

- Rack A slot 1 (for Dimmer Processor module #1)
- Rack A slot 2 (for Dimmer Processor module #3)
- Rack A slot 3 (for Dimmer Processor module #5)
- Rack B slot 1 (for Dimmer Processor module #2)
- Rack B slot 2 (for Dimmer Processor module #4)
- Rack B slot 3 (for Dimmer Processor module #6)

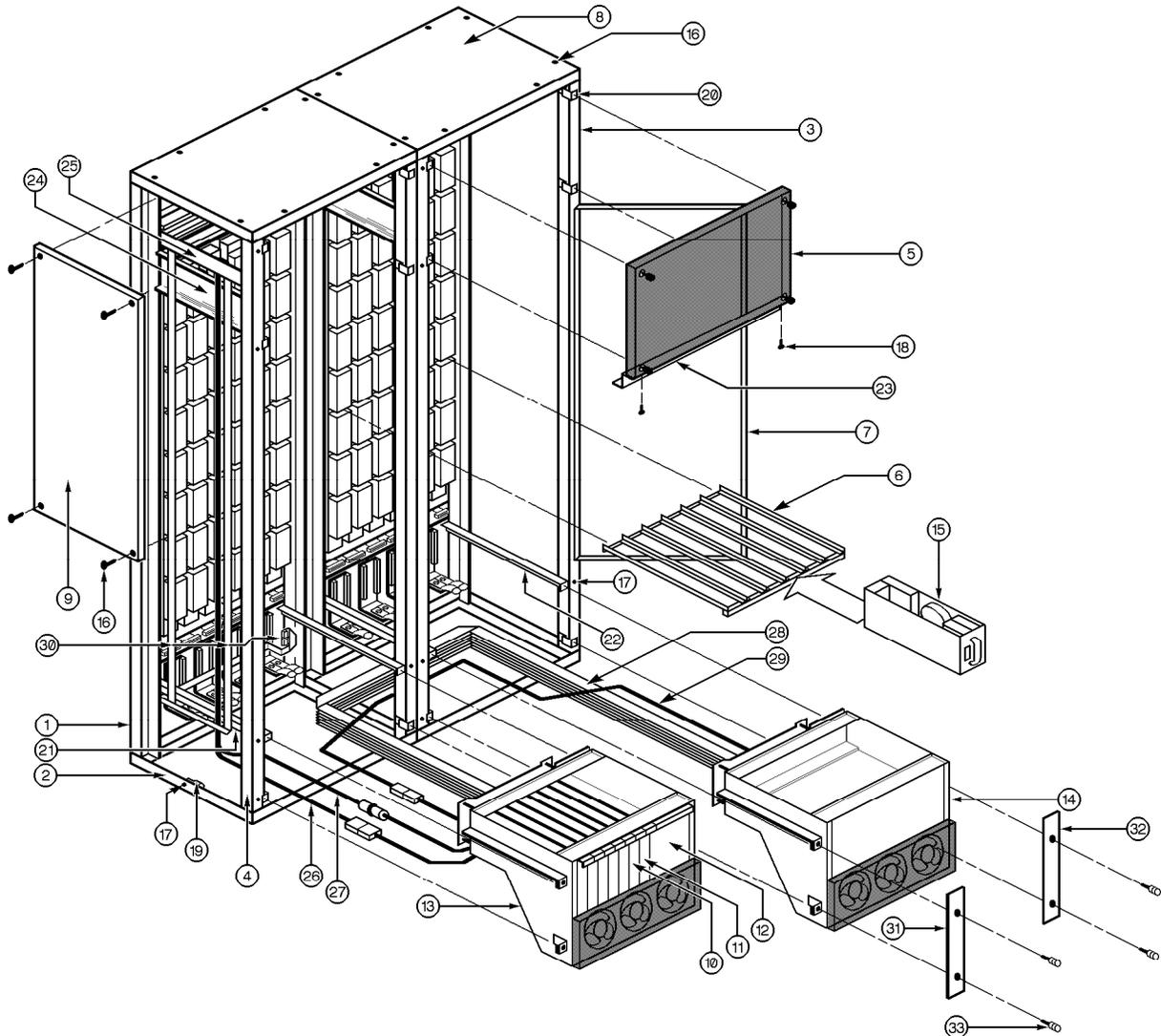
Turn all dimmer circuit breakers in the rack to be adjusted OFF. Remove the first row of dimmers from the dimmer rack. Set up control from the console, the programmer, or a LiteScene station so that all of the above slots can be taken from ZERO to FULL as required.

Use an oscilloscope to view the control output for the odd dimmer (third pin down on the dimmer receptacle in the rack) in the appropriate slot as you adjust the Dimmer Processor module.

1. Set dimmers to ZERO. Adjust R2 'RAMP BIAS' on Dimmer Processor module so that the control output pulse width is just a positive spike. Continue adjusting it until just past the point where the spike disappears and the output is flat at zero volts.
2. Set dimmers to FULL. Adjust R1 'RAMP GAIN' until the control output is high with just a spike to zero volts. Continue adjusting R1 until the spike just disappears and the output is flat at + 12V.

Line Variation Compensation

Line Variation compensation is set at the factory and is not field adjustable. Please contact Strand Lighting Field Service for a return authorization if you think that this adjustment needs to be made.

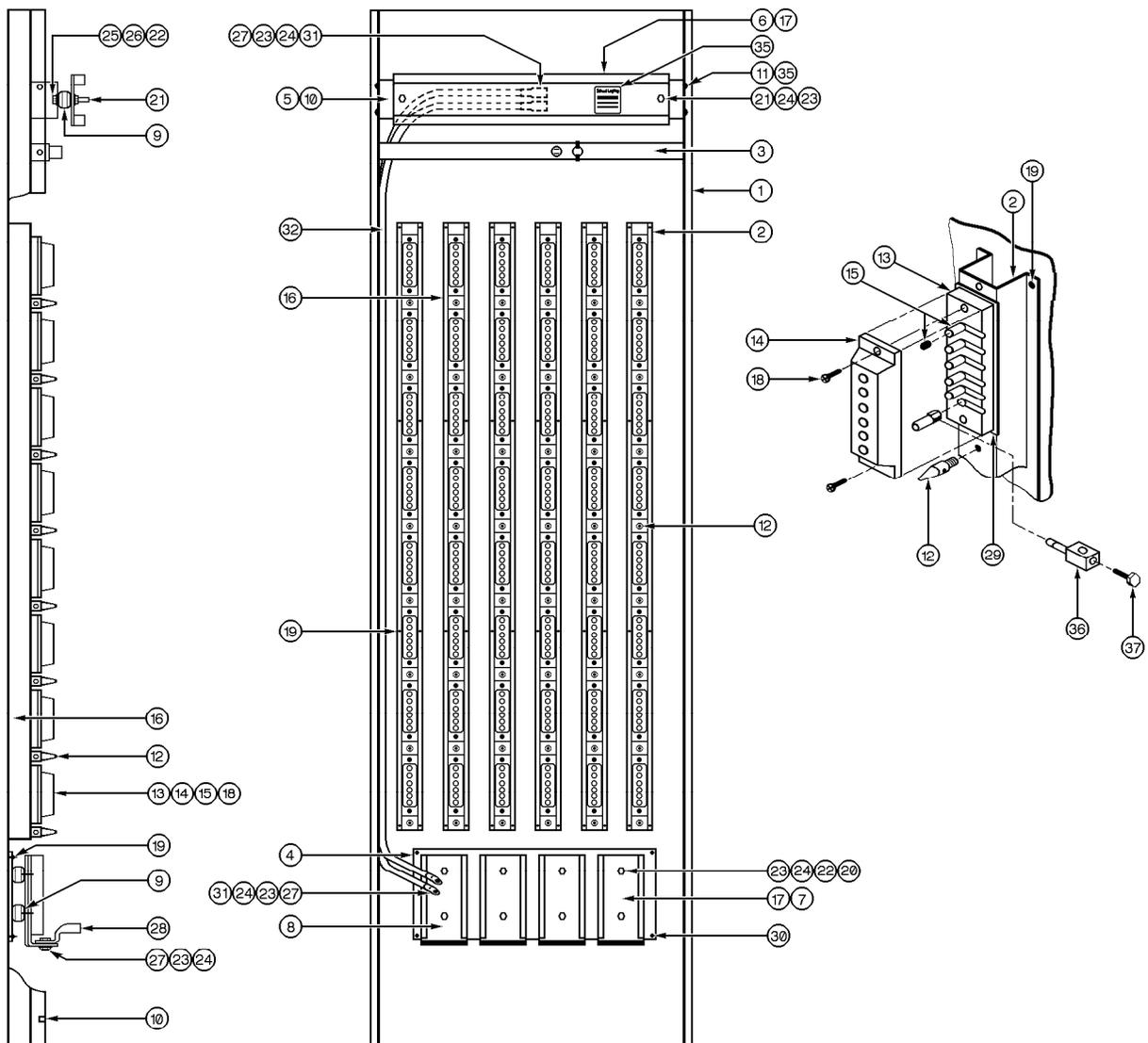


Part #	Description	Part #	Description
①	2-283335-010 Rear Panel	⑱	1-411215 ILSCO Lug SLU .125 (for ground)
②	3-170312-010 Frame End	⑳	3-109145-010 Screen Support Bracket
③	3-109147-010 Right Rail Bracket	㉑	3-109137-010 Left Fan Support Bracket
④	2-109147-010 Left Rail Bracket	㉒	3-109137-020 Right Fan Support Bracket
⑤	3-293103-010 Screen Plate	㉓	3-109125-010 Spacer Bracket
⑥	3-170007-010 Dimmer Tray	㉔	3-109030-010 OverTemp/Shutdown Bracket
⑦	3-283338-010 Door	㉕	3-109169-010 Terminal Strip Bracket
⑧	2-293170-010 Top Cover Plate	㉖	3-381181-010 Fan/Power Harness
⑨	2-283337-010 Side Cover Plate	㉗	* Card Cage Power Harness (part of 3-109030-010)
⑩	3-258515-010 Dimmer Processor Card	㉘	3-262195-030 Ribbon Cables (6)
⑪	3-258516-010 Input Processor Card	㉙	* Rack B Fan Power (part of 3-199062-010)
⑫	3-258517-010 Power Supply Module	㉚	3-262195-040 Ribbon Cables (P1-P21 & P4-P22)
⑬	3-199061-010 Fan Housing, Rack A	㉛	3-109165-010** Left Side Mounting Bracket (Trim Plate)
⑭	3-199062-010 Fan Housing, Rack B	㉜	3-109165-010** Right Side Mounting Bracket (Trim Plate)
⑮	Various Dimmer Modules	㉝	1-391026-010** Knurled Thumbscrew
⑯	0-140046 Screw, 1/4-20 X 1"		
⑰	0-140043 Screw, 1/4-20 X 1/2"		
⑱	0-080033 Screw, 8-32 X 1/2"		

* These harnesses are soldered to the assembly to which they are attached, and are shown for reference only.

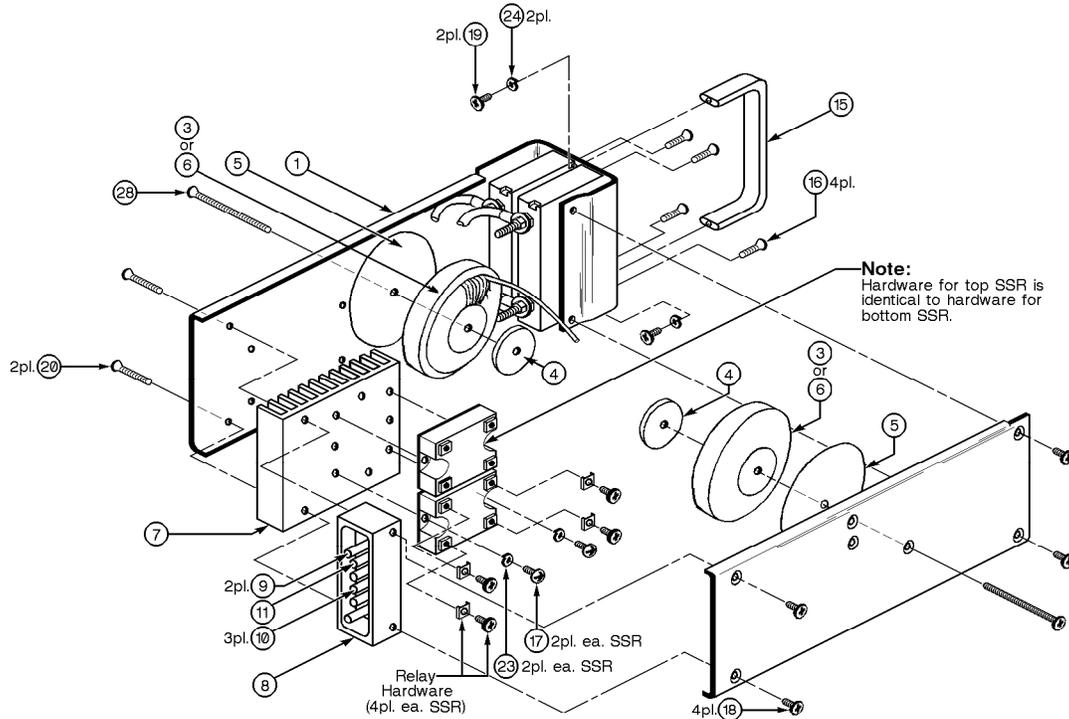
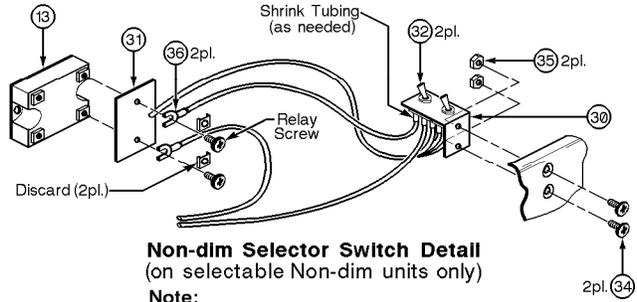
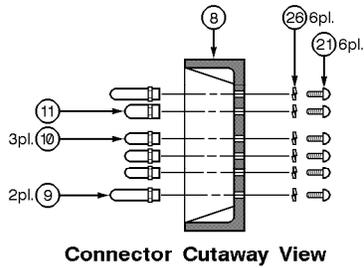
** These parts ship with the Fan Housing assembly.

Figure 12. CD80 Rack Parts



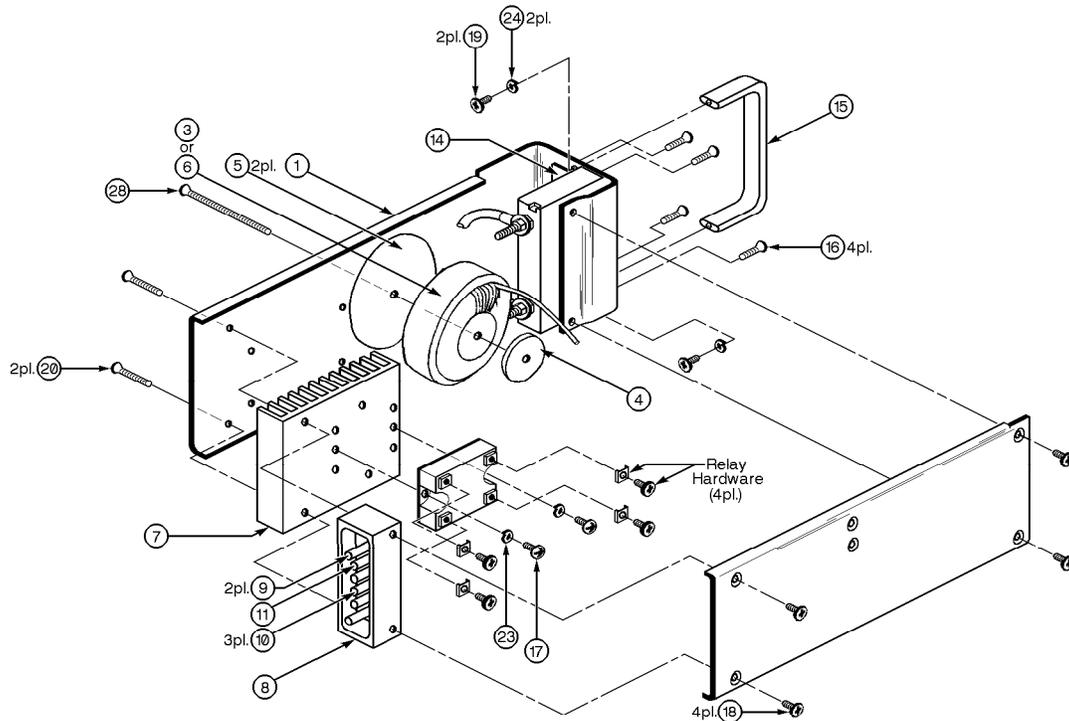
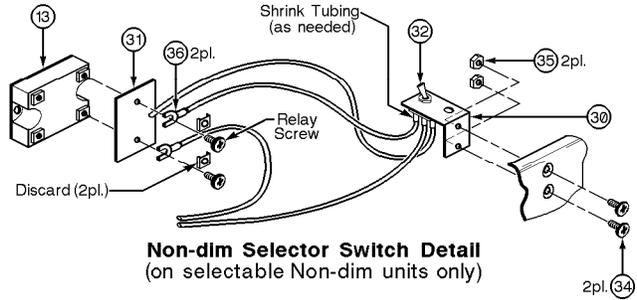
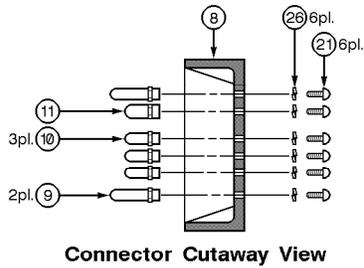
Part #	Description	Part #	Description
①	2-283335-010 Rear Panel	②①	1-380005 Bolt, 3/8 X 3/4"
②	3-109129-010 Connector Support Bracket	②②	1-290128-000 Brass Studs 3/8-16 X 2"
③	3-109138-010 Terminal Support Bracket	②③	0-380003 Split Washer 3/8"
④	3-293014-010 Power Bus Support	②④	1-380015 Hex Nut 3/8-16
⑤	3-109136-010 Neutral Bus Support	②⑤	0-380009 Split Lock Washer 3/8"
⑥	3-006001-010 Neutral Bus Assembly	②⑥	0-380013 Bolt 3/8-16 X 1"
⑦	3-006002-010 Power Bus Assembly	②⑦	0-380012 Flat Washer 3/8"
⑧	2-006-002-010 Neutral Bus	②⑧	0-380006 Bolt 3/8-16 X 1"
⑨	1-193003-000 Standoff Insulator	②⑨	1-411279-000 Lug VHSC 500-12
⑩	1-390052-000 1/4-20 CP Floating Nut	③①	2-193013-010 Connector Insulator
⑪	0-140043 Screw 1/2-20 X 1/2"	③②	1-379046-000 Pop Rivet
⑫	2-291006-010 Tray Support Pin	③③	1-411245-000 Crimp Lug
⑬	2-229023-010 Female Connector (Back)	③④	1-434102-000 250MCM Wire
⑭	2-229022-010 Female Connector (Front)	③⑤	2-325048-010 Marker Strip Label
⑮	3-422002-010 Female Connector Pin	③⑥	2-325035-010 Warning Label
⑯	3-109129-020 Connector Support Bracket	③⑦	0-140031 Split Lock Washer 1/4"
⑰	0-140016 Allen Set Screw 1/4-28 X 7/16"	③⑧	2-191004-010 Adapter Lug, 6Kw Dimmer
⑱	0-100052 Screw 10-32 X 1"	③⑨	1-560009 Bolt 5/16-18 X 5/8"
⑲	1-379013-000 Pop Rivet 3/16 dia X 3/8"		

Figure 13. CD80 Rack Back Panel Parts



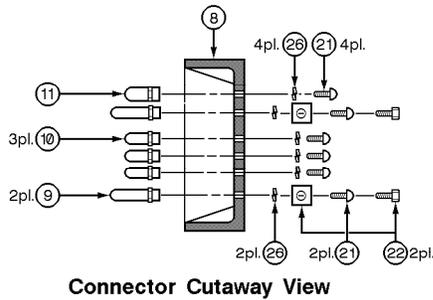
Part #	Description	Part #	Description
① 3-293017-020	Dimmer Chassis	⑱ 0-100016	Screw, RHMS, 10-32 X 3/8" PH BO
② 2-109126-010	Dimmer Cover	⑳ 0-100048	Screw, FHMS, 10-32 X 1-5/8" PH BO
③ 2-169025-010	20 Amp Choke	㉑ 0-080117	Screw, PHMS, 8-32 X 3/8" Brass w/Lock Washer
④ 2-340036-010	Choke Spacer	㉒	
⑤ 2-193011-010	4.5" dia. Insulator	㉓ 0-060024	Washer, Int. Lock, #6 CP
⑥ 2-169036-010	20 Amp Choke (High Performance)	㉔ 0-100004	Washer, Int. Lock, #10 CP
⑦ 2-189015-030	Heat Sink	㉕	
⑧ 3-229021-010	Connector Housing	㉖ 0-080027	Washer, Split Lock, #8 Brass
⑨ 2-411001-010	0.75" Male Connector Pin	㉗	
⑩ 2-411001-020	0.50" Male Connector Pin	㉘ 0-100077	Screw, FHMS, 10-32 X 3" PH BO
⑪ 2-291007-010	Polarizing Pin	㉙ 0-100077	Screw, FHMS, 10-32 X 3" PH BO
⑫ 1-132234-010	20 Amp Circuit Breaker	⑳ 2-109872-010	Switch Bracket
⑬ 2-377003-010 or 2-377008-010	40A Solid State Relay	㉑ 3-722852-010	Non-dim Driver PC Board
⑭ 2-293186-010	Cover Plate	㉒ 1-401234-000	SPDT Maintained Switch
⑮ 1-187017-000	Handle (Amatom #10937-A-10)	㉓	
⑯ 0-060081	Screw, OHMS, 6-32 X 3/8" PH BO	㉔ 0-080077	Screw, FHMS, 8-32 X 1/2" PH BO
⑰ 0-060027	Screw, RHMS, 6-32 X 1/2" PH BO	㉕ 0-080070	Nut, Keps, #8-32
⑱ 0-100047	Screw, FHMS, 10-32 X 3/8" PH BO	㉖ 1-411045-000	Terminal Lug, Spade, #6 Red

Figure 14. CD80 2.4Kw Dimmer Module

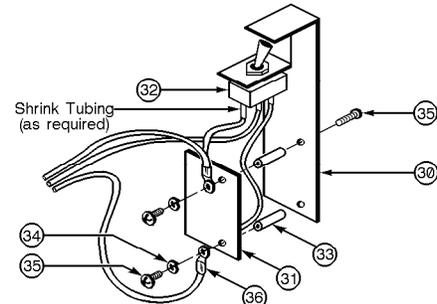


Part #	Description	Part #	Description
① 3-293017-020	Dimmer Chassis	⑱ 0-100016	Screw, RHMS, 10-32 X 3/8" PH BO
② 2-109126-010	Dimmer Cover	⑳ 0-100048	Screw, FHMS, 10-32 X 1-5/8" PH BO
③ 2-169026-010	50 Amp Choke	㉑ 0-080117	Screw, PHMS, 8-32 X 3/8" Brass w/Lock Washer
④ 2-340036-010	Choke Spacer	㉒	
⑤ 2-193011-010	4.5" dia. Insulator	㉓ 0-060024	Washer, Int. Lock, #6 CP
⑥ 2-169037-010	50 Amp Choke (High Performance)	㉔ 0-100004	Washer, Int. Lock, #10 CP
⑦ 2-189015-030	Heat Sink	㉕	
⑧ 3-229021-010	Connector Housing	㉖ 0-080027	Washer, Split Lock, #8 Brass
⑨ 2-411001-010	0.75" Male Connector Pin	㉗ 0-100077	Screw, FHMS, 10-32 X 3" PH BO
⑩ 2-411001-020	0.50" Male Connector Pin	㉘ 0-100077	Screw, FHMS, 10-32 X 3" PH BO
⑪ 2-291007-010	Polarizing Pin	㉙ 2-109872-010	Switch Bracket
⑫ 1-132239-010	50 Amp Circuit Breaker	㉚ 3-722852-010	Non-dim Driver PC Board
⑬ 2-377002-010 or 2-377007-010	80A Solid State Relay	㉛ 1-401234-000	SPDT Maintained Switch
⑭ 2-293186-010	Cover Plate	㉜	
⑮ 1-187017-000	Handle (Amatom #10937-A-10)	㉝ 0-080077	Screw, FHMS, 8-32 X 1/2" PH BO
⑯ 0-060081	Screw, OHMS, 6-32 X 3/8" PH BO	㉞ 0-080070	Nut, Keps, #8-32
⑰ 0-060027	Screw, RHMS, 6-32 X 1/2" PH BO	㉟ 1-411045-000	Terminal Lug, Spade, #6 Red
⑱ 0-100047	Screw, FHMS, 10-32 X 3/8" PH BO		

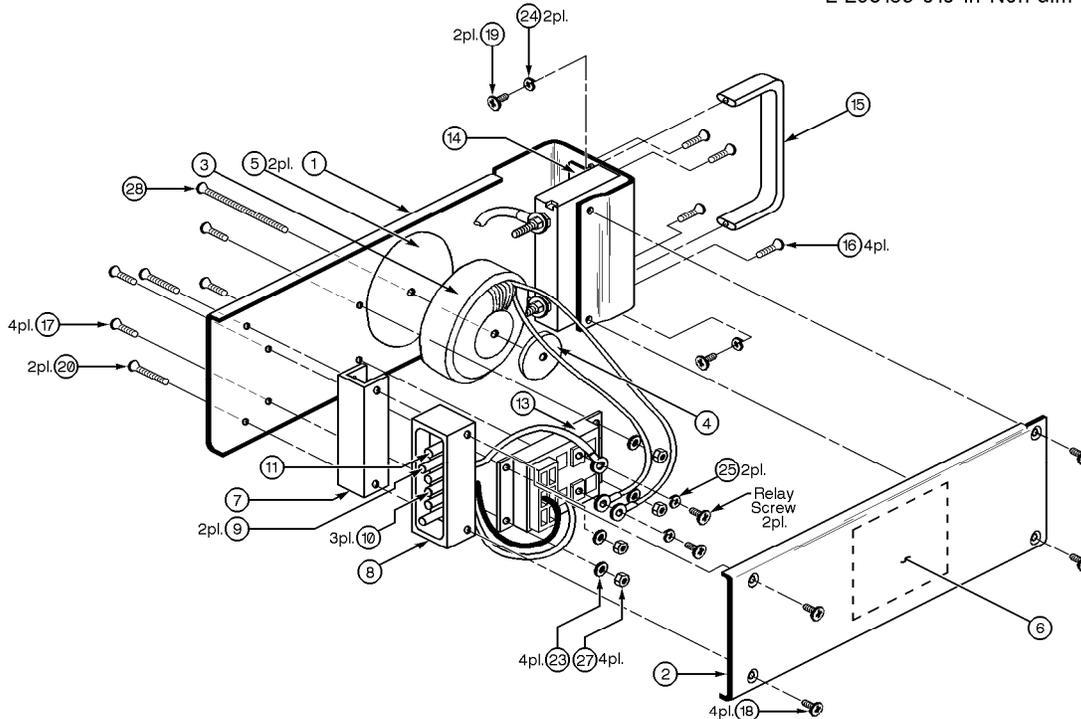
Figure 15. CD80 6Kw Dimmer Module



Connector Cutaway View



Non-dim Selector Switch
(Replaces Cover Plate
2-293186-010 in Non-dim units)



Part #	Description	Part #	Description
(1) 3-293017-020	Dimmer Chassis	(19) 0-100016	Screw, RHMS, 10-32 X 3/8" PH BO
(2) 2-109126-010	Dimmer Cover	(20) 0-100048	Screw, FHMS, 10-32 X 1-5/8" PH BO
(3) 2-169027-010	100 Amp Choke	(21) 0-080117	Screw, PHMS, 8-32 X 3/8" Brass w/Lock Washer
(4) 2-340036-010	Choke Spacer	(22) 1-411288-000	ILSCO Lug CO5RP w/screw
(5) 2-193011-010	4.5" dia. Insulator	(23) 0-100002	Washer, Lock, #10 CP
(6) 2-193012-010	Dimmer Insulator	(24) 0-100004	Washer, Int. Lock, #10CP
(7) 2-109393-010	Aluminum U-channel	(25) 0-100012	Washer, Split Lock, #10 Brass
(8) 3-229021-010	Connector Housing	(26) 0-080027	Washer, Split Lock, #8 Brass
(9) 2-411001-010	0.75" Male Connector Pin	(27) 0-100003	Nut, 10-32 HEX CP
(10) 2-411001-020	0.50" Male Connector Pin	(28) 0-100077	Screw, FHMS, 10-32 X 3" PH BO
(11) 2-291007-010	Polarizing Pin	(29) 0-100077	Screw, FHMS, 10-32 X 3" PH BO
(12) 1-132241-010	100 Amp Circuit Breaker	(30) 2-109403-010	Switch Bracket
(13) 2-377012-010	150A Solid State Relay	(31) 3-722852-010	Non-dim Driver PC Board
(14) 2-293186-010	Cover Plate	(32) 1-401234-000	SPDT Maintained Switch
(15) 1-187017-000	Handle (Amatom #10937-A-10)	(33) 1-340060-000	Spacer, #6-32 X 11/16
(16) 0-060081	Screw, OHMS, 6-32 X 3/8" PH BO	(34) 0-060082	Screw, PHMS, 6-32 X 3/8" PH BO
(17) 0-100060	Screw, FHMS, 10-32 X 1/2" PH BO	(35) 0-060014	Washer, Lock, #6 CP
(18) 0-100047	Screw, FHMS, 10-32 X 3/8" PH BO	(36) 1-411004-000	Terminal Lug, Ring, #6 Red

Figure 16. CD80 12Kw Dimmer Module

Periodic Maintenance

Periodic maintenance should be done every six (6) to twelve (12) months, depending on the environmental conditions. Although a detailed discussion of this procedure is beyond the scope of this manual, basic checklists are provided to show what is involved. Users wishing to do these procedures on their own should consult Strand Lighting Field Service.

1. Turn power to the dimmer rack OFF.
2. Remove Power Supply modules, Input Processor modules, and Dimmer Processor modules from the Command module, dust them off with a soft natural bristle brush, and clean their edge connectors with a mixture of 70% denatured alcohol and 30% distilled water (or other cleaning compound intended for gold edge connectors).
3. Inspect the dimmer bank for loose connections, build-up of dust, and placement of obstructions around it which may impede air flow. Tighten any loose connections found at this time.
4. Vacuum out any excessive dust build-up in the dimmer rack while power to the rack is shut down.
5. Replace all modules.
6. Turn power to the system ON and verify Power Supply module reference voltages.
7. Exercise all circuit breakers by turning them ON and OFF several times. The arc produced when the circuit breakers engage and disengage will clean corrosion and dust off of the contacts.

For best effect the lights for the dimmers should be ON when you do this.

Program the Input Protocol for a Port

You can set input protocols separately for each port to allow use of more than one type of console. The Program switch for the rack pair you wish to program must be ON (up) for this operation. All other program switches must be OFF (down). The new protocol will take effect the next time the mux signal is removed from the rack or the rack is reset.

Press **P-COL A** **[#]** ***** to set Port A for the specified dimmer signal protocol.

P-COL A **0** ***** forces the port to determine the protocol.

P-COL A **1** ***** configures the port for ECMUX.

P-COL A **2** ***** configures the port for AMX192.

P-COL A **3** ***** configures the port for DMX512.

Press **P-COL B** **[#]** ***** to set Port B for the specified dimmer signal protocol.

Unless you want the port to ignore all but a single protocol, or unless there are problems with the port recognizing the input protocol, you should leave this set to its default setting of ZERO.

You must reset the processor or remove the control signal from the system for these settings to take effect.

Assign Control Numbers and Ports

Each dimmer space can be assigned a control number and assigned to a port. The basic goal of this operation is to allow partitioning of one physical dimming system into two separate electronic dimming systems ("partitions") and to number the dimmers in each partition as required. This is a good way to set the 6Kw/12Kw assignments without having to toggle the assignment on the control console. The Program switch for the rack pair you wish to program must be ON (up) for this operation. All other program switches must be OFF (down).

Press **DIMMER** **[#a]** **IN A** **[#b]** ***** to assign dimmer space **[#a]** to be controlled by input **[#b]** from Port A.

Input **[#b]** is the mux signal number output from the control console on the control cable feeding the current rack.

If there is more than one mux signal cable from the console, the second mux signal may be dimmers 193-384 (for AMX) but dimmer 193 would actually be programmed as mux signal 1.

Press **DIMMER** **[#a]** **IN B** **[#b]** ***** to assign dimmer space **[#a]** to be controlled by mux signal **[#b]** from Port B.

Assign Analog Control to Dimmer Spaces

The 16 analog control inputs can each be assigned to any number of dimmer spaces in a 2 rack system. Multiple dimmers can be controlled by each analog signal, but the same dimmer cannot be on more than one signal. There are 16 analog signals available per physical dimming system. The analog signals directly control the physical dimmer spaces to which they are assigned, regardless of the port assignment of the dimmer spaces. The Program switch for the rack pair you wish to program must be ON (up) for this operation. All other program switches must be OFF (down).

Press **DIMMER** **[#a]** **ANALOG** **[#b]** ***** to tell dimmer space **[#a]** to respond to analog signal control **[#b]**.

Set the "Status Quo" Retention Time

The "status quo" time is the time between loss of dimmer signal and when the system will begin fading into the last accessed "backup" cue.

Press **OUT** **[#]** ***** to set the "status quo" time in minutes. You can set this to any full number from ZERO to 25.

You can set the "Status Quo" delay time separately for each rack if required

View Dimmer Assignment Data

You can view assignment data for each dimmer space without changing any data for the dimmer space. The program switch for the required rack must be OFF while you are selecting the rack number, and be turned back ON to view the data.

Turn the program switches on all racks OFF.

Press **SELECT** **[#]** ***** to select the rack pair specified by **[#]** for previewing, e.g., the first pair, second pair, etc.



All Program switches must be OFF (down) to select a rack for viewing. If you leave a program switch ON (up) the active rack pair will be programmed with a new rack pair number.

Turn the program switch on the rack you will be viewing ON.

Press **DIMMER** **[#]** ***** to show the assignment of dimmer **[#]**.

The display format is a-bbbb cc ddd where:

- a = Port designation (A or B)
- bbbb = the input control signal number
- cc = the analog control signal number (if any)
- ddd = ON or OFF non-dim status (On = non-dim)

Program Rack Sequencing

Since a single dimming system with sequential dimmer numbering may have multiple control wires from the console, you can program the starting dimmer number for each rack as required. You can specify different start numbers for each protocol for use when the port is configured for Auto Selection. The Program switch for the rack pair you wish to program must be ON (up) for this operation. All other program switches must be OFF (down).

Press **MUX A** **[#a]** **MUX TYPE** **[#b]** ***** to specify the starting control signal number for the specified protocol for Port A.

[#a] is what the system will label the first dimmer signal on the line when it is using the protocol **[#b]**. This tells the system to add an offset (**[#a]-1**) to each incoming signal number as it is decoded.

This lets you alternately use AMX192 and DMX512 signals for dimmer control. For a 4 rack system (2 rack pairs), you could do the following:

- Patch the first rack pair to be dimmers 1-192 and the second rack pair to be dimmers 193-384 (use the **DIMMER** **[#]** **IN A** **[#]** ***** command demonstrated above for this).
- Enter **DIMMER** **1** **9** **3** **MUX TYPE** **2** ***** to set the start dimmer address for AMX192 in the second rack pair to 193.

Since the DMX512 signal has dimmers labeled 1-384 on a single cable in this example system, and the dimmer spaces are patched to be 1-384, the console outputs 1-384 will run dimmers 1-384.

If you now apply AMX192 signals to the same rack pair (you will need to run two control cables to do this) each control cable carries dimmers labeled 1-192. However, as console signal 1 appears at dimmer rack 3, the system adds 192 to it and sends the signal to the dimmer patched as dimmer 193 (in this case the first dimmer in the rack).

Press **MUX B** **[#a]** **MUX TYPE** **[#b]** ***** to specify the starting control signal number for the specified protocol for Port B.

User Setup Operations

User Setup Operations are performed with the hand held programmer and require the toggle switch on all Input Processor modules to be OFF (down).

The hand held programmer can be operated remotely from the dimming room for these operations.

These operations only work for the dimmer spaces assigned to the port (A or B) to which the CD80 Advanced Electronics Programmer is connected.

These operations are usually performed by the end-user and are not a part of the factory setup.

Change a Dimmer's Non-dim Status

You can change the non-dim status of an input channel to make a dimmer act like a non-dim (dimmer turns ON at 50%) or a dimmer (dimmer fades from ZERO to FULL).

Press **SELECT** **[#]** ***** to select the rack pair specified by **[#]** for previewing.

Press **NON DIM** **[#a]** ***** to toggle the non-dim function of all dimmers assigned to input signal **[#a]** ON and OFF.

ON means the dimmer is a non-dim.

Bring Individual Dimmers to FULL (Test)

You can test individual dimmers by bringing them to FULL using **TEST**. This function cannot bring the dimmer to any level except FULL. You can turn ON multiple dimmers for testing or focusing if required.

Press **TEST** **[#]** ***** to bring the dimmer specified by input **[#]** to FULL.

[#] is the input control signal (not the physical dimmer space number) for the port into which the programmer is plugged. This operation will only work for dimmers which are not receiving an external control signal (i.e., from the control console). Multiple dimmers can be turned on by repeating this command.

If you use this sequence while a dimmer signal is present the selected dimmer will flash ON momentarily.

Press **TEST** ***** to turn all dimmers which are controlled by the dimmer rack OFF.

This operation will only work for dimmers which are not receiving an external control signal (i.e., from the control console).

If you use this sequence while a dimmer signal is present all dimmers will flash OFF momentarily.

If you use this command sequence while you have a backup cue (dimmer rack cue) on stage, it will turn all lights OFF.

Program "Backup" Cues

CD80 Advanced Electronics dimmer racks are capable of memorizing the current dimmer levels (regardless of how these levels were achieved) for later replay. This can be used strictly for emergencies (such as console problems), or can be used to allow access to specific light settings for personnel who should not be accessing the control console. You can record up to 100 cues in this manner.

Press **LEARN** **[#a]** **TIME** **[#b]** ***** to record the current dimmer output values in the cue number specified by **[#a]** with the time specified by **[#b]**.

Since this function reads the actual dimmer level, you can set dimmer levels using the console, the Test function, analog inputs, or LiteScene inputs. The actual levels on stage will be recorded.

Play Back "Backup" Cues

Recorded "backup" cues can be replayed by using the Advanced Electronics Programmer. The first 8 cues can also be played back with a LiteScene push-button control station.

Press **GO** **[#]** ***** to crossfade to the recorded cue specified by **[#]** in the time previously recorded.

To access a cue using a LiteScene control station, push the appropriately numbered button on the control station. This operation will only work for dimmers which are not receiving an external control signal (i.e., from the control console).

Press **GO** ***** to turn all "backup" cues OFF.

To turn OFF all backup cues using a LiteScene control station press the OFF button on the control station. This operation will only work if the control console associated with the selected dimmer spaces is OFF or disconnected from the dimmer control cable(s).

Since the control console must be OFF for these cue commands to function, you should always make sure that you turn all cues OFF before the console is turned ON. If this is not done, the cue which is active when the console is turned ON will return when the console is turned OFF and the "Status Quo" time has been reached.

Preview "Backup" Cues with Console ON

You can see a "backup" cue while the control console is ON by using **PREVIEW**. This puts the cue on stage in place of the current console output.

Press **PREVIEW** **[#]** ***** to put the cue specified by **[#]** on stage immediately even if the control console associated with the dimmer spaces is ON.

PREVIEW will terminate with the next press of a key if a multiplexed dimmer signal (digital or analog) is present.

Index

I

- 100A Dimmer 2
- 12Kw dimmer parts list 35
- 2.4Kw dimmer parts list 33
- 20A Dimmer 2
- 50A Dimmer 2
- 6Kw dimmer parts list 34

A

- AC Power 13
 - install 16
- Adapter
 - XLR to TA4 series 18
- Adapter cable
 - AMX192 18
- Adjustment
 - line variation compensation 30
 - ramp bias 30
 - ramp gain 30
- AMX192
 - adapter cable 18
 - control inputs 18
 - control wiring 18
 - extension cable 19
- Analog control 6, 42
- Assign
 - non-dim status 44
- Auxiliary wiring
 - install 17

B

- Backup cues
 - play back 45
 - preview 45
 - program 45
 - record 45
- Bump 2

C

- Calibration
 - Dimmer Processor card 30
- Channel 2
- Channel Test Chassis 29
- Circuit 2
- Close up dimmer rack 22
- Command module
 - description 8
 - install 21
 - wiring 20
- Command Reference 39
- Comments 4
- Component replacement 23
- Conduit entry area 14
- Control inputs
 - AMX192 18
 - DMX512 19
 - Hand Held Programmer 17
- Control wiring
 - AMX192 18
 - DMX512 dimmer 19
 - Hand Held Programmer 17
 - install 16
- Conventions 3
- Crossfade 2
- Cue 2

D

- Definitions 2
- Dimmer 2
 - 12Kw parts list 35
 - 2.4Kw parts list 33
 - 6Kw parts list 34
- Dimmer level retention 6
- Dimmer module
 - description 10
 - efficiency 10
 - Output curve 6
 - output regulation 6
 - quiet dimmers 11
 - servicing 23
 - types 11

- Dimmer Processor card
 - calibration 30
- Dimmer Processor module
 - description 9
 - servicing 24
- Dimmer rack
 - back panel parts list 32
 - close up 22
 - description 7
 - heat dissipation 13
 - install 15
 - parts list 31
 - sequencing 43
 - turn on 21
- Dimmer signal protocol 5, 41
- Dimmer space
 - assign analog control 42
 - assign control number 41
 - assign non-dim status 44
 - assign to port 41
 - test 44
- DMX512
 - control inputs 19
 - dimmer control wiring 19
 - Extension Cable 20
- Down-fade 2

E

- Efficiency 10
- Environmental considerations 13
- Extension cable
 - AMX192 19
- Extension Cable
 - DMX512 20
 - Hand Held Programmer 17

F

- Factory setup 5, 40
- Fade 2
- Fault isolation 25
- Features 5

H

- Hand Held Programmer 39
 - control inputs 17
 - Extension Cable 17
- Hand Held Programmer control wiring 17
- Hardware
 - Command module 8
 - Dimmer module 10
 - Dimmer Processor module 9
 - dimmer rack 7
 - Input Processor module 9
 - Power Supply module 8
 - Smart Fan control 8
- Hardware description 7
- Heat dissipation 13
- Houselight control 6, 42
- Humidity 13

I

- Input
 - AMX192 18
 - DMX512 19
 - Hand Held Programmer 17
- Input Processor module
 - description 9
 - servicing 24
- Install
 - AC Power 16
 - auxiliary wiring 17
 - Command module 21
 - connections between racks 17
 - control wiring 16
 - power wiring 16
- install
 - dimmer rack 15
- Installation 13

L

- Line variation compensation 30

M

Manual organization 1
Memory 2

N

Non-dim
 assign status 44

O

Operational Features 5
Output curve 6
Output regulation 6

P

Partitions 41
Parts list
 12Kw dimmer 35
 2.4Kw dimmer 33
 6Kw dimmer 34
 dimmer rack 31
 dimmer rack back panel 32
Parts purchases 4
Patch 2
Periodic maintenance 37
Planning
 conduit routing 14
 environment 13
 power requirements 13
Play back backup cues 45
Port
 assign dimmer protocol 41
 assign dimmer spaces 41
 assign rack sequencing 43
Power requirements 13
Power Supply module
 description 8
 servicing 25
Power wiring
 install 16
Preset 2
Preview backup cues 45
Problems 4
Program rack number 40
Programming
 analog control 42
 backup cues 45
 dimmer signal protocol 41
 factory setup 40
 user setup 5, 44

Protocol

 dimmer signal 5, 41

Q

Questions 4
Quiet dimmers 11

R

Rack number 40
Ramp bias adjustment 30
Ramp gain adjustment 30
Record backup cues 45
Regulation 6
Remove
 dimmer module 23
 Dimmer Processor module 24
 Input Processor module 24
 Power Supply module 25

S

Sequencing
 dimmer racks 43
Servicing
 dimmer module 23
 Dimmer Processor module 24
 Input Processor module 24
 periodic maintenance 37
 Power Supply module 25
Set
 Status Quo memory 42
Setup
 user programming 5, 44
Smart Fan control
 description 8
Status Quo memory 6, 42
Submaster 2
Suggestions 4
System configuration 5, 40

T

TA4 connector 18
Technical assistance 4
Temperature 13
Test dimmer space 44
Trouble-shooting 23
Turn on dimmer rack 21

U

Up-fade 2

User setup operations 5, 44

W

Wire

Command module 20

X

XLR connector 18