EC *90* User's Manual

SUPERVISOR

Strand LIGHTING

Offices and Service Centres

Asia:	7th Floor Corporation Sq., 8 Lam Lok St, Kowloon Bay, Kowloon, Hong Kong. Tel: (852) 2757 3033 Fax: (852)2757 1767
Belgium:	Chausée de Haecht 1801, 1130 Bruxelles, Belgium. Tel: (32) 2245 8686 Fax: (32) 2245 2235
Canada:	430 Lucknow Drive, Unit15, Mississauga, Ontario L5S 1V3 Canada. Tel: (1) 905 677 7130 Fax: (1) 905 677 6859
Germany:	Salzbergstrasse 2, 38302 Wolfenbuttel-Salzdahlum, Germany. Tel: (49) 5331 30080 Fax: (49) 5331 78883
Italy:	Via delle Gardenie 33 (Pontina Vecchia Km 33,400), 00040 Pomezia Roma, Italy. Tel: (39) 6914 7123 Fax: (39) 6914 7136
Sweden:	Box 20105, Tappvägen 24, 161 02 Bromma, Sweden. Tel: 46 8 799 6950/1/2/3 Fax: (46) 8281005
United Kingdom:	Grant Way, Isleworth, Middlesex TW7 5QD U.K. Tel: (44) 0181 560 3171 Fax: (44) 0181 568 2103
USA:	PO Box 9004,18111 South Santa Fe Avenue, Rancho Dominguez, CA90221, USA. Tel: (1) 310 637 7500 Fax: (1) 310 632 5519

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prohibited. Certain features of the equipment described in this document may form the subject of patents or patent applications.

Safety Information and Warning

The WARNING signs are to draw your attention to situations that could result in personal injury or even death, if ignored.

Warning

The CAUTION sign draws your attention to a situation that could cause serious damage to the equipment.

Caution

The STOP sign draws your attention to an action that should be taken, or a fact that should be considered carefully for optimum equipment performance.

General Information

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Warning

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This equipment operates at voltage levels that are potentially lethal. Do not touch any of the internal parts of the equipment unless you are fully aware of the hazards involved and the precautions to be taken. It is imperative to provide an adequate earth conductor for the rack and load connections. Do not rely on earthing via conduit or trunking.

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The equipment described in this manual is designed and manufactured to comply with international safety standards IEC 950 and is intended for use as part of a lighting control system. It must not be used for other purposes where there is any risk of safety to persons. It is important that installation be carried out in accordance with the instructions given in this manual and in compliance with applicable electrical regulations. The work should be carried out by a suitably qualified electrician.

The system is designed to be permanently installed with supply and load wiring permanently connected.

In the interests of continued safe and reliable operation, observe the following guidelines:

- Keep the equipment at a room temperature of 0-35°C and a relative humidity of 10-95% (non-condensing) during operation. For operation between 35°C and 40°C de-rate the maximum load by 4% per °C.

  Do not, under any circumstances, operate the equipment above 40°C or in an environment that may become wet.

- Avoid sudden extremes of temperature, rain, direct sunlight or other heat sources.

- Make sure that wires and cables are routed sensibly and wired in accordance with local regulations.

- DO NOT drop the equipment or subject it to excessive bumping or jarring.

- DO protect the unit from excessive dust or other contamination.

Table of Contents

Chapter **1**

Introduction and Assistance

This manual provides information on the installation and operating procedures for EC90sv dimmer racks.

Manual Organisation

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

Introduction and Assistance (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 and programmable features of EC90sv dimmer racks.

Hardware Description (chapter 3) gives an overview of the major hardware components in EC90sv dimmer racks.

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

Front Panel Programming (chapter 5) tells you how to use the menus in the processor module to configure the system.

Event Reporting (chapter 6) tells you how to set up and use Reporting dimmers.

Basic Troubleshooting (chapter 7) tells you how to begin troubleshooting if you have problems with dimmers or the rack.

Periodic Maintenance (chapter 8) lists the steps which should be taken to keep the equipment running at its best.

Definitions

The following definitions are used throughout this manual:

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.

CIC   (Central Interconnection Card). The printed circuit board on which all contractor control wiring connections are made. It is located on a slider mechanism in the fan tray.

Circuit   Connection device and wiring for providing power to a lighting fixture from a dimmer.

Circuit ID   A unique identification number containing up to four digits which you can assign to each dimmer. The circuit ID may be the same as the dimmer number, or may be a special number used to indicate circuit location, phase, channel number, etc. This feature is useful for System Wide Control and Reporter™ PC functions.

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.

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.*

Curve   The relationship between a control level and the actual dimmer output. Also known as "dimmer law."

Dimmer law   See "curve."

Dimmer   Device controlling power to a lighting fixture by use of phase control techniques.

Default   The original factory settings.

Fade   A gradual change in stage levels from one set of intensities ("look") to another.

Fade time   The time it takes for dimmer levels to go from their current levels to the levels in the selected preset. Each preset has its own fade time.

Hard fired dimmer   Standard dimmers use a fraction of the load current to power the thyristor control cicuitry but hard fired dimmers use independent power supplies. Hard fired dimmers provide more stable outputs when used with very small loads (less than 60W), fluorescent ballasts, cold cathode lighting, and inductive loads.

Level   A numerical value used to express the "brightness" of a dimmer. Usually shown as %.

Mux	Abbreviation of the word "Multiplex". Multiplex systems transmit data (usually dimmer information) from a lighting controller to a dimmer rack via a single cable rather than via a pair of wires for each dimmer.
Patch	Historically, the process of physically connecting circuits to dimmers. Now usually refers to electronic assignment of dimmers to channels.
Phase	The three phases of the mains supply to which the dimmers are connected are identified as phase 1, phase 2 and phase 3 in Europe and phase A, Phase B and Phase C in North America.
Power module	A chassis containing one or two dimmers or contactors. This is sometimes referred to as a "dimmer." However, each EC90sv power module can have one or two dimmers or contactors in it, so this manual distinguishes between *dimmers* (individual power control circuits) and *power modules* (a collection of one or more power control circuits).
Preset	A pre-defined setup of intensities for a set of channels, stored in memory for later replay. For Outlook applications, the EC90sv processor module stores 8 programmable presets per room for up to 16 rooms. For SWC applications, the processor module stores 99 programmable presets. Preset 0 (ZERO) is always a blackout.
Preset fade time	See "Fade Time."
Rack number	A number used to uniquely identify each dimmer rack in a multiple rack system. Rack numbers are set from the front panel of the processor module, and are usually set by the installation engineer.
Room	An area separately defined for purposes of architectural lighting control (e.g., Outlook control stations). This is usually either a room in the traditional sense (an indoor enclosed area) or a portion of a room which can be partitioned off. Each room may be separately and simultaneously controlled by the system.
Status Reporting	Status Reporting dimmer or contactor modules are able to measure output voltage, current, DC voltage and temperature. This advanced feature enables rack software to determine if the module is working correctly, and the nature of the load.
SWC	(System Wide Control) A method of programming and controlling more than one dimmer rack simultaneously. A hand held controller lets you program and recall all 99 presets and control individual dimmers. 8 and 16 channel pushbutton stations and an A/V interface, let you recall any 8 or 16 of the 99 presets at each station. Please contact Strand Lighting or see the *System Wide Control Data Sheet* or *System Wide Control User's Manual* (part number 85061) for details on how SWC works.
Reporter PC™	PC Software that runs under Microsoft Windows and lets you set up certain Strand Lighting dimming cabinets and racks (including EC90sv racks). Please contact Strand Lighting for details.

Conventions

The following additional conventions are used in this manual.

ESC   Shows the actual push-button labelled "ESC."

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

Input   (text with first letter capitalized) shows the actual menu selection for menu displays with text selections (e.g., Fan speed can be set to Fixed or Variable).

Patch   (bold text with first letter capitalized) shows a menu name (e.g., Patch menu).

Operational Features   (italic text) refers to a specific chapter or section name, and to specific menu items. Also used for emphasis in notes.

Technical Assistance

EC90sv racks and dimmers require a minimum of maintenance and servicing. See chapter 6 for basic troubleshooting procedures and chapter 7 for periodic maintenance procedures.

Problems

If equipment fails to operate properly upon installation, or under normal load and temperature conditions and basic troubleshooting procedures are not effective, please contact Strand Lighting Field Service at the office serving your area.

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 Department at the Strand Lighting office serving your area.

Addresses

Addresses for all of the Strand Lighting offices are shown on page ii of the front section of this manual.

Chapter 2

Operational Features

This chapter presents the basic operational features of the EC90sv rack.

Configuration

Large racks have provision for up to 36 dimmer modules. Small racks have provision for up to 18 dimmer modules. The modules are arranged in crates (see figure below) and can accept certain combinations of Module types.
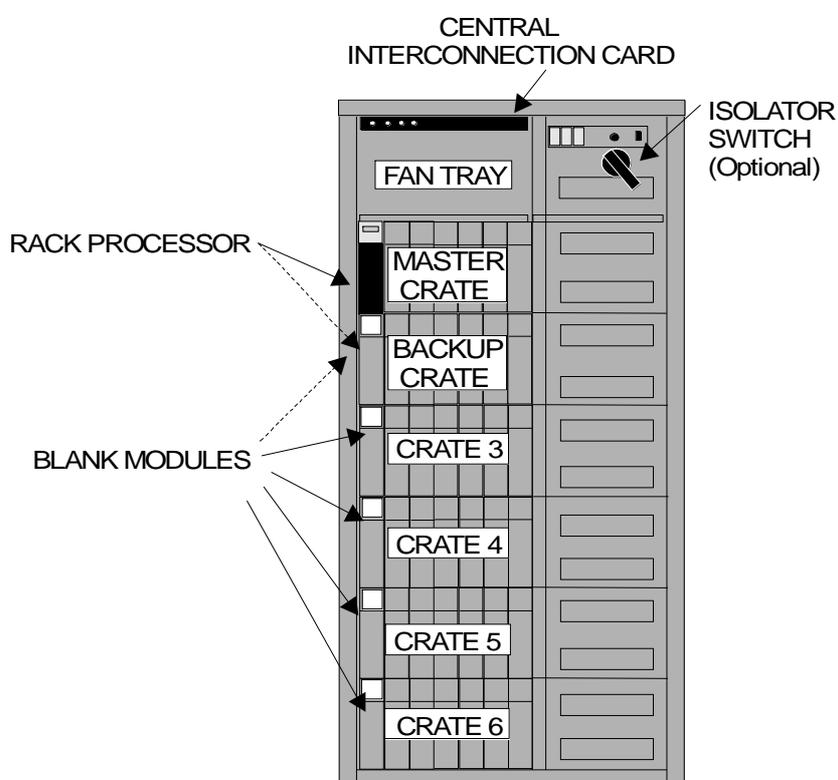
Any 3kW crate can accept any 3kW module, any 6kW crate can accept any 6kW module. The top crate is always the 'Master' Crate containing the rack processor; the second crate must also be a Master in the case of dual electronics racks.

Rack processor modules are available with 36 or 72 dimmer control outputs to drive EC90sv dimmers. If dual electronics is required, 72 way rack processors must be fitted to both crate 1 and 2 positions (shown as *Master* and *Backup* above) and a dual electronics type rack specified at the time of manufacture. This applies to both large and small racks. 72 channel

processors also have 12 Analogue Outputs (0 to +10 volts at 1mA maximum) for auxiliary control.

The following configuration items are usually programmed in the factory or during commissioning, but can also be reprogrammed by the user, and should be checked at commissioning time.

- The processor display language. This can be English, French, German, or Spanish.
- The module types for each rack slot position. From this information, dimmers and analogue outputs are given sequential dimmer numbers to simplify programming. Slot types for Reporting modules are automatically updated if module types are interchanged.
- Rack number (1-99). This number is used by the Reporter PC software.
- PANIC selection and configuration.

Inputs

The following control inputs are available for EC90sv dimmer control.

- Multiplex A input, selectable for SMX / DMX512, AMX192, or D54 inputs.
- Multiplex B input for SMX / DMX512 only.
- 32 (72 channel processor) or 16 (36 channel processor) analogue inputs patchable to any dimmer.
- Digital Network Control for Outlook™ and compatible architectural control stations.
- SWC™ (System Wide Control) for remote preset panels, A/V interface and hand held programmer.
- Connection for communicating with a PC running the Reporter PC™ Windows® based software; or Strand's 430/530 consoles running Reporter™.
- Rack keypad and LCD display to program all functions.
- RS232 port for a local PC running Reporter PC™, enabling setup, playback, show memory storage, operating software upgrades, and full status monitoring.
- External switch contacts for main/backup processor selection, MuxA/MuxB selection, PANIC enable/disable, "Go to Preset 1," and "Go to Next Preset."

All control conections are via 2-part plug-in screw terminal connectors housed in a unit called a Central Interconnection Card (CIC). The CIC is mounted on a sliding mechanism for easy access.

Outputs

The following outputs are available from the EC90sv processor module:

- 12 Analogue Outputs (72 channel processor only) for external equipment.
- Fan fail/module overtemp LED connection.
- PANIC active.
- Master and Backup processor active LED connections with dual electronics systems

Programming Rack Functions

Several additional functions are generally accessed or programmed in the field by the user as required:

- Maximum output voltage (per dimmer): 50-250 volts (e.g. set to 230V for extended lamp life).
- Minimum level (per dimmer): 0% - 100% (e.g. set to 10% for aisle lights or large lamp preheat).
- Room and channel patching (for applications using Outlook and other Digital Network Control compatible stations).
- Each dimmer and analogue output can be patched to any valid SMX / DMX512, AMX192, or D54 address number for the standard multiplex input A (Mux A). Dimmers can only be patched to valid SMX /DMX512 address numbers for multiplex input B (Mux B).
- Circuit ID-used by SWC and Reporter PC software.
- Curve assignment (per dimmer): Linear, Square, S-Curve, Fluo Elec (for electronic fluorescent balasts), Fluo Mag (for magnetic fluorescent balasts) and Non-Dim. The two fluorescent curves let you set the top end voltage and the bottom end cutoff voltage. The Non-Dim curve lets you set the turn-on threshold for the Non-Dim. An additional 5 user defined curves can be programmed at the rack, or downloaded from the Reporter PC software.
- Dimmer response (per dimmer): fast (30ms), normal (100ms) or slow (300ms). This determines a dimmer's rate of response to a change in control level. Slow is usually set for large tungsten loads to reduce filament inrush, medium or fast for small loads.
- Dimmer control assignment (per dimmer). The way in which the various input levels combine is determined on a per dimmer basis by setting the dimmer Mux mode; these outputs are:- Outlook preset, SWC preset, Mux A, Mux B, and analogue ("Input") or to a fixed level (0% - 99% or "Full").
- Record and recall presets (1-8, ON and OFF per room for Outlook control, and 0-99 per rack for System Wide Control).
- Define Preset Number or "Hold" condition on Mux failure.
- Define power-up preset per rack for Outlook presets.
- Calibrate top set between 7 and 13 volts for analogue inputs.
- Calibrate top set between 0 and 10 volts for analogue outputs.
- Set LCD contrast.
- Error log accessible from the processor module or Reporter PC software.
- Dimmer reporting enable/disable (load status reporting dimmers only).

Load Status Reporting

All EC90sv dimmer modules, including contactor Non-Dims and hard fired dimmers, are available in load status reporting versions. Load status reporting versions of dimmers can be mixed in any combination with standard dimmers in EC90sv racks. These dimmers report many status items back to the rack processor. The processor can then determine a wide range of faults with diagnostic data. Reported items include:

- Dimmer type.
- Dimmer output current.
- Dimmer output voltage.
- Dimmer temperature.
- Excess DC output from dimmer.

Security Features

In order to minimize the impact of failures to any part of an EC90sv a number of security features are provided with, or are optional with the racks.

Standard security features for EC90sv racks are:

- 2 fans, in case one fan fails.
- Fan fail indication per fan.
- Overtemperature sensors in each module.
- The processor module can be set to hold the last dimmer levels forever, or to fade to a specified SWC preset after a preset interval in cases of multiplex signal failure.
- Setup data is stored in non-volatile memory.
- Memory card can be easily moved on exchange of processors.
- 2500V opto-isolation of Mux A and Mux B DMX512 inputs, SWC input, Outlook input, Reporter input and external switch contact inputs.
- Any of 72 dimmers and 12 Analogue Outputs (72 channel processor only) can be assigned to PANIC with a mechanical switch. PANIC can be activated (full ON) from the dimmer rack front panel or from a remote momentary contact switch. This activation does not require processor intervention. It is strictly hardware activated. (Requires optional PSU Part No. 66100).
- Automatic PANIC on removal or failure of processor module. In racks with two processor modules, both modules must be removed to activate PANIC (requires power supply as above).
- Keypad lock.

Optional security features for EC90sv racks include:

- Redundant tracking backup (requires a second processor module fitted to the rack).
- Optional automatic switch over from failed processor to working processor, or Panic on failure of both.
- Setup data can be transferred between processors if either processor is replaced.
- Reporter PC software lets you store setup data off-line.
- Backup processor activated by remote switching.

SWC™ (System Wide Control)

SWC lets you control multiple EC90sv racks from a single location. A hand held controller lets you program and recall all 99 presets and control individual dimmers. 8 and 16 channel pushbutton stations let you record or recall any 8 or 16 of the 99 presets at each station. An audio visual (A/V) interface is also available to activate presets from external contacts. Contact Strand Lighting or see the *System Wide Control User's Manual* for details on SWC operation.

Outlook™

Outlook is a comprehensive family of control stations designed for architectural applications needing a simple, flexible control solution with minimal installation and cabling costs. Outlook stations require the optional PSU, Part no. 76421, to be fitted. These control stations can access, modify, and recall lighting levels stored in the EC90sv processor module. Features and options include:-

- Control up to 16 separate rooms, with up to 12 channels per room.
- 8 preset scenes plus ON and OFF for each room.
- Manual sliders (3, 6, 9, or 12 sliders per station) for direct control of individual circuits.
- Record facility for saving slider levels for future pushbutton recall.
- Programmable fade times between 0 and 4 minutes from Outlook control stations or 0 to 10 minutes from the rack processor or Reporter PC software.
- Record lockout facility for playback-only operation.
- 1, 4, and 8 preset pushbutton stations.
- Audio-Visual interface.
- Room combine stations for room partitioning.

Reporter PC™ Software

Reporter software running on a PC under Microsoft® Windows® lets you control multiple EC90sv racks. This software lets you remotely program all processor features and download an additional 5 user programmable dimmer curves.

Reporter PC software lets you access rack and dimmer status information:

- No load
- Load error (deviation from recorded load)
- Overload
- CB trip
- Overheat
- Thyristor or Contactor short circuit
- Thyristor or Contactor open circuit
- High DC
- Module swap
- SRP fault

- Mux A and Mux B input fail.
- Phase fail A, B or C
- Fanfail warning.
- Panic mode activated

- Processor Enabled (master or backup)
- Tracking OK
- Input line voltage per phase, and total load current per phase
- Earth Leakage Fault (special EC90sv systems only)

Contact Strand Lighting or see the *Reporter Software User's Manual*, part number 85083, for more details on Reporter PC operation.

Dimmer Characteristics

Since the control electronics for all dimmers is in the processor module, dimmer characteristics are determined by both the dimmer itself and the control electronics.

Regulation

Line regulation acts on each individual dimmer and maintains dimmer curve parameters (set curve, max voltage, min level).

Output

- The output response curve can be set to Linear Power, Square, S-Curve, Fluo Elec (for electronic fluorescent ballasts), Fluo Mag (for magnetic fluorescent ballasts), and Non-Dim. The two fluorescent settings let you set the top end voltage and the bottom end cutoff voltage. The Non-Dim setting lets you set the turn-on threshold for the Non-Dim. 5 additional user programmable curves are available.
- The output waveform is a variable conduction angle sine wave (230VAC).
- Dimmer response can be set to fast (30ms), normal (100ms) or slow (300ms). This determines a dimmer's rate of response to a change in control level. Slow is usually set for large tungsten loads to reduce filament inrush, medium or fast for small loads.
- A special smoothing algorithm is applied to small level changes to maintain smooth fades even with very long fade times.
- 5 user curves are set to 1:1 by default, and can be programmed by the rack keypad or from the Reporter PC.

Special Power Modules

EC90sv power modules are available in thyristor dimmer/non-dim, contactor non-dim and hard fired thyristor versions for use in a variety of situations. All modules are available with load status reporting as an optional feature. Contactor non-dims can be used for motor loads, capacitive loads, HMI ballasts, or any other load that does not respond well to phase controlled dimming. Hard fired dimmers are particularly useful for fluorescent, cold cathode, and other inductive loads.

Efficiency

The power efficiency of the dimmer is a minimum of 97% at full load. The power efficiency of contactor non-dims is 100%. The Power output is approximately 10Btuh per Amp of connected load.

Servicing

EC90sv dimmer racks are designed to be easily serviced in the field. They incorporate:

- A single connector card (CIC) for all control connections making installation and maintenance an easy task.
- Highly reliable, oversized power module contacts.
- Replaceable processor module(s).

Chapter 3

Hardware Description

The EC90sv dimmer rack is a free standing, factory assembly of welded steel construction finished in thermally set powder coat paint with bolt-on covers. The rack and all crates are earth grounded.

Fixing holes are provided so that racks can be bolted together and to the floor. Eye bolts are provided for attaching to the top of the rack for lifting purposes.

Dimmer Rack

Each EC90sv dimmer rack consists of the following:

- 6 (large rack) or 3 (small rack) crate versions containing up to 36 power modules or 18 power modules respectively.
- 1 or 2 rack processors.
- Central Interconnection Card (CIC) for all external signal connections.
- 2 ventilation fans.
- Individual circuit breakers for each dimmer.
- RS232 port.
- Reporter PC port.
- SWC/Outlook port.
- PANIC switch.
- Indicators for low voltage power, 3 phase power, Fan fail and PANIC.
- Optional power supply for SWC / Outlook ancillaries (76421)
- Optional Isolator switch.

The top crate contains the rack processor, and for dual electronics versions the second crate must also contain a rack processor; both processors are identical. The first position in all subsequent crates are occupied by blank modules. The connectors in the rack are polarized to prevent dimmer modules being plugged into slots of the wrong rating.

Power distribution is by five 30x10mm copper bus bars rated at 600A each.

Module configuration within crates is detailed in chapter 2.

Eye Bolt Positions

50mm HOLE FOR
SIGNAL WIRING

APERTURE FOR
POWER WIRING

CENTRAL
INTERCONNECTION CARD

OUTLOOK/SWC STATION
POWER SUPPLY (OPTIONAL)

ISOLATOR SWITCH (OPTIONAL)

FANS

BUSBARS

BUSBAR FUSES

CRATES

ALLEN SCREW
(Door Release)

N.B Each dimmer has its own
circuit breaker housed in the
door section (not shown)

APERTURE FOR
POWER WIRING

LOAD CONNECTOR TERMINALS (12 0ff)
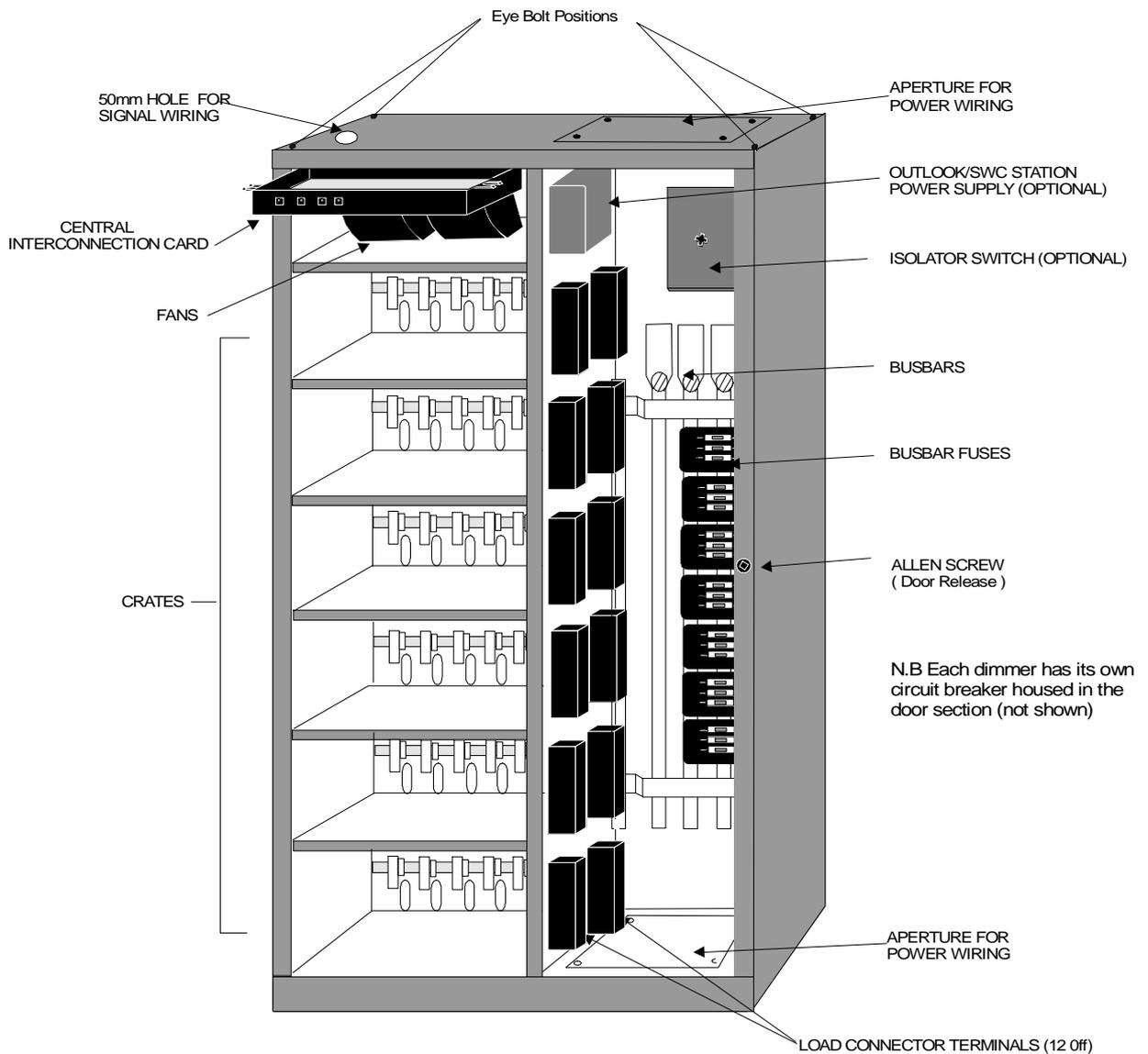
Central Interconnection Card

The Central interconnection Card (CIC) is housed in the top compartment of the rack above the fan units. All contractor signal wiring is terminated to the connectors underneath this card and the unit is mounted on a sliding mechanism for easy access. This card also contains some configuration links and DIP switches to select dimmers for PANIC.

SWC Port

A six pin XLR socket provides an interface with Strand's System Wide Control allowing remote programming and recall of all 99 presets via a handheld unit.

POWER
L1 L2 L3   PANIC   SWC
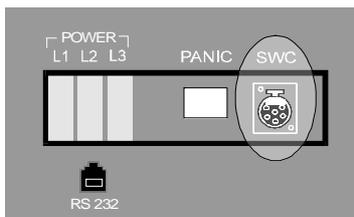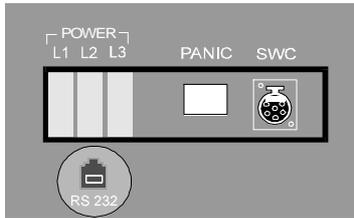
RS 232

RS232 Port

The RS232 port is provided for connecting to a PC running Reporter software, allowing local status reporting or configuration.

This port is also used for down loading rack operating software.

PANIC Switch
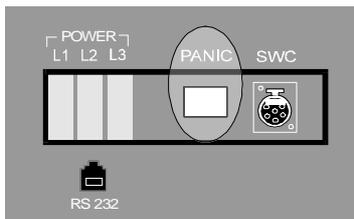
The PANIC switch will bring selected dimmers to full and can be used in an emergency situation such as mux or control desk failure. The dimmers are selected by switch banks located on the CIC.

Miniature Circuit Breakers
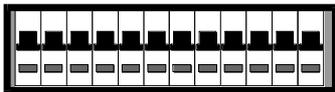
Individual modules are protected by their own circuit breakers which are mounted adjacent to the crates in the rack door, allowing modules to be isolated and removed without shutting down the rack. The rating of these breakers will vary according to the size of module installed.

- 3kW   16A
- 6kW   32A
- 10kW   50A

Contracting Access

The contracting chamber is accessed via a full height hinged door which is secured by an allen screw situated in the right hand pillar. The door opens more than 90º to allow free access to the chamber. Power cable entry is via the top and bottom of the racks and provide access onto the bus bars. The bottom aperture is located within the contracting chamber.

- Top Aperture :   400 x 400mm
- Bottom Aperture :   358 x 285mm

Cable entry for signal wiring is through a 50mm hole, suitable for conduit, in the top of the rack.

Rack Capacity

- Large rack: 36 Dimmer modules
- Small rack: 18 Dimmer modules

Size & Weight (Approx.)

- 6 Crate Rack (large)

Height:	1968mm	Width:	905mm
Depth:	510mm	Weight Loaded:	450kg
		Weight Empty:	200kg

- 3 Crate Rack (small)

Height:	1168mm	Width:	905mm
Depth:	510mm	Weight Loaded:	250kg
		Weight Empty:	130kg

Power Distribution   EC90sv racks are equipped with busbars in the contracting chamber for three phase plus Neutral and Earth connections. Busbars are rated at 600A per phase and are provided with M12 bolts for fitting with proprietary cable clamping hardware.

Racks must be provided with individual supply feeds, with either an external isolator or an optional rack mounted isolator. A cable spreader box will need to be mounted to the top access plate if the internal isolator is fitted.

> *The mains supply must not be looped through from one rack to another.*

Typical configuration is shown below.
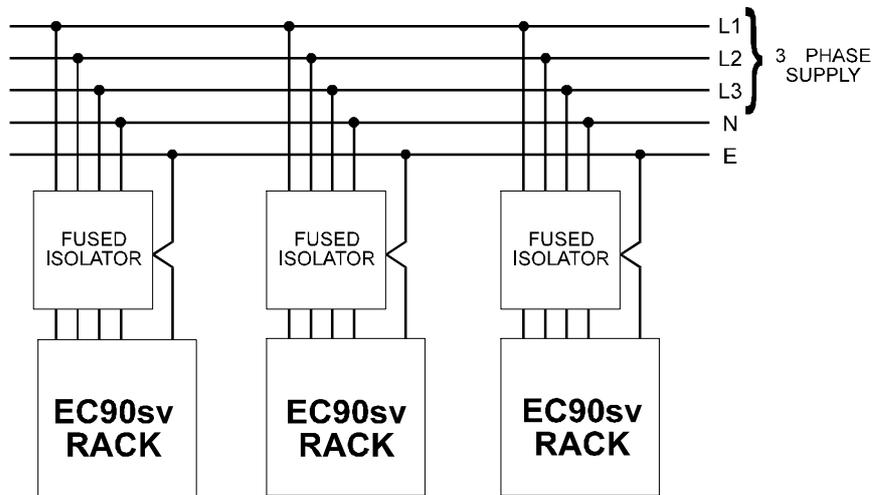
Supply Voltage   EC90sv racks are available for use with 220-240VAC power supplies only. Phasing within the rack is sequential across dimmer crates running in the phase sequence:- L1, L2, L3, L1, L2, L3. All dimmers in a vertical stack down the rack are on the same phase. In dual power modules, both dimmers are on the same phase.

Operation on single phase is possible, refer to the **Installation** section.

Non-standard phasing is possible to special order. The rack processor may control any dimmer on any phase.

LOAD
CONNECTIONS
Crate 1

LOAD
CONNECTIONS
Crate 2

LOAD
CONNECTIONS
Crate 3

LOAD
CONNECTIONS
Crate 4

LOAD
CONNECTIONS
Crate 5

LOAD
CONNECTIONS
Crate 6

E
N
L3   } INCOMING
L2   }   MAINS
L1

3 x 10A FUSES
Rack Processor,
Additional PSU
Fans

3 x 80A FUSES
Crate 1

3 x 80A FUSES
Crate 2

3 x 80A FUSES
Crate 3

3 x 80A FUSES
Crate 4

3 x 80A FUSES
Crate 5

3 x 80A FUSES
Crate 6

L1
L2
L3   } ALTERNATIVE
N   }   MAINS
E   CONNECTION

CONTRACTING CHAMBER LAYOUT

Warning

It is imperative that an adequate Earth conductor for the rack and load connections are provided. Do not rely on Earthing via conduit or trunking.

Central Interconnection Card

All contractor connections for control lines are by plug-in screw terminals. For signals that must be bussed from rack to rack, two terminal block connections are provided, one for input, the other for output. Strand Lighting supplies appropriate link cables for rack interconnection in multiple rack systems.

The chassis is secured to the rack by a sliding mechanism. Loosening two thumb screws allows the chassis to slide out and drop down for easy access (see rack drawing on page 12).

The (CIC) contains terminals for control of the following:

- **Mux A / B Inputs**: SMX / DMX512, AMX, D54.

- **Contact Inputs**: for master/backup selection of processors, Mux A/B selection, 'Goto' preset selection and external PANIC switch enable/disable.

- **Analogue Inputs**: for external connection to analogue lighting desks such as LX.

- **Analogue Outputs**: +10v supply at 1mA max for high impedance inputs.

- **SWC / Digital Network Connections** Outlook stations, A/V interfaces, SWC units.

- **Reporter PC connections** for linking to the PC monitoring system.

- **LED outputs**: for fan fail/module overtemp, panic, processor active (master or backup - for dual electronics systems)

The CIC also houses the switch banks for selecting dimmers for the PANIC function, Analogue Outputs and termination links for the mux signals.

Control Circuit Isolation

Opto Isolation between high voltage and control electronics is 3750 VAC. All control inputs, apart from Analogue Inputs, are also isolated from the processor electronics at 2500VAC, offering *double optical isolation* between the controller and the high power circuits.

Optional Power Supply (part no 76421)

Each EC90sv rack can have an additional power supply for powering up to 25 Outlook or SWC wallstations. In addition, this power supply will drive dimmers in Panic mode when no processor is fitted or the processor power supply has failed. The power supply is mounted in the contracting chamber, (see page 12).

Ventilation

RACK
COOLING

FANS (2)

FRONT

AIR
PLENUM
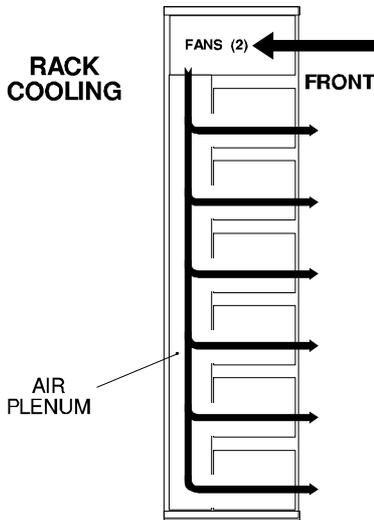
Adequate ventilation must be provided to maintain an ambient operating temperature within the range 0 to 35ºC and humidity of 45-90% non-condensing. Special attention should be paid to the need to maintain ambient temperature within these limits when racks are enclosed in a small room. Air flow is from the top of the rack, as shown in the diagram, supplied to an air plenum at the rear of the rack, by two tangential fans and exhausted through slots in the front of each dimmer module. No air is vented over the dimmer power connectors ensuring clean contacts.

EC90sv racks are designed to operate with only one fan working and for a minimum of 30 minutes with no fans working. Air flow sensors monitor fan operation and report inadequate air flow to the rack processor module in the top crate.

Removal of modules in a rack will affect the pressurisation of the air plenum at the rear of the rack. Although EC90sv can operate with up to 10% of its modules removed, it is recommended that removed modules are either replaced by spare units or the slots filled by blank modules.

The optional Reporter PC software will report the current fan speed setting ("FIXED" or "VARIABLE") and any fan failure. In additon, the fan fail LED on the front of the rack will flash if one fan has failed and remain on constantly if both fans fail. The remaining fan is driven to full to compensate.

Processor Module

Each EC90sv rack contains one or two processor modules. Each processor module has an 8 character by 2 line backlit LCD allowing simple setup and control at the rack. This display normally defaults to **Rack: 01**. If there are any dimmer events reported, the display will show appropriate messages with an event count.
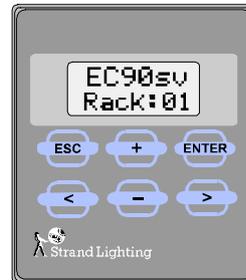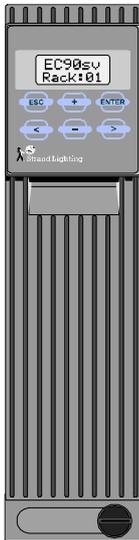
Pressing the > key takes you into a series of setup menus to view and set up the more frequently used EC90sv features. See the *Front Panel Programming* chapter for details on accessing these functions.

+ - keys give a set of current status messages.

All programmed data is held in battery maintained RAM on the processor module daughter board for up to 6 months without power to the rack.

Processor Options

The rack can be equipped with one or two processor modules. The second processor module acts as a fully tracking backup, and can be automatically or remotely activated by a switch contact. The configuration data from either processor is transferred into the other processor automatically. The currently inactive processor always tracks the currently active processor.

Power Modules

MAIN MODULE PCB

STATUS REPORTING PROCESSORS
(1 per dimming channel)

OVERTEMP SENSOR

CONNECTOR

Polarising
Insert

AIR FLOW

HEATSINK   CHOKES   D TYPE - DUAL 3Kw POWER MODULE
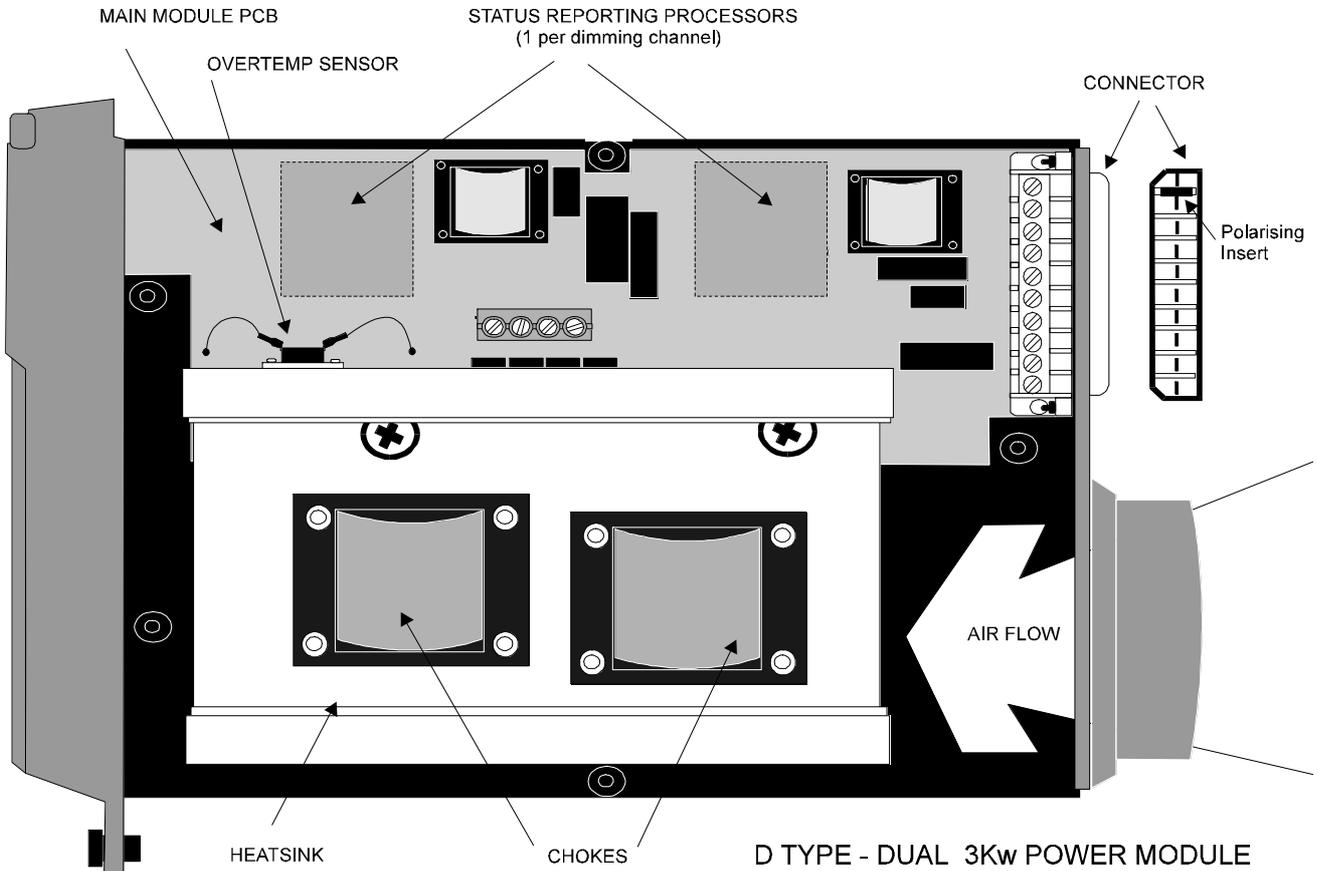
Connector Power and control circuit connections are made through a standard connector. The module connector and the receptacle in the rack contain polarising inserts for the purposes of ensuring the modules cannot be fitted into the wrong locations.

Circuit Protection Each dimmer module is wired through to an appropriately sized thermo-magnetic circuit breaker of either 6kA or 10kA fault current rating.

Output Voltage   At full load under normal operating conditions, voltage loss in the dimmer will not exceed 8 volts. The maximum output voltage for each dimmer can be limited through a software setting.

Line Compensation   The system will regulate the dimmer outputs to within 1volt over operating voltage range. Each individual dimmer is separately regulated.

DC Component of Output   Less than 1 volt with tungsten loads from 60w to the maximum rating of the dimmer, at all control levels.

EC90sv load status reporting dimmers include monitoring circuitry which will shut down the dimmer if excessive DC is detected.

Filter Risetime   High specification dimmer types include filter chokes with risetimes of 450μsec. The standard 230VAC dimmer includes a filter with a risetime of 100μsec. The 450μsec chokes meet BBC noise emission specification PID/171.

Hard Firing   EC90sv hard fired dimmers use a thyristor pair and separate control circuit board for power control. Unlike the thyristor in standard fired dimmers, which gets its control power from a fraction of the load power, hard fired thyristors get their control power from a separate power supply. Because the thyristors are fired independently of the load, hard fired dimmers are more suitable for use with loads that include transformers or ballasts, cold cathode or fluorescent tubes.

Load Status Reporting   The optional status reporting system requires a load of at least 100 watts (at 230VAC) on a 3kW module to distinguish between load and no load. This level goes up proportionately with larger power modules. Individual circuits can have their load status reporting disabled without affecting load status reporting for other dimmers.

Using With Fluorescent Lamps   If fluorescent lamps are to be used with EC90sv then hard fired dimmer types are recommended (see above). With small loads, it is possible that the RFI filter networks (used to ensure compliance with EN55014) may cause input to output leakage even when dimmers are turned off. The networks may be removed by cutting a link, for each relevant channel, inside each module.

LK 1

LK 2

CUT FOR
CHANNEL 2

CUT FOR
CHANNEL 1

LK 11

CUT FOR
CHANNEL 1

LK 21

CUT FOR
CHANNEL 2
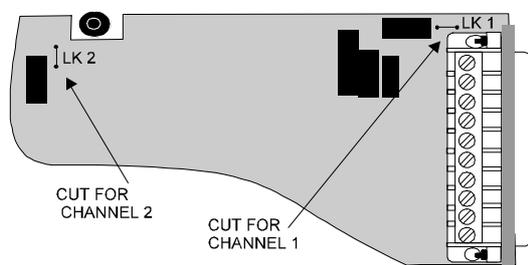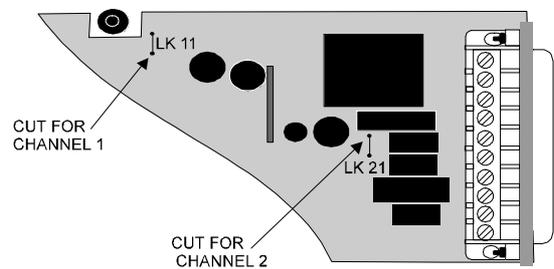
A / B TYPE DIMMERS   C / D TYPE DIMMERS

If these links are cut, then you must ensure compliance with EN 55014 by other means.

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Modules are available in the following configurations for 220 / 240VAC.

Dimmer Modules

Part no.	Description	230V		Firing	Status Reporting
		Power kW	Choke µs		
72411	Type A Module	dual 3kW	100	std	✔
72412	Type B Module	dual 3kW	100	std	
72421	Type C Module, hi-spec	dual 3kW	450	hard	✔
72422	Type D Module, hi-spec	dual 3kW	450	hard	
72431	Type E Module, hi-spec	6kW	450	hard	✔
72432	Type F Module, hi-spec	6kW	450	hard	
72435	Type G, hi-spec, double-width	10kW	450	hard	✔
72436	Type H, hi-spec, double-width	10kW	450	hard	

Contactor Modules

Part no.	Description	230V		Firing	Status Reporting
		Power kW	Choke µs		
72441	EC90sv, Type U, Module	3kW + c	450	hard	✔
72442	EC90sv, Type V, Module	3kW + c	450	hard	
72443	EC90sv, Type W, Module	c + 3kW	450	hard	✔
72444	EC90sv, Type X, Module	c + 3kW	450	hard	
72445	EC90sv, Type Y, Module	2xc (3kW)			✔
72446	EC90sv, Type Z, Module	2xc (3kW)			

Misc. Modules

Part no.	Description	230V		Firing	Status Reporting
		Power kW	Choke µs		
72491	EC90sv Blank Dimmer Module				
72492	EC90sv Bypass Module	3kW/6kW	N/A	N/A	no

Chapter 4

Installation

Before installing your EC90sv 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.

Configuration Kit The following items are supplied with each rack on installation:

- Set of Module Identification letters and numbers.
- 1 x 5mm Allen key.
- 4 x Eye Bolts.
- 4 x 6 way female connectors.
- Analogue Input connector set, part no.76311.

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

- Operating temperature: 0 to 40°C ambient.
- Humidity: 5%-95% non-condensing.
- Storage temperature: -40°C to 70°C.

Warning

> *Dimmer rack efficiency is at least 97%. 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 at least 3% of the maximum load the dimmer racks will handle.*

Caution

> *This equipment is for indoor use only!*

Power Requirements

A 220 - 240VAC, 50/60Hz, 3 phase or single phase, power source must be provided for the system.

Because of electrical and RF noise generated by phase fired dimming equipment, Strand Lighting recommends that the dimmer rack power be a separate feed and that no other equipment share the feed.

Warning

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

Single Phase Operation

For single phase operation the three 'Live' busbars (L1, L2, L3) can be strapped together using suitably rated wire.

Warning

> *The max. current allowable in single phase operation is 600A, dictated by the size of the Neutral busbar, and must not be exceeded.*

Conduit Layout

The location of conduit / trunking runs and their entrance to the dimmer rack is important and should be carefully planned before cutting holes or attaching conduit. The figure overleaf shows entry areas for both power and signal wiring plus busbar wiring.

> ***Do not*** *run power feed or load wires in the same conduit or wireway as control and low voltage wiring.*
>
> ***Do not*** *run load cable trays and/or conduit in close proximity to any computer or CRT display equipment.*
>
> ***Do not*** *run wiring from other unrelated equipment in the same conduit with EC90sv 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*** *use alternative control cables to those specified by Strand Lighting. EC90sv 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.*

Phase Wiring

1. Remove plastic covers from busbar terminals.

2. Connect all external power wiring to the busbars, via any isolator that may be fitted, and secure with proprietary cable clamping hardware using the M12 bolts supplied.

3. Replace plastic covers.

Internal power wiring between load connectors and module connectors is factory wired.
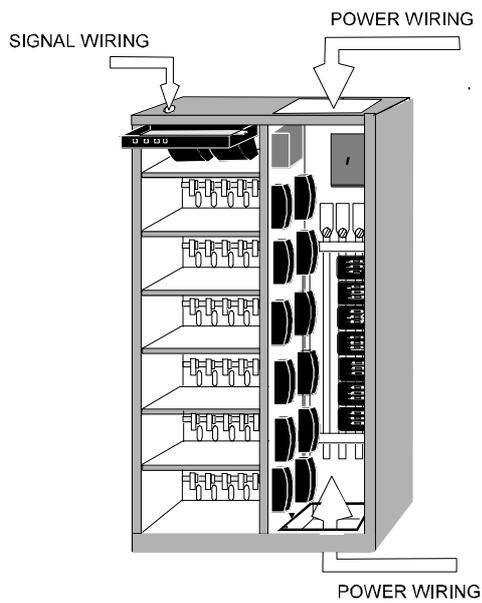
SIGNAL WIRING

POWER WIRING

POWER WIRING

POWER IN

E   N   L3 L2 L1

INTERNAL ISOLATOR
(OPTIONAL)

E
N
L3
L2
L1

M12 Bolts

Plastic Covers

10A FUSES - FANS, PROCESSORS, AUX. POWER

80A FUSES - CRATE1

80A FUSES - CRATE 2

80A FUSES - CRATE 3   BUSBAR WIRING

80A FUSES - CRATE 4

80A FUSES - CRATE 5

80A FUSES - CRATE 6

Load Wiring

Warning

⚠️
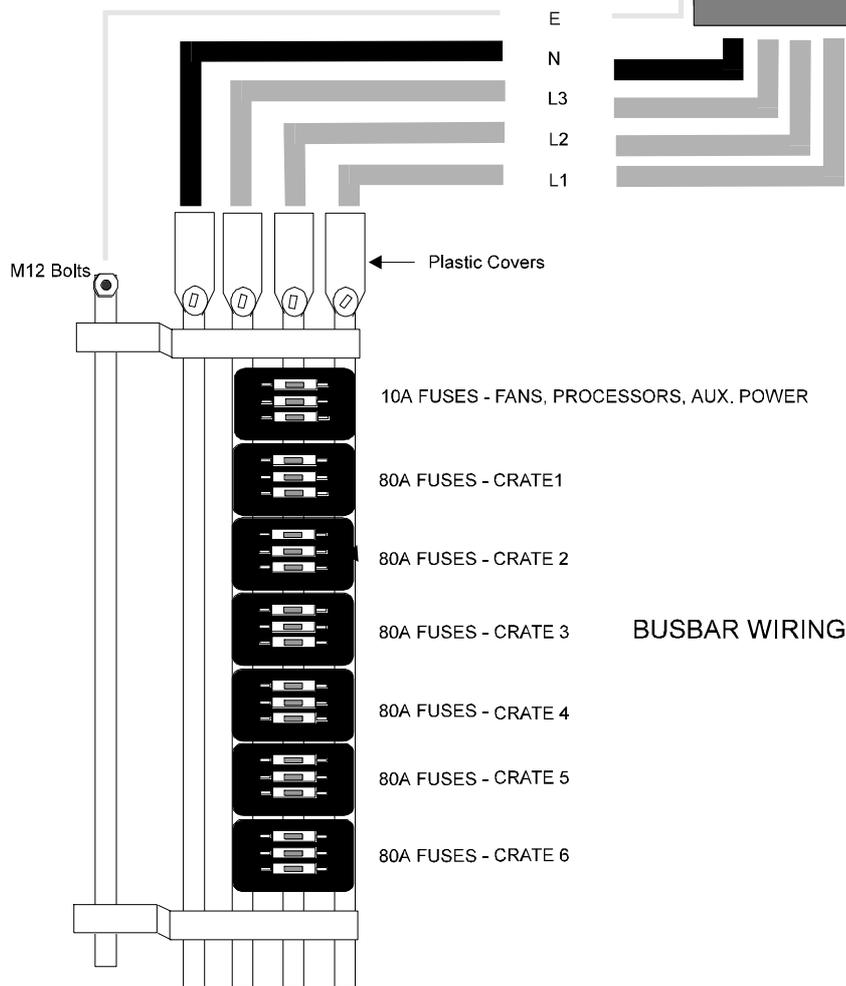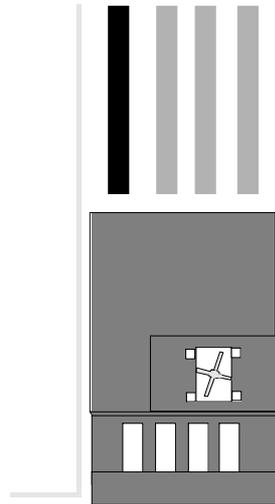
Individual 3 terminal connections are provided for each dimmer output and these are located at the left hand side of the contracting chamber in line with the respective crate. Load cables may exit through either access plate and can be secured to the cable ladder on the right hand side of the chamber.
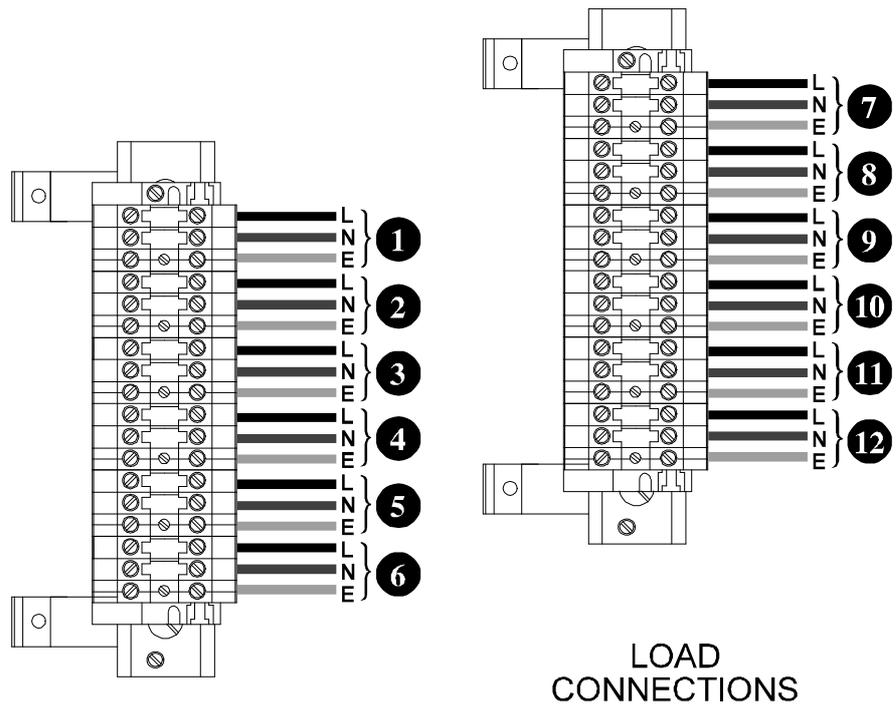
LOAD
CONNECTIONS

Connectors are colour coded as follows:-

GREY	Live
BLUE	Neutral
GREEN /YELLOW	Earth

A crate of 6kW Single dimmer units will use connectors 1-6 whilst a crate of 3kW dual dimmers will use connectors 1-12.

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Load terminal wire size is as follows:-

3kW	$4mm^2$	solid
	$4mm^2$	stranded
6kW	$10mm^2$	solid
	$10mm^2$	stranded
10kW	$25mm^2$	solid
	$25mm^2$	stranded

! **Caution**

Dimmer control involves fast waveform switching and care must be taken to ensure that this does not result in radiated interference or induced fields. It is therefore important that the the two load conductors for each circuit carry equal and opposite current components, achieved by running the two conductors together as a pair of equal length.

Control Wiring

EC90sv accepts a variety of control signals as inputs and provides several types of output signals. Control wiring connections are terminated at the Central Interconnection Card (CIC). The connections between dimmer rack components are pre-wired at the factory and all contractor control signal wiring goes to the two part plug in connectors underneath the CIC unit.
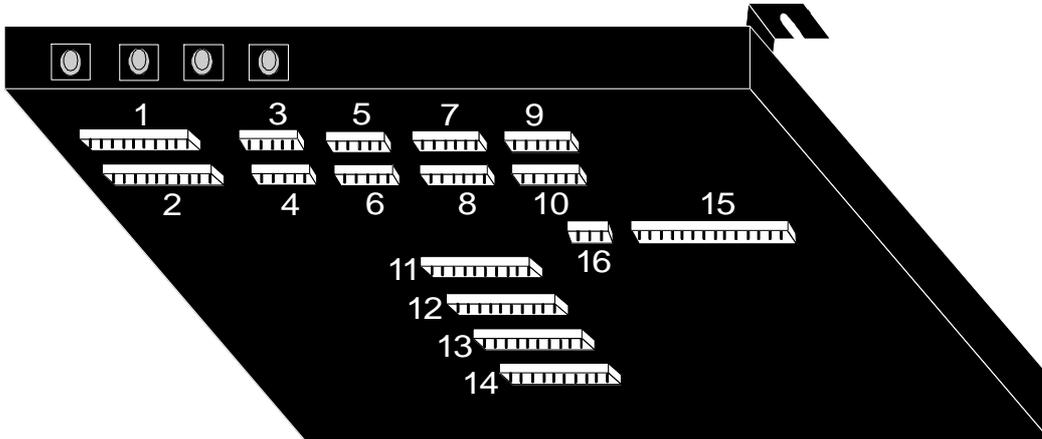
EXTERNAL SIGNAL WIRING
CONNECTORS

1 - 2	CONTACT INPUTS
3 - 4	MUX A
5 - 6	MUX B
7 - 8	SWC DIGITAL NETWORK
9 - 10	REPORTER LINK

Paired for easy daisy chaining

11 - 14	ANALOGUE INPUTS
15	ANALOGUE + LED OUTPUTS
16	PROCESSOR ACTIVE LED OUTPUTS
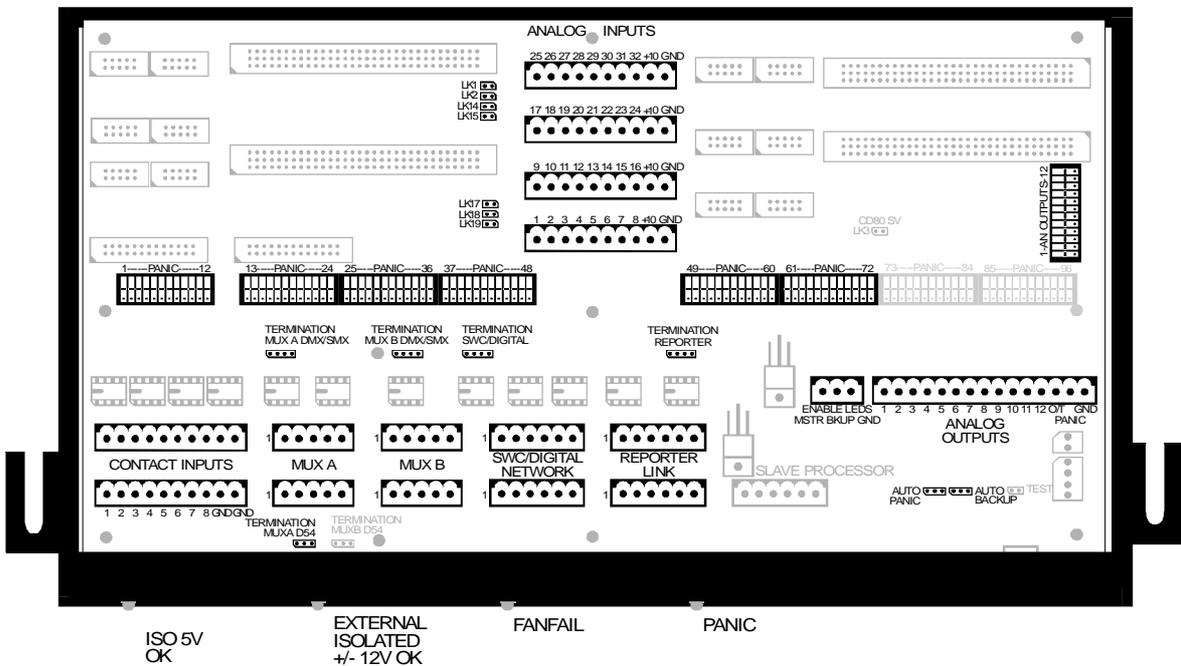
Panic switches, termination points
and configuration links shown in bold

CENTRAL INTERCONNECTION
CARD - CIC

Connection Between Racks

If a single control console is to drive dimmers in more than one rack, the multiplexed control signal must be daisy-chained to all of the racks in which it is to be used. Duplicate parallel sockets are provided for these signals to make daisy chaining easier. Factory assembled cables are available to interconnect racks to save time on-site.

Fan Fail / Overtemp Sensors

In the event of a single fan failure, the fan fail LED will flash and the other fan will be driven to full speed. In the event of both fans failing, the same LED will remain on constantly. If a reporting dimmer indicates an overtemperature condition, the LED will also flash, and the fans will be driven to full.

A external fan fail indicator LED can be connected (see page 29). The individual rack signals are usually daisy-chained together so that any rack activates a console or other indicator.

Each *module* has its own safety overtemperature cut-out. On reporting modules, an overheat warning will be given before the module thermal cut-out operates with a flashing red LED on its from panel, and by the rack's fan fail/overtemp LED. Note that BOTH dimmers in a dual module will be disabled when the cut-off operates.

Non-reporting modules indicate cut-off by their green output LEDs going out, and there is no warning.

[3] Strand Lighting equipment uses standard US-style 6-pin RJ11 telephone style connectors for wall boxes and extensions to connect the Reporter PC, and terminal block connections inside the EC90sv racks for data signals from the PC. The RS485 converter supplied with the Reporter PC software has a 6-pin RJ11 connector on its output. There are two pluggable terminal blocks wired in parallel on the CIC to allow easy daisy-chaining of signals to multiple racks.

The last rack in the control cable run should be AC terminated. All other racks should be unterminated.
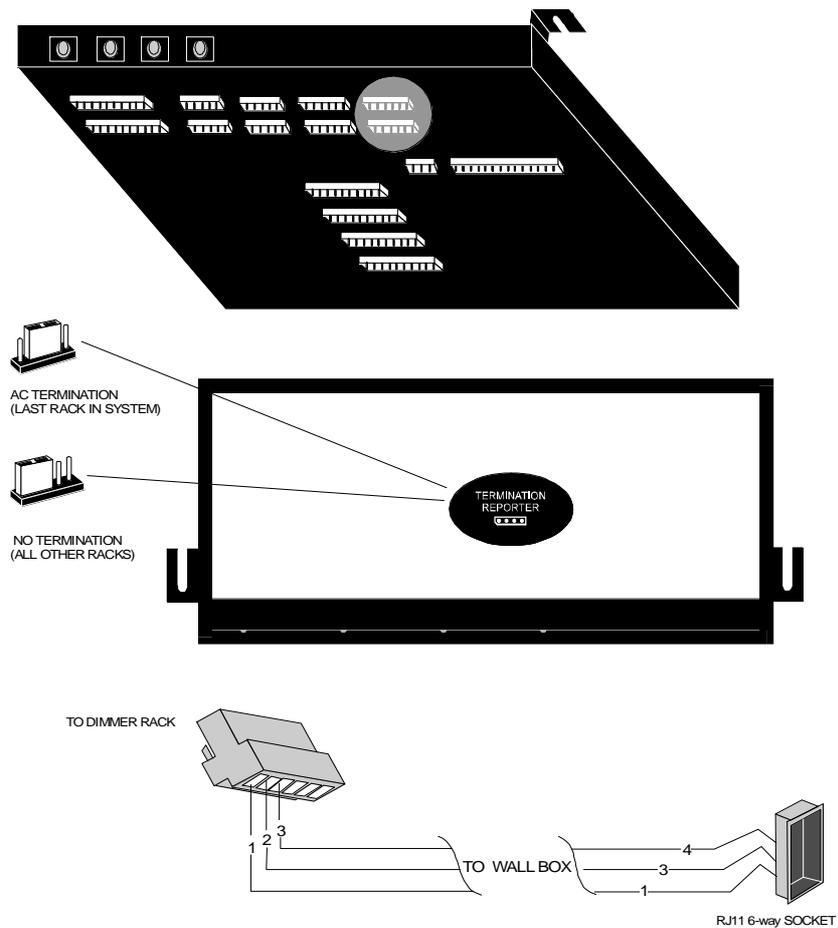
Cable:	Belden 9841/42 or equal.
Max Length:	Standard RS485 electrical characteristics apply, including line driver and receiver characteristics, line loading, and multi-drop configurations.
Connector:	Dual parallel terminal blocks in rack, labelled REPORTER LINK. RJ11 6-pin connectors in wall boxes.

RJ11 Pin	RJ11 pin no.	Signal	Comments	Pairs	Wire color
1	1	COMMON	signal common (shield)		shield
2	3	DATA 1-	data signal complement	pair 1	black
3	4	DATA 1+	data signal true		red

DMX512 Dimmer Control Wiring

The two types of connections provided in Strand Lighting equipment for DMX512 dimmer control signals are the 5 pin XLR style connector and terminal blocks. EC90sv dimmer racks use pluggable terminal block connections. Wall boxes and consoles use XLR style connectors. There are two pluggable terminal blocks wired in parallel on the CIC to allow easy daisy-chaining of signals to multiple racks.

The last rack in the control cable run should be DC terminated. All other racks should be unterminated.
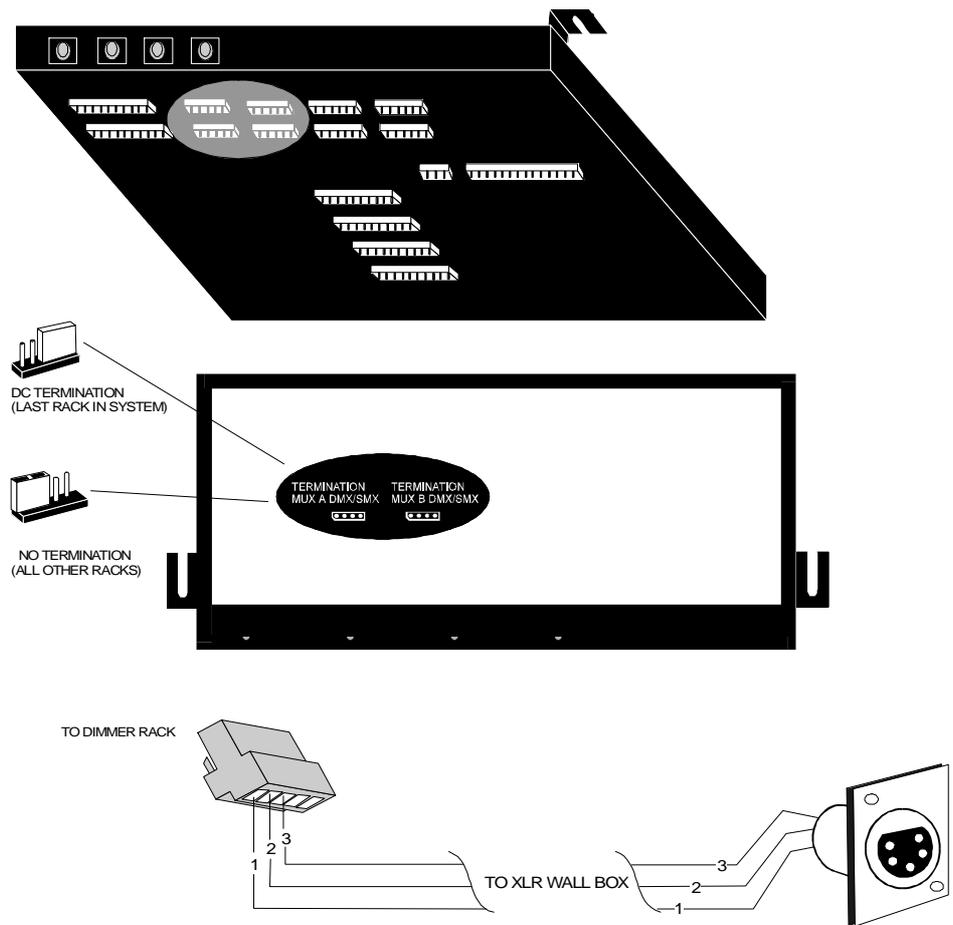

DC TERMINATION
(LAST RACK IN SYSTEM)

NO TERMINATION
(ALL OTHER RACKS)

TERMINATION
MUX A DMX/SMX

TERMINATION
MUX B DMX/SMX

TO DIMMER RACK

TO XLR WALL BOX

Cable:	Belden 9841/42 or equal.
Max Length:	Standard RS485 electrical characteristics apply, including line driver and receiver chracteristics, line loading, and multi-drop configurations.
Connector:	Dual parallel terminal blocks in the rack, labelled MUX A and MUX B. "XLR" style connectors in wall boxes and on control consoles.

XLR Pin	Terminal number	DMX Signal	Comments	Pairs	Wire Color
1	1	COMMON	dimmer common (shield)		shield
2	2	DATA 1-	dimmer drive complement	pair 1	black
3	3	DATA 1+	dimmer drive true		red

AMX192 Control Wiring

The two types of connections provided in Strand Lighting equipment for the AMX192 signal are the 4 pin XLR style connector and terminal blocks. Unless otherwise specified, dimmer racks use terminal block connections and consoles use XLR style connectors.

AMX192 is only supported on the MUX A input of EC90sv racks.

AMX192 control lines are **not** terminated.

TO DIMMER RACK

1 2 3 4 5

Link to pin 5

TO XLR WALL BOX

1
3
2
4
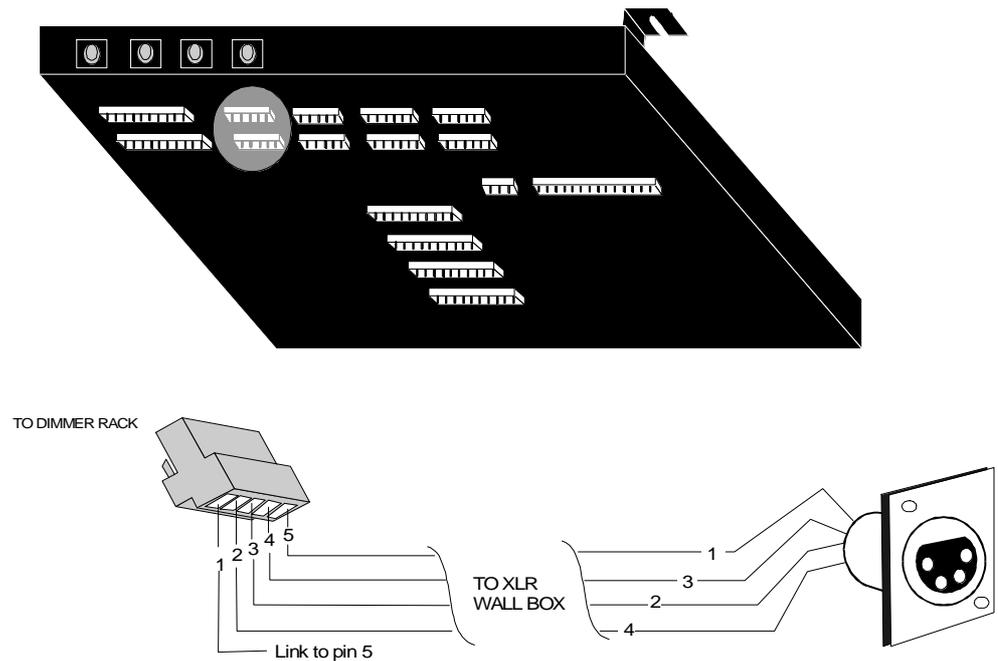
Cable:	Belden 9156 or equal. May use Belden 8723 for adapters under 100 feet (30m) long.
Max Length:	1000 feet (300m) must be Daisy chained - no branching runs.
Connector:	Dual parallel terminal blocks in rack, labelled MUX A. "XLR" style connector on control consoles.

XLR Pin	Terminal number	Signal	Comments	Belden 8723	Belden 9156
4	2	CLOCK -	clock complement	Green	Black
2	3	CLOCK +	clock true	White	White
1	5	COMMON	Analogue common	Black	Black
3	4	ANALOGUE	multiplexed Analogue	Red	Red

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

D54 Control Wiring   The two types of connections provided in Strand Lighting equipment for the D54 signal are the 3 pin XLR style connector and terminal blocks. Unless otherwise specified, dimmer racks use terminal block connections and consoles use XLR style connectors.

D54 is only supported on the MUX A input of EC90sv racks.

D54 control lines do not usually require termination. However, in installations with very long runs or significant electrical interference, the termination link may be fitted in the last rack in the control cable run.

TERMINATED

NOT TERMINATED

TERMINATION
MUXA D54

TO DIMMER RACK

4 5

TO XLR WALL BOX

1

3

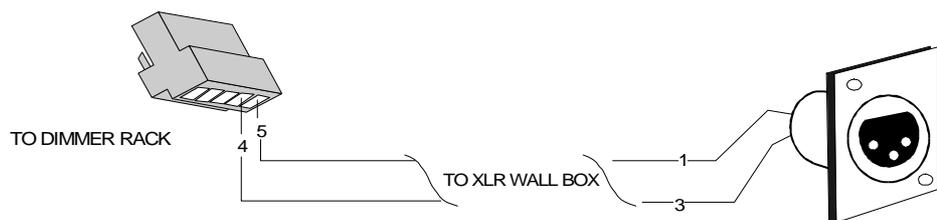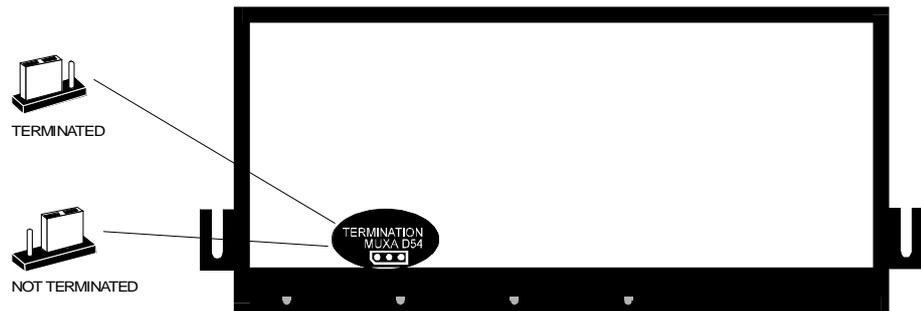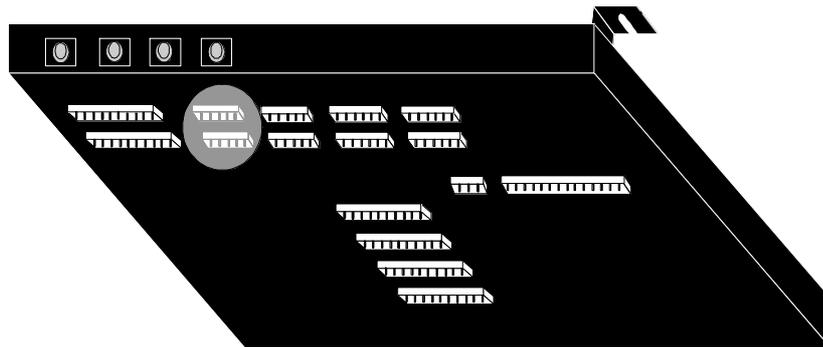| Cable:	Belden 9156 or equal.			
Max Length:	1000 feet (300m). must be Daisy chained - no branching runs.			
Connector:	Terminal blocks in rack, labelled MUX A. "XLR" style connector on control consoles.			
XLR Pin	**Terminal number**	**Signal**	**Comments**	**Wire color**
1	5	GND	ground	Black
2			not used	White
3	4	SIGNAL	multiplexed Analogue signal	Red

SWC and Digital Network Control Wiring

Control wiring from SWC hand held controllers, SWC pushbutton stations and Outlook stations is connected to the SWC/DIGITAL NETWORK connector on the CIC. Note that you will need the EC90sv optional power supply (part number 76421) to power SWC or Outlook stations.

The last rack in the control cable run should be AC terminated. All other racks should be unterminated.

AC TERMINATION
(LAST RACK IN SYSTEM)

NO TERMINATION
(ALL OTHER RACKS)

TERMINATION
SWC/DIGITAL NETWORK

6
5 — Not Used
2 3 4
1
TO DIMMER RACK
SCREEN
Only connected at Rack end

TO SWC
WALL BOX

2
1
3
4

6
2 4 5
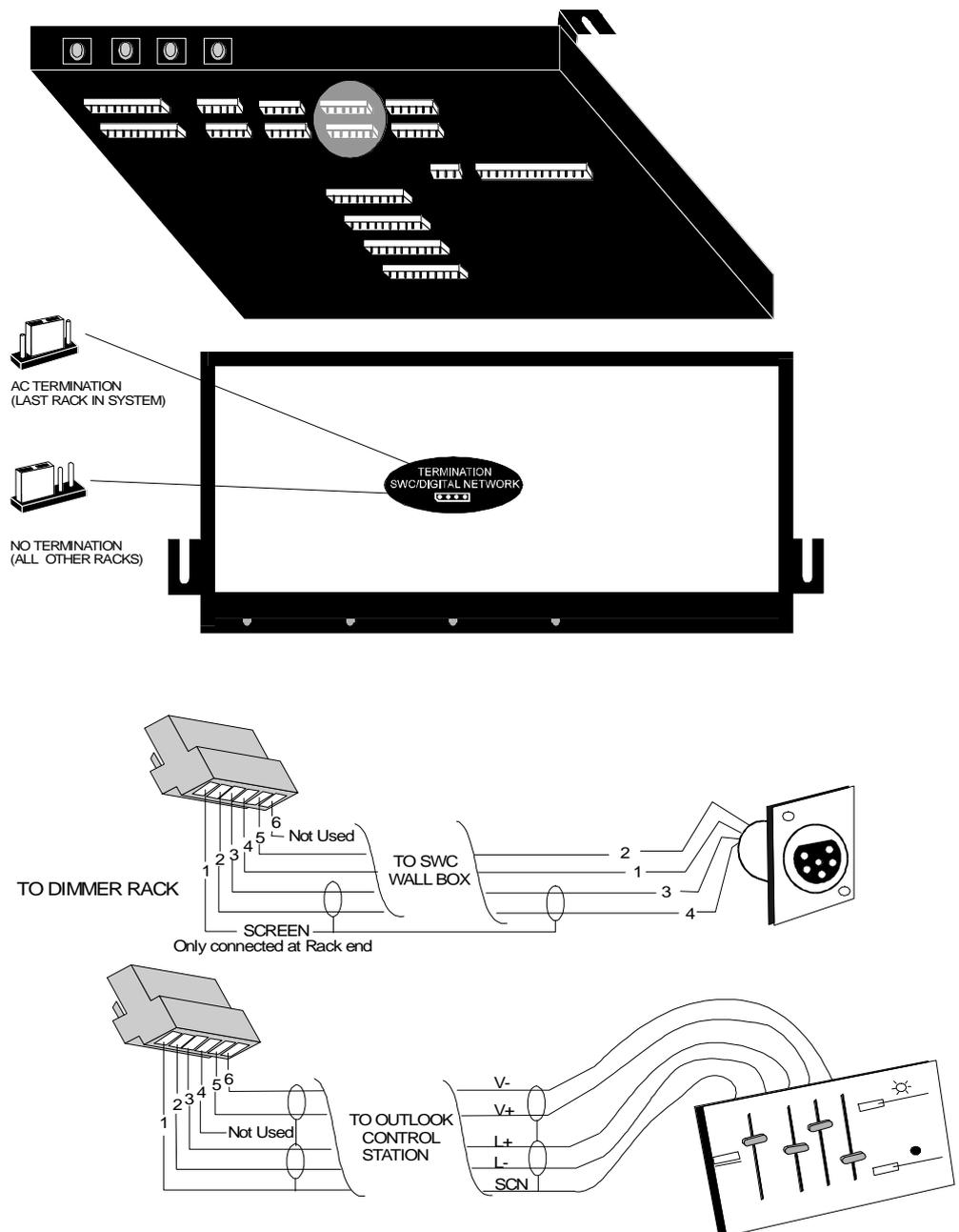3
1
Not Used

TO OUTLOOK
CONTROL
STATION

V-
V+
L+
L-
SCN

Cable: Belden 9773 or equal.

Max Length: 1000 feet (300m - daisy chained runs only).

Connector: Terminal blocks in rack, labelled SWC/DIGITAL
              NETWORK.

Network :   Unpluggable terminal block on stations.

SWC CONNECTIONS

XLR Pin	Rack Term	Signal Name	Comments	Pairs	Cable Color
1	4	GND (PWR)	handheld remote only	pair 3	black
2	5	+12V		pair 2	black
3	3	DATA +		pair 1	black
4	2	DATA -			red
5		-12V	N/C	pair 2	white
6			N/C		
	1	SCREEN	connect only at rack end		Screen wire

OUTLOOK STATION CONNECTIONS

Station Terminal	Rack Term	Signal Name	Comments	Pairs	Cable Color
L -	2	LAN DATA-		pair 1	black
L +	3	LAN DATA +			red
V -	6	-12V		pair 2	white
V +	5	+ 12V			black
SCN	1	SCREEN	connect to 0 volt line		

For long runs, if no SWC socket boxes are fitted, pair 3 may be used in parallel with PWR pair2 to lower the cable voltage drop.

If connections must be made in a junction box due to the length of run or other considerations, these connections must be soldered before installation of the insulator.

These are not power connections, they are electronic interconnections which feed data directly to a microprocessor in the processor module. Poor connections may cause problems by introducing electronic noise into the system, resulting in poor system operation.

PANIC Wiring   PANIC control wires are connected to the CONTACT INPUTS terminal block as shown below. A remote panic indicator LED may be connected as shown.
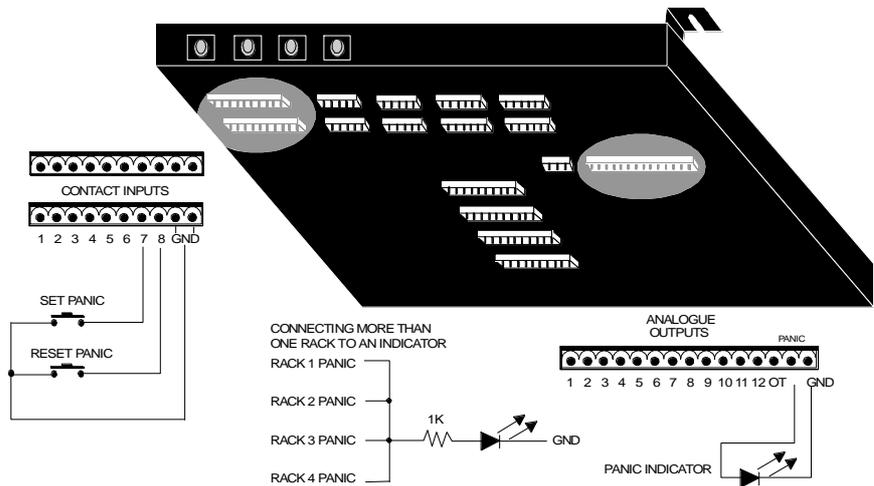
In multiple rack systems you can connect PANIC in parallel across more than one rack. All racks that are connected in parallel will then be activated by a single switch.

Automatic PANIC Settings   PANIC can be automatically activated when the processor (or both processors in a dual processor system) is removed, and automatically deactivated when a processor is reinstalled.

To activate automatic panic, install the jumper between pin 1 and pin 2 of link LK8. To deactivate automatic panic, install the jumper between pin 2 and pin 3 of link LK8. The CIC ships with automatic panic activated.

PANIC activated on processor removal or failure.

Nothing happens on processor removal. Activate PANIC using front panel pushbutton.
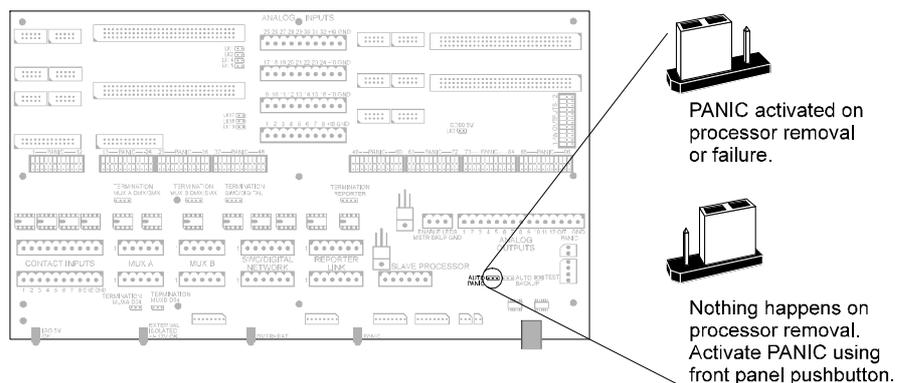
Other Contact Connections

You can connect several other external contacts for controlling rack functions as shown below. These functions are then available remotely and instantly.

CONTACT INPUTS

1 2 3 4 5 6 7 8 GND

MASTER/BACKUP
(Toggle)

MUX A (Open)
MUX B (Closed)

GO TO SWC PRESET 1

GO TO NEXT SWC PRESET

GO TO SWC PRESET 0
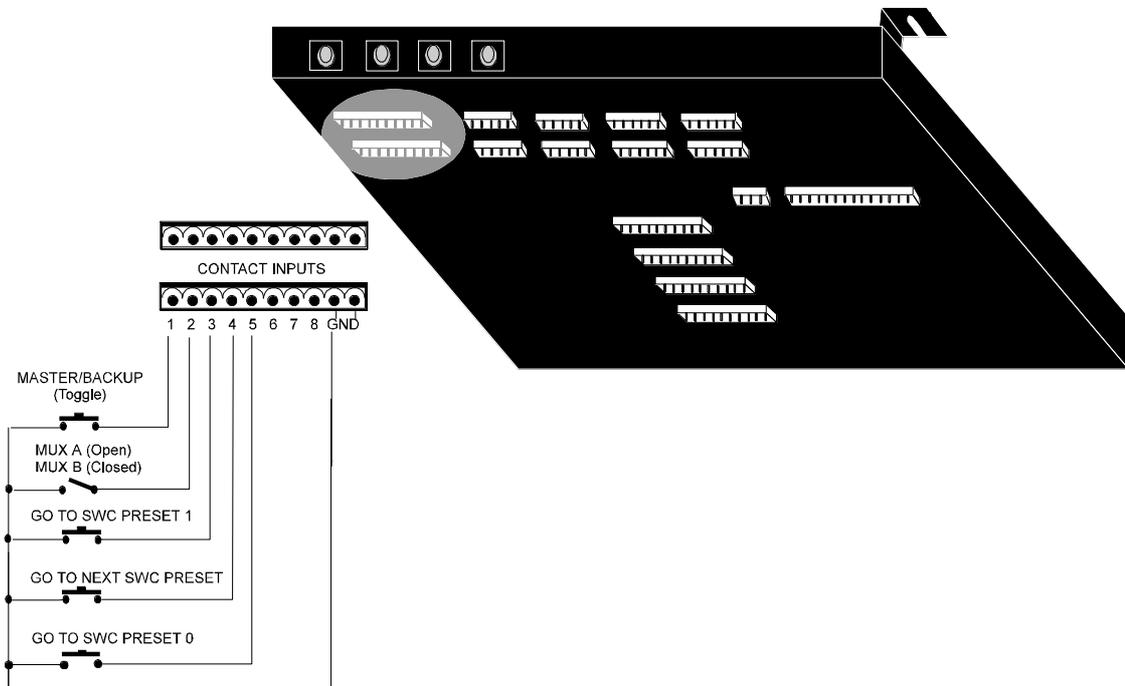
> *The Mux A/B switch is only relevant when the Muxmode in the **Mux Inputs > Dimmer Muxmode** menu is set to "H/W Sel AorB". Note that each dimmer can have a different muxmode, a useful feature if you want to split a rack's dimmers across two performance spaces.*

Automatic Backup Setting

Backup can be automatically activated if the active processor fails.

To turn automatic backup activation ON, install the jumper between pin 1 and pin 2 of link LK9 and set the *Proc Control* item in the **Rack Config** menu to "SelectBy Contact." To turn automatic backup activation OFF, install the jumper between pin 2 and pin 3 of link LK8. The CIC ships with automatic backup activation ON and the *Proc Control* item in the **Rack Config** menu set to "SelectBy Contact."
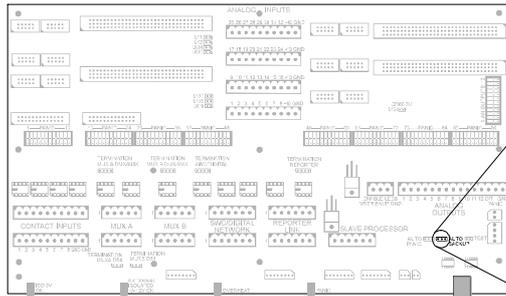
Backup automatically activated on main processor failure.

Nothing happens on processor failure.

How Dual Electronics Systems work

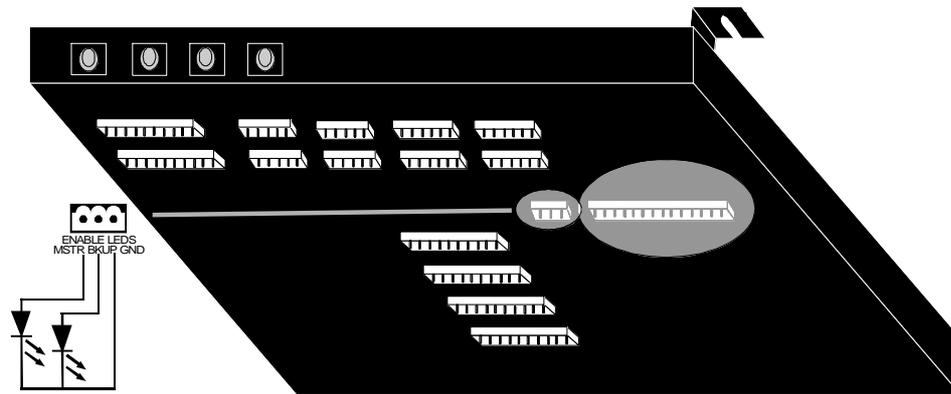When a dual electronics rack powers up, logic on the CIC monitors certain signals generated by each processor. If the master is OK, then it is enabled immediately. If it is not OK, then the backup is enabled, provided that it is OK. If neither is OK, then panic can be automatically enabled - if the Automatic Panic Mode is selected (see above).

Both processors constantly receive all signals, and Automatic Backup or Panic will occur within 0.2s of a processor failure. The currently active processor continuously updates the inactive processor with any changes to rack configuration. The inactive processor indicates that it is *Tracking* or *Updating* on its default display.

Fanfail/Overtemp Warning and Processor Active LED Wiring

You can connect an external fanfail/overtemp warning LED to the system if you wish. The external indicator is connected to the ANALOGUE OUTPUTS connector on the CIC.

Dual processor systems also provide two LED outputs to remotely indicate which processor is active. Refer to the section on *Automatic Backup* above.

Enabled Processor Indicators

CONNECTING MORE THAN
ONE RACK TO AN INDICATOR

ANALOGUE
OUTPUTS

PANIC

1   2   3   4   5   6   7   8   9   10 11 12 OT   GND

RACK 1 OT

RACK 2 OT

1K

RACK 3 OT   GND

RACK 4 OT
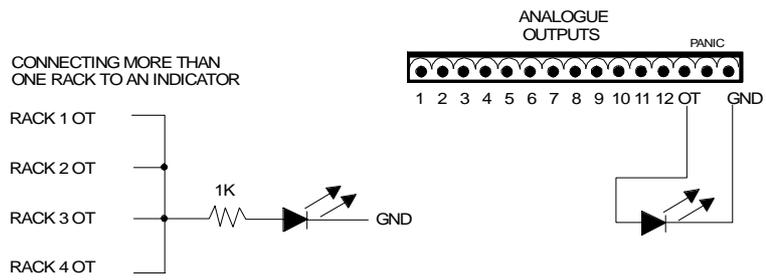
Analogue Control   EC90sv racks have 32 (72 channel processor) or 16 (36 channel processor) Analogue Inputs. This control signal is combined with the other control signals according to the Dimmer Mux Mode selected for each dimmer. These signals are input through four pluggable terminal blocks on the CIC.

25 26 27 28 29 30 31 32 +10 GND

17 18 19 20 21 22 23 24 +10 GND

9 10 11 12 13 14 15 16 +10 GND

1 2 3 4 5 6 7 8 +10 GND

10KΩ POT
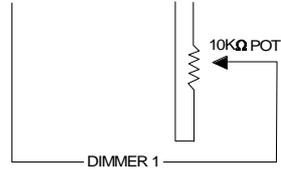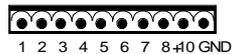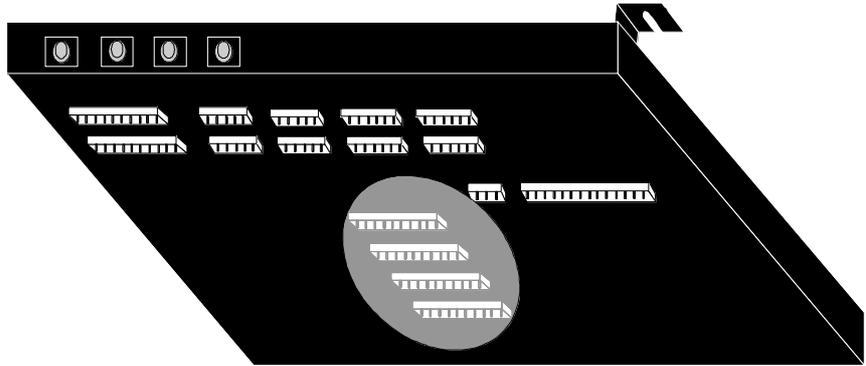
TYPICAL CONTROL HOOKUP

DIMMER 1

Analogue Output   72 channel processor modules have 12 Analogue Outputs, which can source a maximum of 1mA into a high impedance input (minimum 10KΩ). The circuit shown below represents the driver circuit on the CIC.
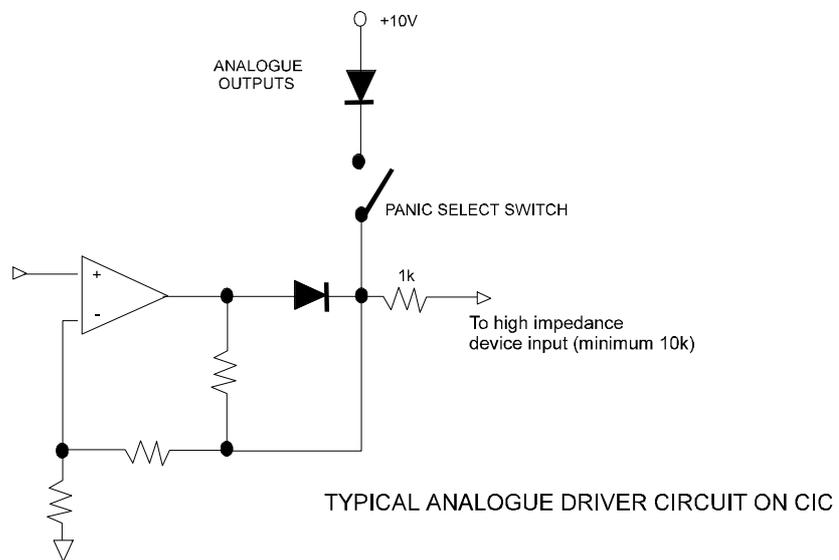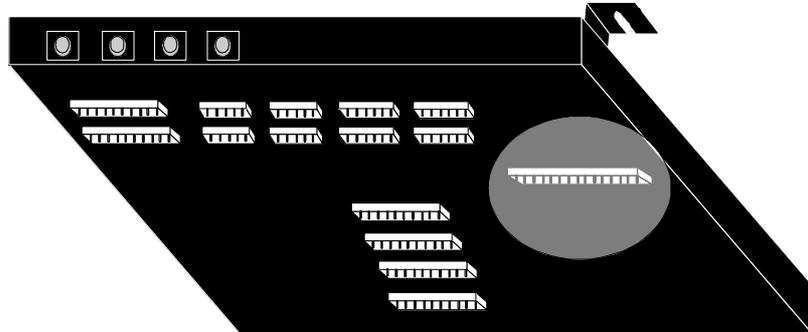
ANALOGUE
OUTPUTS

+10V

PANIC SELECT SWITCH

1k

To high impedance
device input (minimum 10k)

TYPICAL ANALOGUE DRIVER CIRCUIT ON CIC

12 Analogue Outputs are available on systems fitted with 72 way processors; these appear in the menus as the last 12 dimmers in the system. So in a rack with 72 dimmers, these will be dimmers 73 - 84.

The parameters for Curve, Max Voltage, Min Voltage, Response Time etc., apply to these dimmers too.

Hardware Setup

Select Dimmers for PANIC

Once you have finished, the system can be set up as required.

PANIC, when selected, turns any single dimmer, combination of dimmers, or all dimmers ON, bypassing system electronics.

Select PANIC for a dimmer using the 72 switches located on the CIC circuit board. In addition, racks with 72 channel processors have 12 Analogue Outputs that can be tied to PANIC with their own set of switches (labelled AN OUTPUT on the CIC).

> *Not all racks have a direct numerical relationship between the PANIC selection switch number and the dimmer controlled by the switch. If a PANIC selection switch does not control the dimmer you think it should, use the* View PANIC Map *item in the* **Rack Config** *menu to see which dimmer the switch controls.*

Dimmers and Analogue Outputs with switches ON are switched ON when you activate PANIC, regardless of their control settings. Dimmers or Analogue Outputs with PANIC select switches OFF are switched off when PANIC is activated. Analogue Output ON is approx. +10VDC. Racks are shipped with all switches OFF.

Caution

> **When PANIC is activated, any Analogue Output set for PANIC will be sent +10VDC, regardless of how the Analogue Output scaling is set. Any selected dimmer will be set to FULL regardless of how the maximum output voltage is set.**

To activate PANIC:

1. If the processor module is installed, press PANIC on the rack to turn selected dimmers in the rack ON.
2. If you have a remote PANIC station, press PANIC on the station to turn selected dimmers in the rack ON.
3. If you have the automatic PANIC activation jumper (LK8) set to activate PANIC on processor removal, removing the processor module will turn selected dimmers in the rack ON. Systems with two processor modules must have both modules removed to activate PANIC. You should not use this method just to activate PANIC, since it will cause wear and tear on the processor module connectors.

To deactivate PANIC:

1. If the processor module is installed, press the switch on the rack or on a remote PANIC station to turn selected dimmers in the rack OFF.
2. If you have the automatic PANIC activation jumper (LK8) set to activate PANIC on processor removal, re-install the processor module to turn selected dimmers in the rack OFF.

> *Make sure that the reason for removing the processor module has been checked before re-installing the module.*

Check All Wiring

Before applying power to the system you should double-check all of your wiring.

1. Check that all terminals and mechanical fixings are secured.
2. Check for stray wire strands and make sure wires are correctly restrained and not in contact with any metal edges.
3. Check Earth connections.
4. Double-check Neutral connections and positively verify phase orientation at the input busbars. Ensure that Neutral has not been confused with a phase; connecting the unit "across the phases" will do severe damage.
5. Make a full safety inspection of all load wiring.

Apply System Power

1. Check power to make certain that it is correctly rated. If not, correct before proceeding.
2. Apply power to system.
3. Make sure that the fans operate.
4. If system does not function properly, follow the troubleshooting instructions in Chapter 6 of this manual. If these steps fail, or for assistance with replacement parts, please call Strand Lighting directly.

Processor Configuration

Once you have applied power you need to make sure that the system is working correctly and the the processor modules are set properly for the installation.

Startup When the rack is switched ON, a number of self-tests are run. The system displays the rack number.

1. Make sure that all status indicators are showing that the system is operating correctly. The seven LEDs on the front of the rack should show (from left to right):

    - **Opto Power** Isolated +5V power should be ON.
    - **Aux. Power** supply should be ON (if the rack contains an optional power supply).
    - **Fan Fail / Overtemp** should be OFF.
    - **PANIC** should be OFF.
    - **L1, L2, L3** should be ON.

2. Check the following items to make sure they are correctly set in the processor module:

    - Slot type (see page 77).
    - Rack number (see page 78).
    - Starting mux signal number and dimmer protocol (see page 65).
    - Time and date (see page 80).

3. Other items you may wish to check at this time, depending on your system configuration, are:

    - Dimmer patch (see page 66).
    - Outlook patch (see page 64).
    - Language (see page 77).
    - Max Voltage (see page 78).
    - Min Level (see page 78).

4. Switch on all load circuit breakers.

5. Connect a suitable luminaire to each outlet and check every dimmer using the SET LEVEL control facility, a suitable control console, or an SWC hand held controller. Investigate and correct any malfunctions you find.

> *If any dimmers do not work, stop and check the slot type for the dimmer. Dimmers will not work if their slot type is incorrectly assigned. Make sure that all of the modules are in their correct slots and that the slot type for each dimmer is correctly set in the processor module.*

6. If you have status reporting dimmers, denoted by the symbol **R** on their front panels, check that their red LED's are all **off** when all dimmers are off. Refer to the chapter on *Status Reporting* for details of the various faults that are denoted by the module LED's.

Front Panel Programming

This chapter gives the basics of how to program the processsor module from its front panel. In general, it will be easier to do any setup with a PC running the Reporter PC software, but this interface lets you configure the rack without a computer. After the initial *Navigating the System* section, this chapter is organized by menu, in the order the menus appear in the processor module **Main** menu. Each section provides a menu diagram and gives details on how to select and program EC90sv programmable features using the processor module keypad and display.

Navigating the System

You can access a range of programmable features through the use of the processor module's keypad and 16 character display. The menu system is designed to minimize multi-level menus and keep operation simple. Menus can be shown in French, German, Spanish, or English. English is the default language and this text assumes that English is selected.

The Keypad and Key Lock

The keypad has 6 buttons which let you navigate through the EC90sv menus.

To avoid tampering by unauthorized personnel, EC90sv includes a security mechanism indicated by a key (on the display. If this key appears, you must press **ESC ENTER** simultaneously and hold them for about 2 seconds to unlock the system before any of the keys will respond.
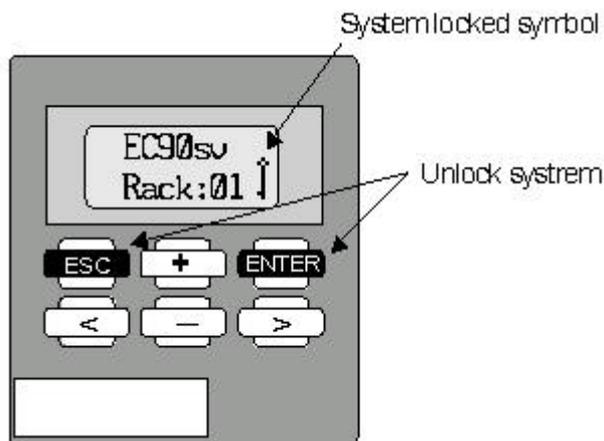
This feature can be enabled and disabled from the **Rack Config** menu by using the *Set Key Lock* item. When this item is enabled, the processor is locked automatically after 10 minutes with no keyboard input. When this item is disabled, the system is always unlocked. The factory default setting for the *Set Key Lock* item is "Disabled."

< > let you go to a submenu, move between fields, or move along a large numeric field. An underline cursor shows which field or digit is selected.

Displays with submenus have an arrow in the lower right corner. Press > in these displays to go to the next menu level.
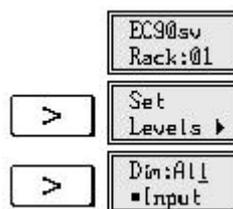
Once you are in a working menu, > sends you to the next field, or to the next number in a scrolling numeric field, and < sends you to the previous number in a scrolling numeric field, or to the previous field.

+ -   are used to adjust a numeric field shown in the display or to scroll between options in a field.

ESC   leaves an option or menu and returns you to the previous menu level. Some options require positive confirmation with ENTER. You will be prompted if confirmation is required. Since we have made no changes to the dimmers in the examples so far, no confirmation is necessary to leave the menu.

ENTER   lets you make changes to fields that are not changed live as you use + and **-** (not-Live fields). Displays with not-Live fields are shown in the menu trees as follows:
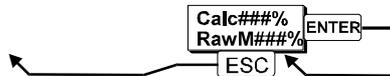
When a field displays "All," you must press **ENTER** to action a change. Fields with "All" as an option are shown in the menu trees as follows:

Finally, **ENTER** lets you confirm changes made in a not-Live field when you exit the display using **ESC** get the "Confirm Changes" message. To cancel the operation once you get the message, press **ESC**.
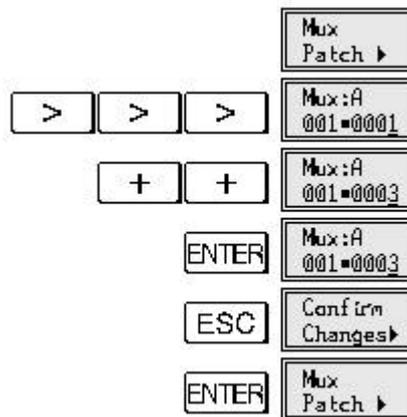
Fields   There are three basic types of fields used in EC90sv displays.

- Display fields.
- Selection fields.
- Scrolling numeric fields.

Display fields

Display fields are used as labels or to show data which cannot be changed. When you use < or > to move through a display, the cursor skips these fields.

Selection fields

Selection fields let you scroll through a fixed list of options. When you use < or > to move through a display, the cursor lands on the first character or number of these fields. The only way to change the values in these fields is with + and - keys.

Selection fields can have text values, numeric values, or both. Some text values allowed in otherwise numeric selection fields are Off, Full, and dash ("-", meaning "none").

Scrolling numeric fields

Scrolling numeric fields let you scroll individual digits of the number to easily change numbers with multiple digits. Scrolling numeric fields can also have valid text values (e.g. "All"). When you use < or > to move through a display, the cursor lands on the ones digit. If the current value is a text value, the cursor lands on the letter that is in the ones digit position. Once in a scrolling field you can use < and > to select the digit you want to increment and then use + or - to increment or decrement the selected digit. When a digit reaches 9, pressing + again will set that digit to 0 and increment the digit to its left.
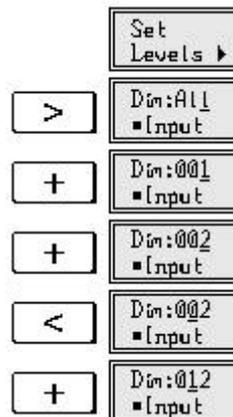
If you know you want to increment the tens digit only, you can move to the tens digit while the display still shows "All."

	Dim:All ■Input
<	Dim:All ■Input
+	Dim:001 ■Input
+ +	Dim:021 ■Input
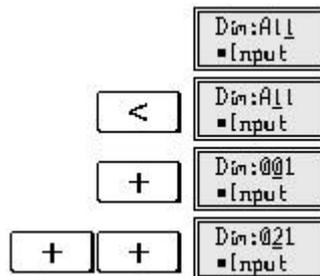
Some text values allowed in scrolling numeric fields are Off, Full, dash ("-", meaning "none"), and Hold.

> **A word about Analogue Outputs**
>
> *12 Analogue Outputs are available on systems fitted with 72 way processors; these appear in the menus as the last 12 dimmers in the system. So in a rack with 72 dimmers, these will be dimmers 73 - 84.*
>
> *The parameters for Curve, Max Voltage, Min Voltage, Response Time etc., apply to these dimmers too.*

Default Display

The default display lets you access a series of status displays using + and - and lets you access the **Main** menu by using >. The diagram below shows the status items you can access from the default display.
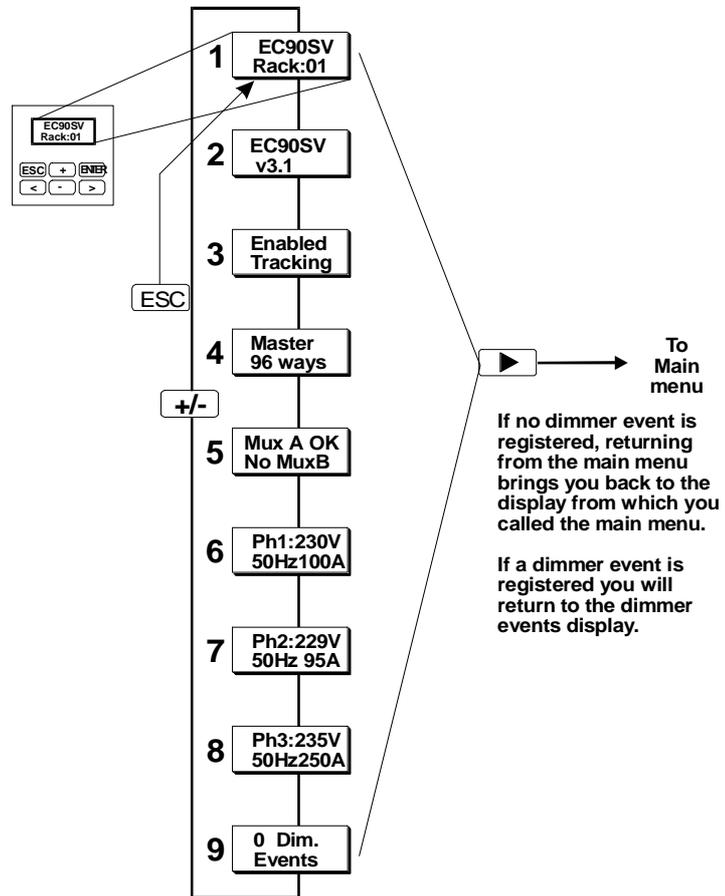
The default displays are information only displays which let you check several pieces of system information without needing to go through multiple menu levels. The description numbers below correspond to the numbers next to the display in the figure.

1. The Default display shows the dimmer rack type and rack number.
2. The Version display shows the dimmer rack type and the software version number.
3. The Backup display shows which processor is enabled, and whether or not there is a backup processor. The currently operating processor will show "Enabled," while the current backup processor shows "Disabled." "Tracking" in the second row shows that there is a backup processor, while "No Track" shows that ther is no backup processor. When the backup and main processor are functioning, both displays should say "Tracking." When the system is

properly tracking, data is continuously copied from the "Enabled" processor (Master) to the "Disabled" processor (Backup).

4. The Size display shows whether the processor is "Master" or "Backup," and how many dimmers are fitted.

5. The Mux display shows whether Mux A is currently functioning, and shows whether Mux B is operational.

6. The Ph, 2 & 3 displays show the voltage, frequency, and current for their respective phases. Current will always be 0 (zero) on the processor that is "Tracking," and on systems without Reporting dimmers.

7. The Events display shows how many dimmer events are currently active, and indicates the nature of each event in an auto-scrolling display.

Main Menu

From
default
display →

Set
Levels ▶ ▶ → Dim:##/All =##% → ENTER for "All"
ESC

ESC

EC90SV
Rack:01

[ESC] [+] [ENTER]
[<] [-] [>]

Outlook
Presets ▶ ▶ → **To Outlook Presets menu**

SWC
Presets ▶ ▶ → **To SWC Presets menu**

+/-

Mux
Inputs ▶ ▶ → **To Mux Inputs menu**

Patching ▶ ▶ → **To Patching menu**

Dimmer
Curves ▶ ▶ → **To Dimmer Curves menu**

Dimmer
Respons ▶ ▶ → **To Dimmer Response menu**

Event
Report ▶ ▶ → **To Event Report menu**

Rack
Config ▶ ▶ → **To Rack Config menu**
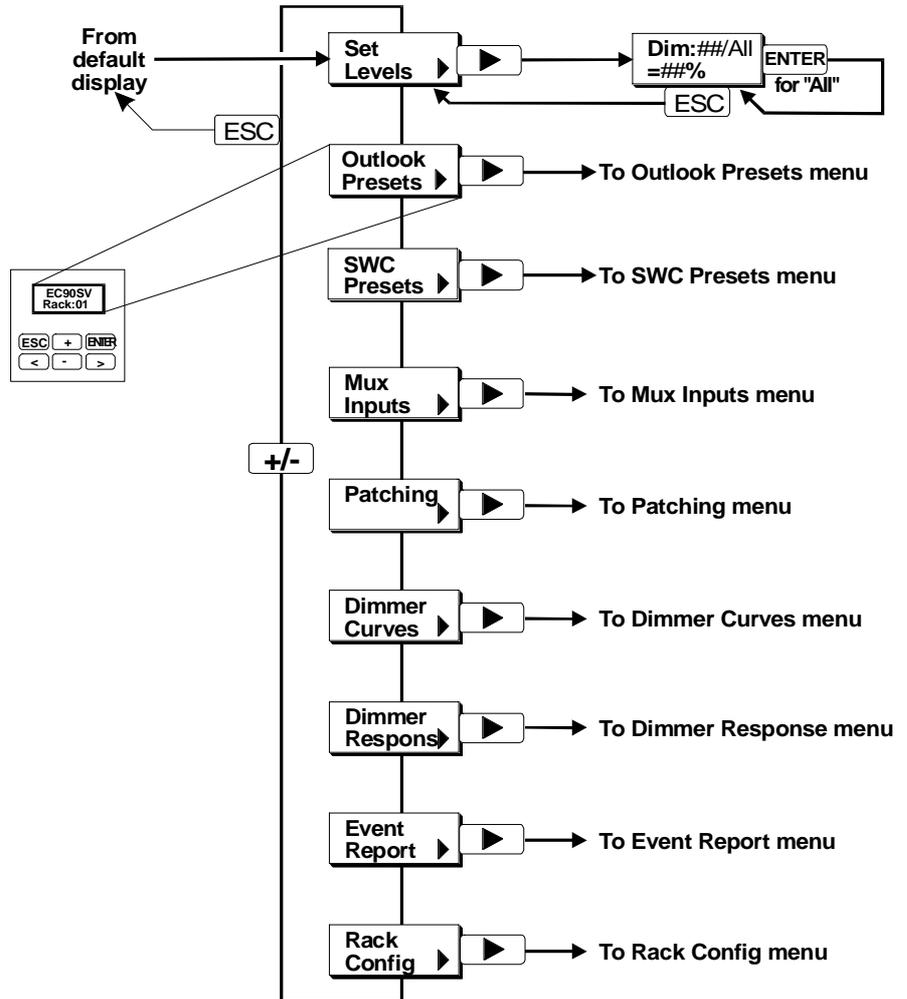
The **Main** menu lets you access all of the other sub menus for configuring the EC90sv rack.

Set Levels This function lets you test individual dimmers and loads directly from the keypad, regardless of the signals being received from presets and other inputs.

> *Since this overrides the control inputs, including the presets, it is possible to completely disable any or all of the dimmers. Use this function carefully. It is easy to completely lose control of dimmers by forgetting to set them back to Input. Levels set here are remembered even if you shut power to the system OFF.*

Normally this control is set to "*All=Input*", which lets the Mux inputs, Analogue Inputs, and presets control the dimmer levels. The relationships of the inputs to each other are determined by the Dimmer Mux Mode setting.

This control may also be used to set dimmer levels to record SWC and Outlook presets where there is no conventional lighting control system.

To set all dimmers to 50% follow the steps below.

Action	Result
	EC90sv / Rack:01
>	Set Levels ▶
>	Dim:All ▪Input
>	Dim:All ▪Input
+ until	Dim:All ▪50%
ENTER	Dim:All ▪50%
ESC	Confirm Changes
ENTER	Set Levels ▶
ESC	EC90sv / Rack:01

To set dimmers 5 and 8 to 90% follow the steps below.

| Action	Result
+ until	Dim:05 ▪Input
>	Dim:05 ▪Input
+ until	Dim:05 ▪90%
<	Dim:05 ▪Input
+ until	Dim:08 ▪Input
>	Dim:08 ▪Input
+ until	Dim:08 ▪90%
ESC ESC	EC90sv / Rack:01

Outlook Presets Menu

Before using Outlook presets, ensure that the room/channel/dimmer assignment has been correctly set (see page 65).

There are 10 Outlook presets per room. Eight of them (1-8) are user programmable. Preset 0 is a non-recordable blackout state, preset 9 is all dimmers full ON and MAN is the current slider settings being received from an active slider control station. When you record a preset, you record the actual dimmer levels as they appear in your room. Outlook presets and SWC presets are completely separated, and separately controlled, even though they can control the same dimmers. If you are using the SWC hand held controller, SWC pushbutton controllers, or SWC A/V interface, see *SWC Preset Menu* (page 57).

Outlook presets can be recalled and added to the dimmer output on a "highest takes precedence" (HTP) basis from the processor module keypad or from a control station. Selecting a preset crossfades the output of the Outlook preset processor from the previously selected preset to the new preset in the programmed fade time.

> *Don't forget that Outlook presets are not the only source of control in a EC90sv system. If a dimmer has control input from other sources, the Dimmer Mux Mode setting for each dimmer determines what signals appear at the dimmer. If a dimmer is ON from another source, you may not be able to fade it OFF using Outlook presets. In addition, the dimmer levels are affected by Max voltage and Min Level settings.*
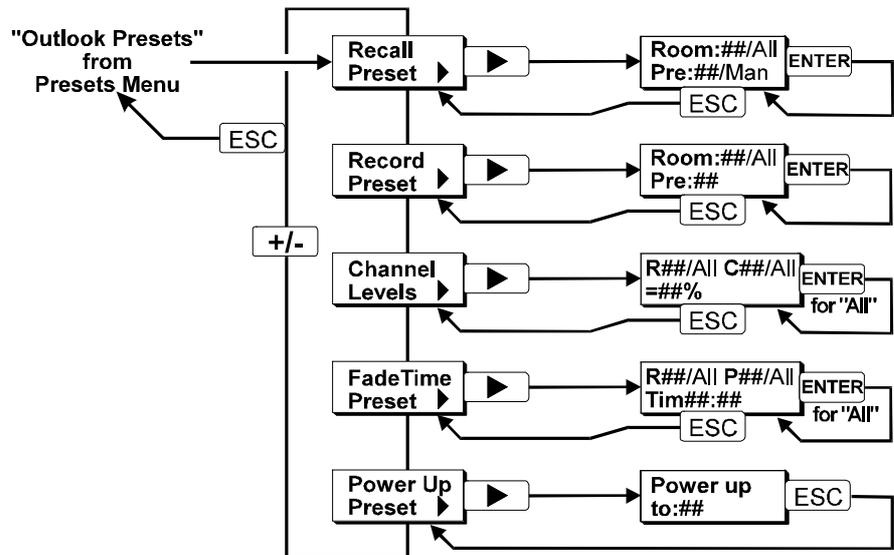
Recording and Recalling Presets

You can record the current dimmer output to any of the 8 recordable Outlook presets per room.

1. Set up the lighting state using any means of control.
2. Use the *Record Preset* menu item to select a room and preset number.
3. Press **Enter** to record the current dimmer levels to the selected preset.
4. Repeat for any other presets.

You can activate any Outlook preset by using the *Recall Preset* menu item to select a room and preset number.

> *"Recall Preset" changes the lighting levels by activating the preset. It is not a "blind" viewing facility.*

Set Channel Levels

You can set channel levels directly from the keypad by selecting their room, channel number and setting a level. This lets you test individual dimmers and loads regardless of the signals being received from the different inputs.

> *Since this overrides the control inputs, including the presets, it is possible to completely disable any or all of the dimmers. Use this function carefully. It is easy to completely lose control of dimmers by forgetting to set them back to Input.*

Normally channel levels are set to "*All=Input*" which lets the Mux inputs, Analogue Inputs, and presets control the dimmer levels. The relationships of the inputs to each other are determined by the *Dimmer Mux Mode* setting.

This control may also be used to control dimmers recording into SWC and Outlook presets where there is no conventional lighting control system.

Set Fade Times

You can set the fade time (up to 10 minutes) for all Outlook presets in all rooms, for all presets in a specified room, or for one preset at a time by using the *Fade Time Preset* menu item.

To set a fade time for the manual faders, select the "Man" setting in the preset field. Manual fade time is set per room. The default for the manual preset is ZERO seconds. With a ZERO time set, when you press "Manual" or "Take Control" on an Outlook slider station the lighting instantly fades from the current level to the levels set on the sliders. If a manual fade time is programmed, the channels fade from their current levels to the slider levels in the programmed time.

Setting the fade times for all presets in all rooms or all presets in one room will not change the manual fade time. If you move any slider on the station that currently has control while a manual fade is in progress, the lighting levels will instantly conform to the current slider levels.

Set the Power Up Preset

You can select an Outlook preset that will always appear when the system is powered up (e.g. after a power failure). The default preset is ZERO, which sets the entire system to a blackout on power-up. Use the *Power Up Preset* menu item to select the preset number. This setting applies to all rooms in the system, so if you select preset 1, then on power-up each room will fade to its own preset 1.

The No Mux SWC preset can act as an overall system power-up preset if desired. If a No Mux preset and a Power Up preset are assigned, the dimmer levels will be combined according to the *Dimmer Mux Mode* settings.

SWC Preset Menu

There are 99 user programmable system wide controller (SWC) presets per system. Preset 0 is a non-recordable blackout state. When you record preset, you record the actual dimmer levels as they appear on stage or in your rooms. If you are using Outlook controllers, see *Outlook Preset Menu* (page 53). Outlook presets and SWC presets are completely separated, and separately controlled, even though they can control the same dimmers.

Any SWC preset can be added to the dimmer output on a highest takes precedence (HTP) basis by activating it from the processor module keypad, remotely from the SWC hand held controller, or remotely from a PC running the Reporter software. When you activate an SWC preset, the system crossfades from any previously selected SWC preset (or from a blackout).

> *Don't forget that SWC presets are not the only source of control in a EC90sv system. If a dimmer has control input from other sources, the Dimmer Mux Mode setting for each dimmer determines what signals appear at the dimmer. If a dimmer is ON from another source, you may not be able to fade it OFF using SWC presets. In addition, the dimmer levels are affected by Max voltage and Min Level settings.*
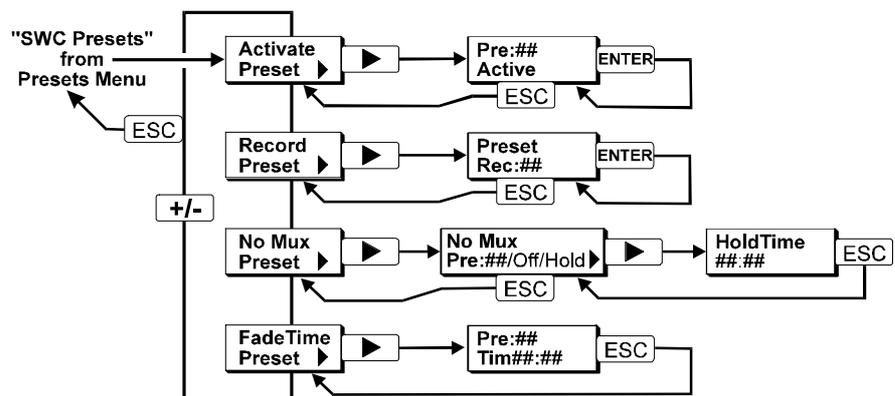
Activate a Preset   You can activate the dimmer levels of any SWC preset from the processor module control panel.

> *"Activate Preset" changes the lighting levels by activating the preset. It is not a "blind" viewing facility.*

To activate SWC preset 3, follow the steps below:

Action	Result
	`EC90sv` `Rack:01`
`>` then `+` until	`SWC` `Presets`
`>`	`Activate` `Preset ▶`
`>`	`Pre:Off` `Active`
`+` until	`Pre:03`
`ENTER`	`Pre:03` `Active`
`ESC` until	`EC90sv` `Rack:01`

To turn off SWC presets, follow the steps below:

Action	Result
	`EC90sv` `Rack:01`
`>` then `+` until	`SWC` `Presets`
`>`	`Activate` `Preset ▶`
`>`	`Pre:03` `Active`
`−` until	`Pre:Off`
`ENTER`	`Pre:Off` `Active`
`ESC` until	`EC90sv` `Rack:01`

Record a Preset You can record the current dimmer output to any of the 99 user programmable SWC presets.

1. Set up the lighting state using any means of control.
2. Follow the procedure as shown.
3. Repeat for any other presets.

To record the current dimmer output to preset 3, follow the steps below:

Action	Result
	EC90sv Rack:01
> then + until	SWC Presets
>	Activate Preset ▶
+	Record Preset ▶
>	Preset Rec:01
+ +	Preset Rec:03
ENTER	Preset Rec:03
ESC until	EC90sv Rack:01
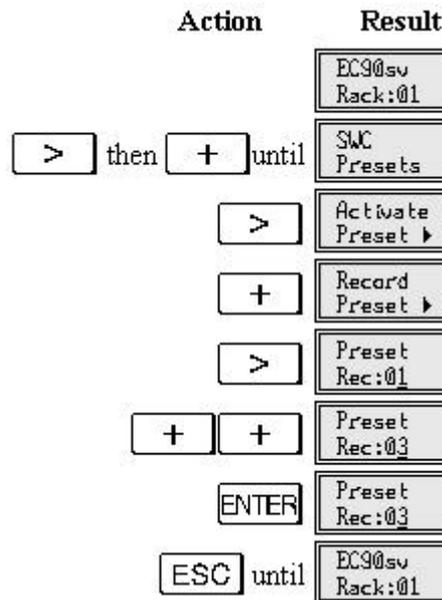
Set the No Mux Preset The No Mux preset is the preset the system will fade to if you lose the Mux signal. What happens to the dimmers if the Mux signal is lost depends on the No Mux setting.

Hold	System holds current levels on loss of Mux signal. HoldTime submenu is disabled if this option is selected.
Off	System fades to black on loss of Mux signal.
1-99	System fades to selected SWC preset on loss of Mux signal.

The default setting is No Mux=Off. No Mux=Hold is a useful safety feature in live performance situations.

> *Setting NoMux to Hold may cause problems if the dimmers are left ON after the control desk is turned OFF. Many desks produce unwanted signals as the power fails, and once the desk is turned OFF, the dimmers are susceptible to noise pickup on the Mux Input. This can leave the dimmers unexpectedly ON. If you set NoMux to Hold, make sure unattended dimmers are turned OFF.*

To assign preset 5 as the "backup" with a Hold Time of 30 seconds, follow the steps below.

Action	Result
	EC90sv Rack:01
> then + until	SWC Presets
>	Activate Preset ▶
+ +	No Mux Preset ▶
>	No Mux Pre:Off▶
+ until	Preset Pre:05 ▶
>	HoldTime 00:10
<	HoldTime 00:10
+ +	HoldTime 00:30
ESC until	EC90sv Rack:01

In the above example, when both Muxes fail, the system will hold the last levels for 30 seconds and then fade into SWC preset 5.

> *When you select a new preset for the No Mux preset, the hold time is automatically reset to 10 seconds.*

To set the system to hold levels on loss of Mux signal, follow the steps below.
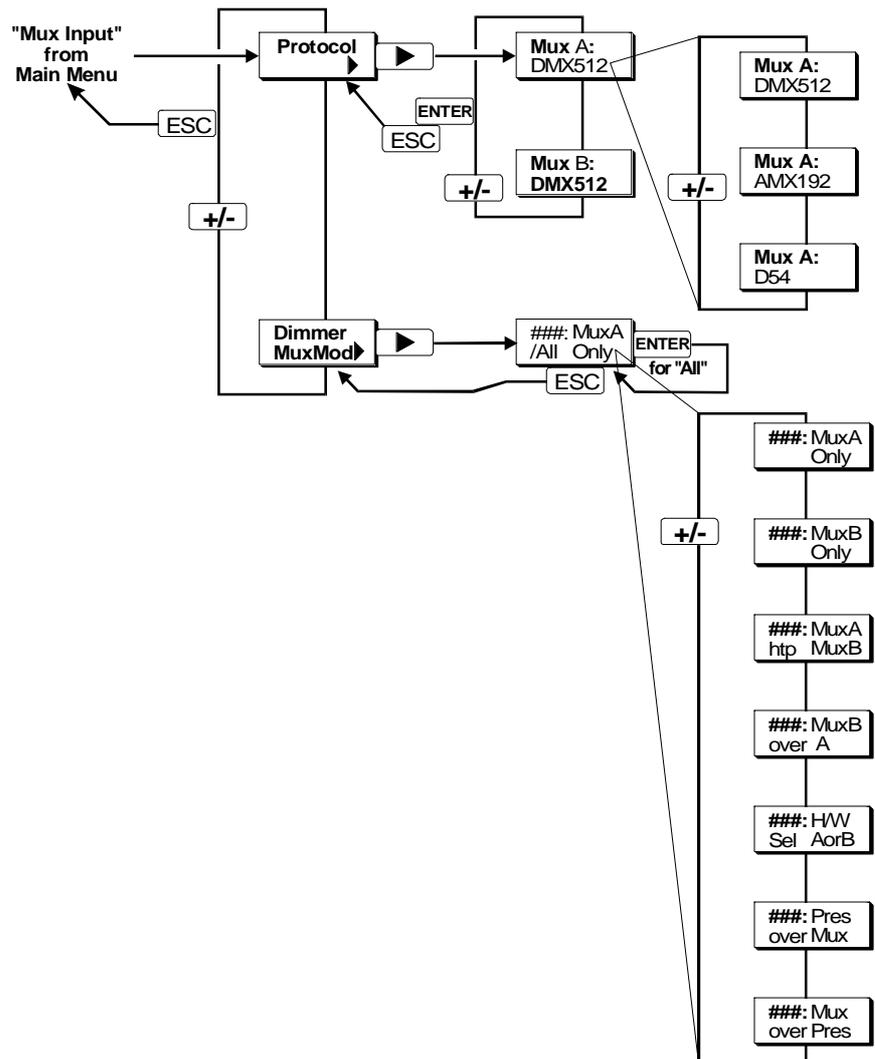
	Action		Result
			EC90sv Rack:01
`>` then	`+`	until	SWC Presets
	`>`		Activate Preset ▶
	`+`	until	No Mux Preset ▶
	`>`		No Mux Pre:05 ▶
	`−`	until	Preset Pre:Hold
	`ESC`	until	EC90sv Rack:01

Set Fade Time You can set the fade time for all SWC presets in the rack or for one preset at a time. To set the fade time for all presets to 1 second, follow the steps below.

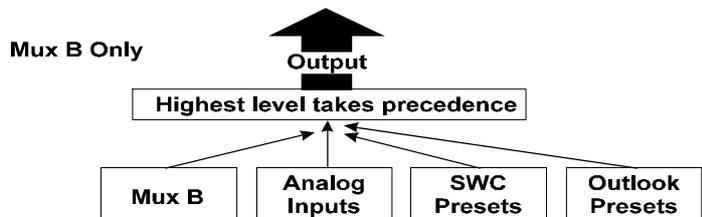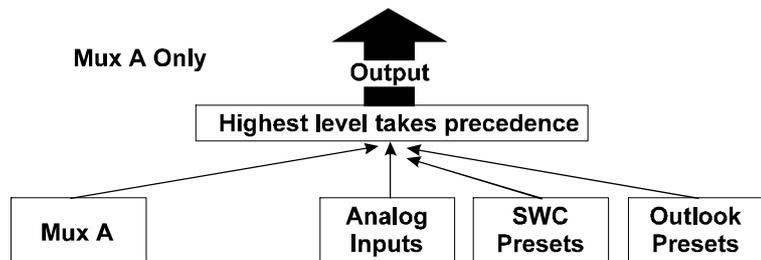|	Action		Result
			EC90sv Rack:01
`>` then	`+`	until	Activate Preset ▶
	`+`	until	FadeTime Preset ▶
	`>`		Pre:All Tim00:05
	`>` `>`		Pre:All Tim00:05
	`−`	until	Pre:All Tim00:01
	`ENTER`		Pre:All Tim00:01
	`ESC`		Confirm Changes
	`ENTER`		Record Preset ▶
	`ESC`	until	EC90sv Rack:01

Mux Inputs Menu

The Mux input protocol for Mux A can be set to DMX512, AMX192, D54 or SMX formats. The Mux input protocol for Mux B is either DMX512 or SMX. In addition, you can set the way in which the input signals interact (called the Mux Mode) for each dimmer individually. This lets you split a single rack for use with more than one type of input if required, or use signals from more than one input to control the same sets of dimmers.
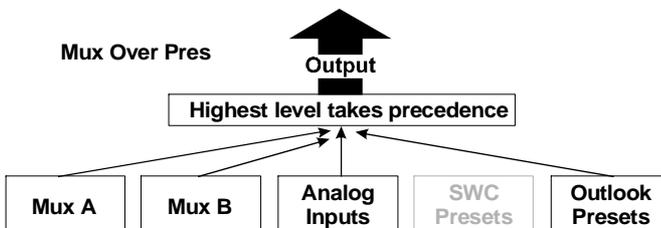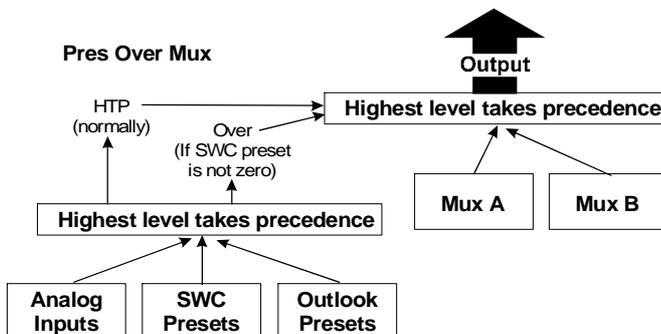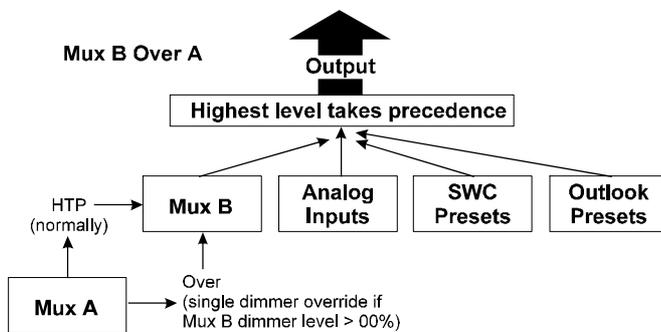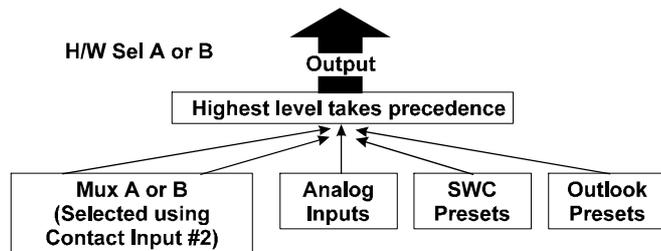
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To set the protocol of Mux A to AMX192, follow the steps below.

Action	Result
	EC90sv Rack:01
`>` then `+` until	Mux Inputs ▶
`>`	Protocol ▶
`>`	Mux A: DMX512
`>`	Mux A: DMX512
`+` until	Mux A: AMX192
ENTER	Mux A: AMX192
ESC	Confirm Changes
ENTER	Protocol ▶
ESC until	EC90sv Rack:01

The way in which the various inputs interact to create a dimmer signal is determined by the *Dimmer Mux Mode* menu item. The diagrams below show what each of the options means in terms of signal processing.

Mux A Only

Output

Highest level takes precedence

Mux A — Analog Inputs — SWC Presets — Outlook Presets

Mux B Only

Output

Highest level takes precedence

Mux B — Analog Inputs — SWC Presets — Outlook Presets

**Mux A htp Mux B**

Output

| Highest level takes precedence |

| Mux A | Mux B | Analog Inputs | SWC Presets | Outlook Presets |

H/W Sel A or B

Output

| Highest level takes precedence |

| Mux A or B (Selected using Contact Input #2) | Analog Inputs | SWC Presets | Outlook Presets |

Mux B Over A

Output

| Highest level takes precedence |

| Mux B | Analog Inputs | SWC Presets | Outlook Presets |

HTP (normally) →

| Mux A |

Over
(single dimmer override if
Mux B dimmer level > 00%)

Pres Over Mux

Output

| Highest level takes precedence |

| Mux A | Mux B |

HTP (normally) →

Over
(If SWC preset
is not zero) →

| Highest level takes precedence |

| Analog Inputs | SWC Presets | Outlook Presets |

Mux Over Pres

Output

| Highest level takes precedence |

| Mux A | Mux B | Analog Inputs | SWC Presets | Outlook Presets |

Patching Menu

The **Patching** menu lets you allocate dimmer numbering according to your own requirements.

- The *Outlook Patch* option lets you assign each dimmer to a channel in a room.
- The *Start Address* option lets you patch all dimmers in the rack sequentially after the specified *Mux Start* number. This is an easy way to assign the Mux patch without going through the slow process of assigning each dimmer individually.
- The *Mux Patch* option lets you assign each dimmer to a specified multiplex number.
- The *Analog Patch* option lets you assign each dimmer to a specified Analogue Input.
- The *CID Start Number* option lets you set a starting circuit ID for a rack and have the software automatically number the ramaining circuits in the rack from the CID start number. This is an easy way to set up a rack so that the cicuit IDs are offset by a fixed amount from the Mux adderesses.
- The *Circuit ID* option lets you assign your own dimmer numbers independently of the *Start Number* or *Dimmer patch*. It is important only for use with the SWC hand held controller or with the Reporter software. This facility lets you use your desk's channel numbering scheme, or even a geographic numbering scheme, (e.g. 100, 101, 102... 110, 111, 112 etc.) when remotely controlling dimmers in a complete system.
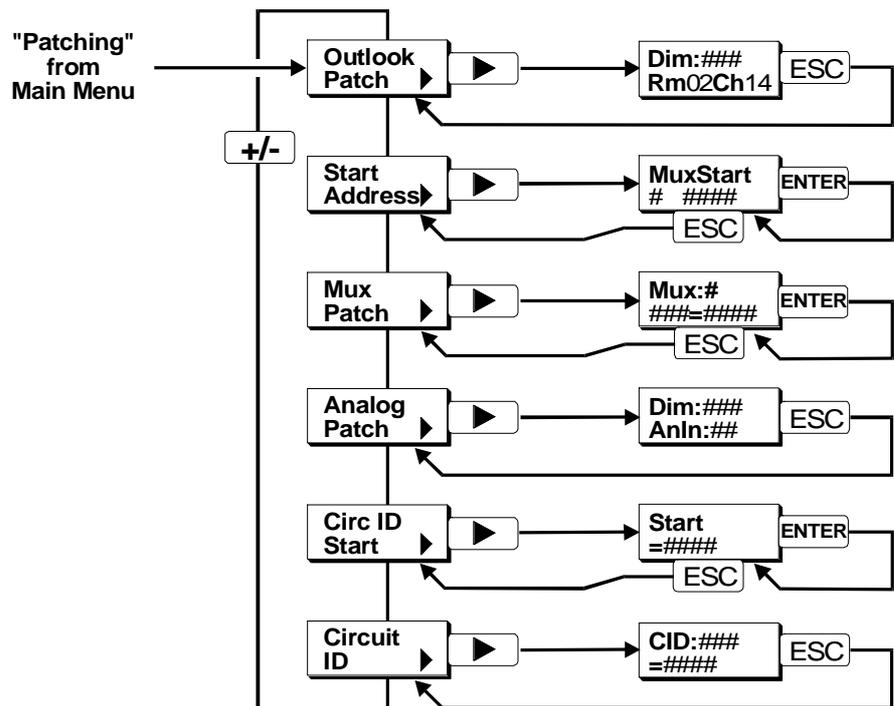
Patch Dimmers to Rooms

If you are using Outlook (or compatible) controllers you can patch dimmers to specific channels in specific rooms. To set dimmer 2 to channel 1 in room 2, follow the steps below.

Action	Result
	`EC90sv` `Rack:01`
`>` then `+` until	`Patching` ▸
`>`	`Outlook` `Patch` ▸
`>`	`Dim:01` `Rm01Ch01`
`+`	`Dim:02` `Rm01Ch02`
`>`	`Dim:02` `Rm01Ch01`
`+`	`Dim:02` `Rm02Ch02`
`>` `−`	`Dim:02` `Rm02Ch01`
`ESC` until	`EC90sv` `Rack:01`

Set the Starting Address

In order to assure that all controls operate separate dimmers, multiple rack installations require that each rack is uniquely numbered and dimmers assigned accordingly.

In most systems, dimmers are numbered consecutively through the dimmer racks. The first dimmer in a rack is set to one number higher than the last dimmer in the previous rack. The following example assumes that the first rack has 72 dimmers controlled by 72 consecutive Mux signals, and sets the first Mux B signal for the second rack to 73.

Action	Result
	EC90sv Rack:01
`>` then `+` until	Patching ▶
`>` then `+` until	Start Address▶
`>`	MuxStart A 0001
`+`	MuxStart B 0001
`>`	MuxStart B 0001
`+` until	MuxStart B 0003
`<`	MuxStart B 0001
`+` until	MuxStart B 0073
ENTER	MuxStart B 0073
ESC	Confirm Changes
ENTER	Start Address▶
ESC until	EC90sv Rack:01

The Mux address will change as the dimmer number is changed showing the address that the dimmer is patched to. Remember that any changes to the patch will be seen on the lighting output as soon as you press **Enter**

Patch Dimmers to Mux Signals

You can patch one or more dimmers to be controlled by one Mux signal. This lets you re-assign dimmers to different mux signals, or group various sets of lights.. The following example patches dimmers 1 and 2 to Mux signal 100. Unless you patch some other dimmer to Mux signals 1 and 2, neither of these signals will control any dimmers.

Action	Result
	EC90sv Rack:01
> then + until	Patching ▶
> then + until	Mux Patch ▶
>	Mux:A 001=0001
>	Mux:A 001=0001
+ until	Mux:A 001=0100
< then	Mux:A 001=0100
+ >	Mux:A 002=0002
+ until	Mux:A 002=0100
ESC	Confirm Changes
ENTER	Mux Patch ▶
ESC until	EC90sv Rack:01

You can unpatch dimmers by setting them to 'Park', which is situated "below" channel 1.

Action	Result
	Mux:A 001=0001
>	Mux:A 001=0001
−	Mux:A 001=Park

Patch Dimmers to Analogue Signals

You can patch one or more dimmers to be controlled by any of the 32 Analogue Inputs (or 16 inputs for 36 channel processor modules). Dimmers patched to analogue signals can also be patched to Mux signals. The following example patches dimmers 1 and 2 to Analogue Input 1.

> *- - means not patched to any dimmer.*

Patching a dimmer to an Analogue Input does not unpatch it from any Mux signals. These two dimmers will now be patched to Mux signal 100 and Analogue Input 1.

Set the Starting Circuit Number

The circuit ID feature lets you give 4-number identifications to dimmers, which lets you control dimmers from multiple sources, even if those sources do not call the dimmers by the same numbers. Circuit ID's are useful when using the optional SWC hand held controller or a PC running the Reporter PC software, both of which let you control large numbers of dimmers easily and remotely.

In the following example, a 48 dimmer rack is being added to an existing 512 dimmer installation. Since the system (now 560 dimmers) exceeds the capacity of one DMX512 link, the control console's second Mux output must be used to control dimmers 513-1024. However, to the rack this signal appears as 1-512 again.

If you set the starting circuit ID for the new rack to 513 and its Mux Start number to 1, the dimmers can be controlled by the main control console as 1-48 in the second DMX cable and from the SWC hand held controller or the EC90sv processor front panel as circuits 513-560.

Action	Result
	EC90sv Rack:01
[>] then [+] until	Patching ▶
[>] then [+] until	Circ ID Start ▶
[>]	Start ∎0001
[+] until	Start ∎0003▶
[<]	Start ∎0003▶
[+]	Start ∎0013▶
[<]	Start ∎0003▶
[+] until	Start ∎0513▶
[ENTER]	Start ∎0513▶
[ESC]	Confirm Changes
[ENTER]	Circ ID Start▶
[ESC] until	EC90sv Rack:01

Set Individual Circuit IDs

This procedure creates Circuit IDs sequentially for all dimmers in the new rack, starting with the number you specify.

Although it is generally easier to set circuit IDs using the Circ ID Start menu, you can also set a single circuit ID if necessary.

To set a Circuit ID for dimmer 1, follow the steps below.

Action	Result
	EC90sv Rack:01
> then + until	Patching ▶
> then + until	Circuit ID ▶
>	CID:001 ∎1
>	CID:001 ∎1
+ until	CID:001 ∎5
> + until	CID:001 ∎51
> + until	CID:001 ∎513
ESC until	EC90sv Rack:01

Front Panel Programming

Dimmer Curves Menu

There are 3 incandescent, 2 fluorescent, and one Non-Dim curve programmed into EC90sv which you can assign to dimmers for compatibility with other dimmers or specific application requirements. You can download 5 additional user defined curves from the optional Reporter PC, or you can program them from the rack using the *Rack Config* menu. The factory default is "Square."
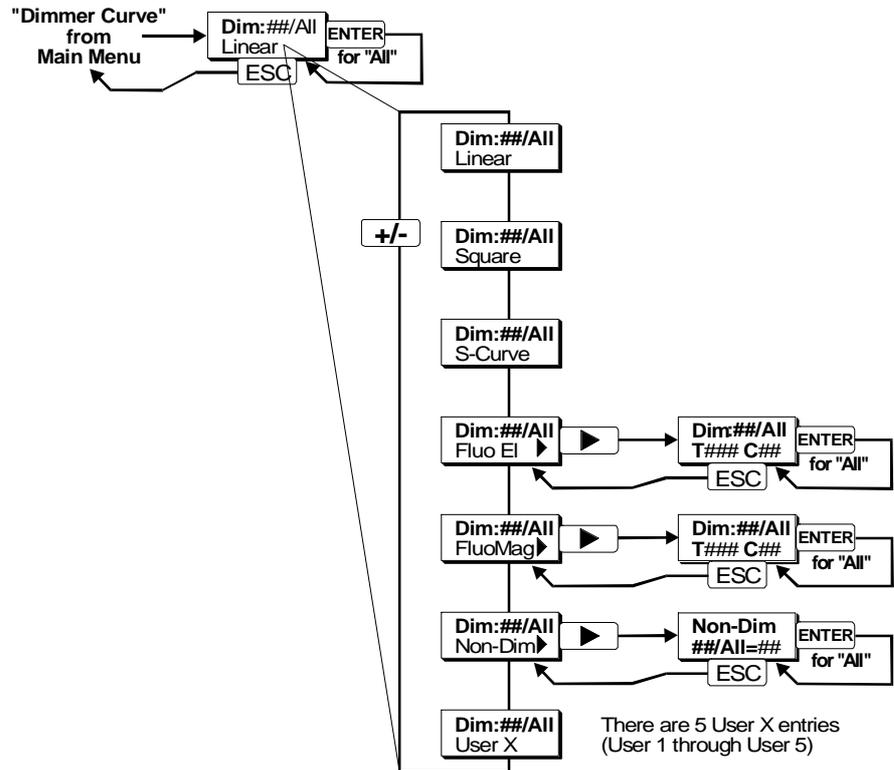
"Dimmer Curve" from Main Menu → **Dim:##/All** Linear — **ENTER for "All"**
ESC

+/-

Dim:##/All Linear

Dim:##/All Square

Dim:##/All S-Curve

Dim:##/All Fluo El ▶ ▶ **Dim:##/All** T### C## — **ENTER for "All"** / ESC

Dim:##/All FluoMag ▶ ▶ **Dim:##/All** T### C## — **ENTER for "All"** / ESC

Dim:##/All Non-Dim ▶ ▶ **Non-Dim** ##/All=## — **ENTER for "All"** / ESC

Dim:##/All User X   There are 5 User X entries (User 1 through User 5)

If you set a slot type for a contactor module (U, V, W, X, Y, Z), the dimmer curve is automatically set to "Non-Dim". If you set a slot type for an incandescent power module, the dimmer curve is set to "Square."

Reporting dimmers and contactors automatically set their slot types.

Set Incandescent Dimmer Curves

The following graph illustrates the relationship between input signal and output voltages for the incandescent curves. In general, you can use Square for TV requirements, Linear for theatre use, and S-Curve for architectural installations or when you need to match older dimmers.

230V Nominal Supply

Legend:
- Square
- S-Curve
- Linear

Y-axis: RMS Output Voltage (V) — 0, 50, 100, 150, 200, 250
X-axis: Control Signal Level (%) — 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
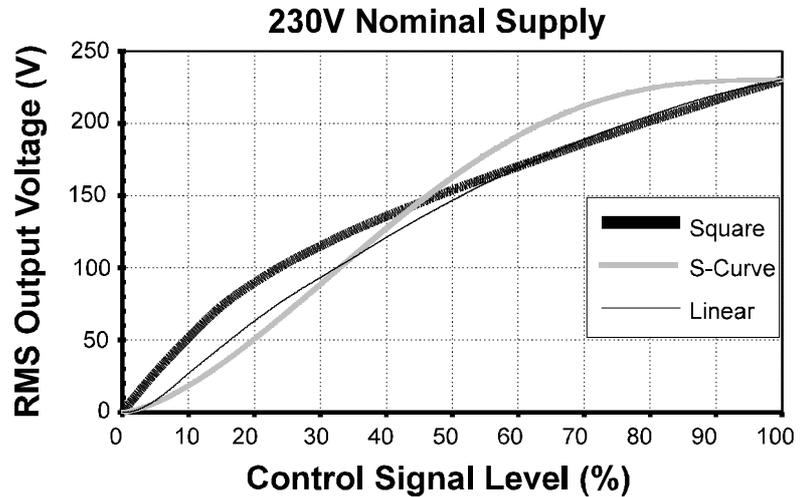
Separate dimming curves are supplied for use with magnetic and incandescent fluorescent fixtures. You should set these correctly for best results from your installed fixtures.

To get to curve settings from the default screen, follow the steps below.

Action	Result
	EC90sv Rack:01
> then + until	Dimmer Curves ▶
>	Dim:All Square
+	Dim:All S-Curve
ENTER	Dim:All S-Curve
ESC	Confirm Changes
ENTER	Dimmer Curves ▶
ESC until	EC90sv Rack:01

If you set a slot type for a contactor module (U, V, W, X, Y, Z), the dimmer curve is automatically set to "Non-Dim". If you set a slot type for an incandescent power module, the dimmer curve is set to "Square."

Set Fluorescent Dimmer Curves

The EC90sv rack supports both magnetic and electronic (phase controlled) fluorescent ballasts. For optimum performance you should set the appropriate fluorescent curve for each of your fluorescent dimmers. The settings for top end voltage and cutoff voltage are done the same way for magnetic and electronic ballast curves.

⚠️

Caution

Note that you must use an appropriate value of topset voltage with electonic ballasts, or damage may occur. Due to resonant effects, the actual voltage at the ballast can be higher than the Topset voltage. Using an RMS meter <u>at the ballast</u>, be sure to set the Topset so that the ballast manufacturer's maximum voltage is not exceeded.

Fluorescent lamps operate best when the dimmer response is set to "Slow" (see page 76 for setting dimmer response).

For additional information on Fluorescent Dimming refer to the Strand Lighting fact sheet *A Guide to Fluorescent Dimming.*

To set a dimmer to "Magnetic" with a top voltage ("T") of 100 and a cutoff voltage ("C") of 35V, follow the steps below.

Action	Result
	EC90sv / Rack:01
`>` then `+` until	Dimmer / Curves ▶
`>`	Dim:All / S-Curve
`+` `<`	Dim:001 / S-Curve
`+` `+`	Dim:21 / S-Curve
`>` `>` `+`	Dim:21 / FluoMag
`>`	Dim:21 / T120C040
`<`	Dim:21 / T120C040
`–` `–`	Dim:21 / T100C040
`>` `>`	Dim:21 / T100C040
`+` until	Dim:21 / T100C035
`<` `–`	Dim:21 / T100C035
`ESC` until	EC90sv / Rack:01

> *If the fluorescent ballasts require a heater circuit, you will need to connect the heater circuit to a separate non-dim or contactor, and then patch the non-dim to the same control channel as the fluorescent dimming circuit. The FluoMag setting delays the startup of the dimmed circuit to allow for a separate heater circuit to turn ON first.*

Set Dimmers to Non-Dim

You can also assign dimmers a Non-Dim curve. When you assign a Non-Dim curve you also have the option of setting the threshold percentage. Non-dims remain at ZERO when the controller is below the set threshold percentage and at FULL when the controller is above the threshold.

> *In order to keep dimmers from turning ON and OFF with slight voltage fluctuations if the control is set to the threshold value, non-dims are acutally turned ON about 2% above the threshold voltage, and not turned OFF until about 2% below the threshold voltage.*

Dimmers that are set to a contactor slot type will automatically be set to the Non-dim curve.

There is a slight difference between the way contactors act and the way dimmers act when set to Non-Dim. When dimmers are set to Non-Dim, they are still affected by the *Max Voltage*, *Min Level*, and *Response Time* settings. When set as contactors, these settings are not applied.

The example below sets dimmer 5 to Non-Dim with a threshold of 40%.
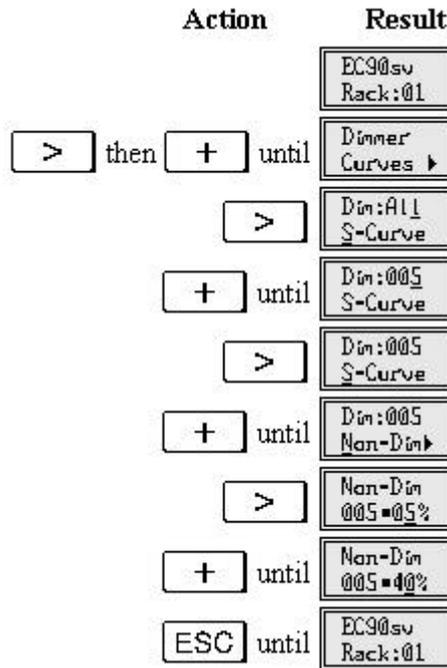
Dimmer Response Menu
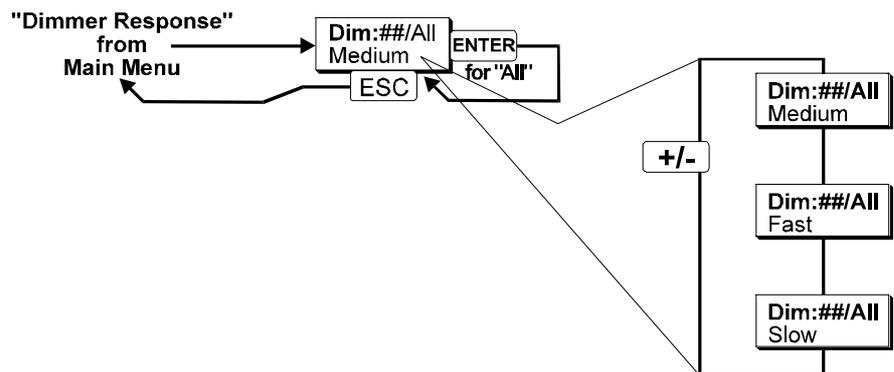
The response speed of a dimmer is the rate at which it responds to an increase or decrease in its control level. EC90sv provides "Medium" (100mS), "Fast" (30mS) and "Slow (300mS) response times which you can assign to all dimmers or to any single dimmer. "Slow" is generally used for

large lamp loads (e.g. 5kW fittings such as QuartzColor Pollux), while "Fast" is used for the small lamp loads that you might use in a chase effect.

The following example sets the response of all dimmers to "Fast."

Action	Result
	EC90sv Rack:01▶
`>` then `+` until	Dimmer Respons▶
`>`	DIM:All Medium
`>`	DIM:All Medium
`+`	DIM:All Fast
ENTER	DIM:All Fast
ESC	Confirm Changes
ENTER	Dimmer Respons▶
ESC until	EC90sv Rack:01

⚠ **Caution**

The "Fast" setting together with the accuracy of digital dimmers can cause very high inrush currents to flow. These may damage large lamp filaments and cause circuit breakers to trip. Only set dimmers to FAST if necessary for a particular effect.

Event Report Menu

The **Event Report** menu lets you turn dimmer status reporting ON or OFF (per dimmer), "Learn" the characteristics of load status reporting dimmers, and see the current events for each dimmer (see chapter 6, *Event Reporting*).

Rack Config Menu

The **Rack Config** menu lets you access system functions for initial setup.
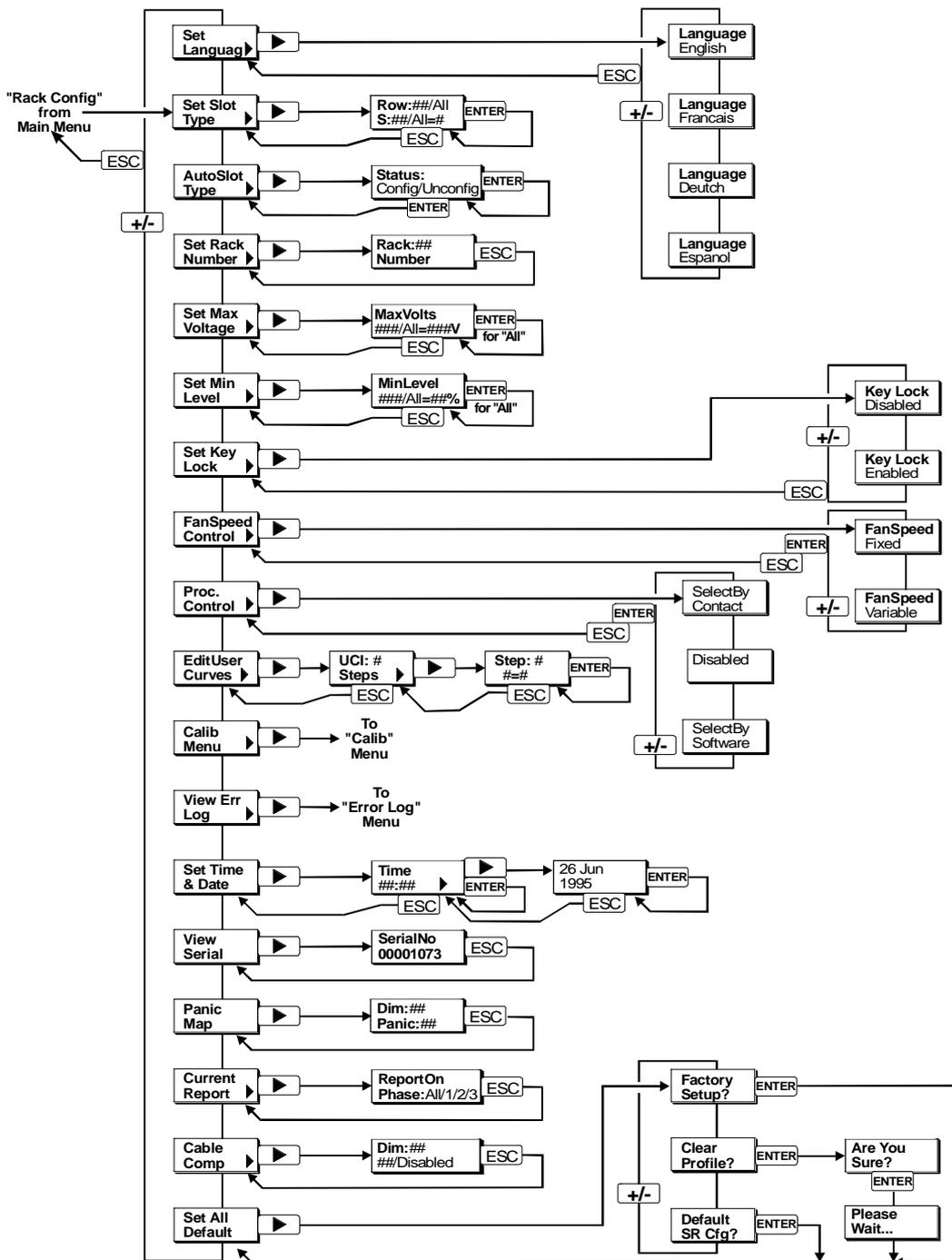
Set Language   The language used for messages can be set to English, French, German, and Spanish. Once changed, all subsequent messages will be displayed in the selected language. The factory default setting is English.

Set Slot Type   Before you can control dimmers, the processor module must know what types of power modules are installed in the rack. The defaults are "-" (none) for slot type. Since the slot type is usually set at the factory or during commissioning, you should need this function only if you move dimmers around or get new power modules. The dimmer type designation (a letter) is printed on the front of each dimmer. Constant modules are type "-" (none) and will be skipped when dimmers are patched.

> *Dimmers will not work properly without the correct slot type setting. You should at least spot check these settings during installation. If you are having problems with dimmers during installation, check this setting first. If you add or move dimmers, check this setting.*

The following example sets all dimmers in the rack to type B.

Action	Result
	EC90sv Rack:01▶
`>` then `—` until	Rack Config ▶
`>`	Set Languag▶
`+`	Set Slot Type ▶
`>`	Row:All S:All∎-
`>`	Row:01 S:All∎-
`>` `+`	Row:01 S:All∎B
ENTER	Row:01 S:All∎B
ESC	Confirm Changes
ENTER	Set Slot Type ▶
ESC until	EC90sv Rack:01

When you set a slot to a contactor type (U, V, W, X, Y, Z) the dimmer curve is automatically adjusted to "Non-Dim". If you reset the slot to an incandescent dimmer type, the curve will be set to "Square"

Caution

If you change a dimmer type from single to dual dimmer, or vice versa, the patching for every dimmer after the newly changed slot will be repatched to accommodate the change in number of dimmers.

Set Slot Types Automatically

For systems with Reporting modules, you can automatically configure the slot types when you set up the system, when new modules are added, or when modules are moved. This feature will only add modules to the map or change the types for existing Reporting modules. To remove modules from the map or to change the type for a non-reporting module, you must use the Slot Type menu.

Action	Result
	EC90sv Rack:01▶
> then − until	Rack Config ▶
>	Set Languag▶
+ +	AutoSlot Type ▶
>	Status Unconfig
ENTER	Status Config
ESC	Confirm Changes
ENTER	AutoSlot Type ▶
ESC until	EC90sv Rack:01
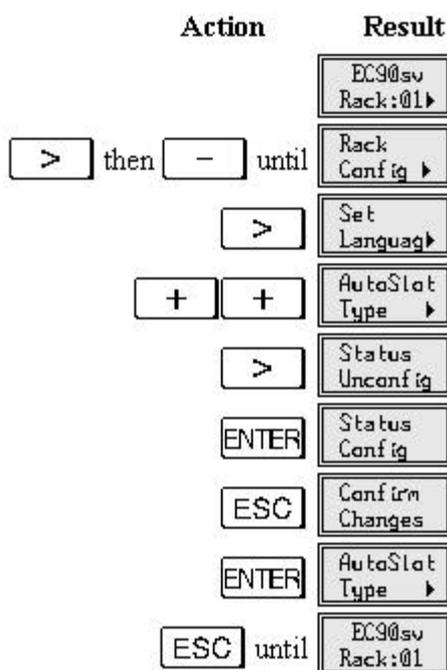
This feature is for initial setup, and if you change a module from a reporting to non-reporting type, or vice versa. Slots identified by this procedure as Reporting modules are constantly scanned, and their slot type changed automatically if you change the module. Slots identified as non-reporting modules are not scanned by the system for type or for dimmer status data.

Set Rack Number

For multiple rack installations which will be using the Reporter software or the SWC hand held controller, you must set a unique rack number for each dimmer rack so that you can identify racks from the controller.

Set Maximum Output Voltage

You can set a maximum output voltage for any or all dimmers. For instance, you can set the maximum voltage lower than the rated voltage of your lamps for improved lamp life. If you have lamps or equipment that cannot tolerate the line voltage, you can use this feature to set the voltage output from the dimmer to an appropriate voltage for the device. The

maximum output voltage is applied to all dimmers and dimmers assigned as non-dims. It is not applied to contactor non-dims. You cannot use contactor non-dims for devices which need a maximum output voltage setting. For Analogue Outputs, which are the dimmer numbers above the actual number of dimmers in the rack, a setting of 250V will give +10VDC at the output.

This sets the maximum dimmer output voltage, not the maximum control level applied to the dimmer.

Caution

Be careful when using a maximum output voltage with dimmers set for PANIC. When panic is activated, full output voltage appears at the output of any dimmer or non-dim set for PANIC, regardless of how the maximum output voltage is set.

Set Minimum Dimmer Levels

You can set a minimum level for any or all dimmers. This can be used for security/safety lighting in locations where you always want at least some light. It can also be used as a preheat for large lamps. Minimum dimmers levels are shown in control percentage.

This sets the minimum control level applied to the dimmer, not the minimum dimmer output voltage.

Set Key Lock Status

To avoid tampering by unauthorized personnel, the EC90sv processor module includes a security mechanism indicated by a key on the right side of the display. If this key is present, you must press **ESC ENTER** simultaneously and hold them for about 2 seconds to unlock the system before any of the keys will respond.

The *Set Key Lock* item in the **Rack Config** menu lets you Enable or Disable the automatic locking function. When Enabled, the processor automatically locks if there has been no input for 10 minutes. When Disabled, the processor is always unlocked.

Set Fan Speed Control

The cooling fans in the rack can be set to Fixed or Variable speeds.

Use the Fixed setting where rack room cooling is a problem. With this setting, the fans are always ON when the dimmer rack is ON.

The variable setting operates on a HTP basis with the dimmers and runs proportionately, i.e. if only 1 dimmer is at full then the fan runs at full speed, where as if all dimmers were at 50% the fan would run at approx half speed.

Increases in fan speed take 1 minute, decreases in fan speed take 5 minutes.

Set the Active Processor

In racks with dual processors, the currently active processor can be selected automatically, by contact, or by software. The default for this feature is Select By Contact, which lets you select the current processor manually

with an external switch or automatically by setting the Auto Backup link (LK9 on the CIC).

The Select By Software setting is provided for older CIC boards without automatic backup selection, and emulates this feature in software. You should not use this setting with new CIC cards. To identify new CIC cards, look for connector PL49, which is a 3-pin connector labelled "ENABLE LEDS." This connector did not exist on older CIC boards.

The Disabled setting makes a processor completely passive. It continues to send the "I'm alive" signals to the CIC. This setting is useful mainly for disabling the backup processor while loading new software.

Set Time and Date This menu item lets you set the system time and date. System time is set in 24 hour mode (hh.mm.ss). The main reason for setting this correctly is to ensure that all system reporting is time-stamped correctly.

Edit User Curves

Using the Edit User Curves item in the Rack Config menu, you can edit the 5 user curves for the rack. These curves initially contain 2 steps, at 0% and at 100%. To change a user curve from its default, specify the curve number, then the number of steps, then edit the value for each of the steps.

When you first specify the number of steps the software creates the steps spaced evenly between 0% and 100%. That both 0% and 100% are counted as steps. To create a curve divided equally into 4 parts you need to specify 5 steps. As you enter new values, the software linearly interpolates between each pair of adjoining steps. To get a smooth curve, you will need to enter a considerable number of steps.

Action	Result
	EC90sv Rack:01▶
> then − until	Rack Config ▶
> then + until	EditUser Curves ▶
>	UC1: 2 Steps ▶
+	UC2: 2 Steps ▶
>	UC2: 2 Steps ▶
+ + +	UC2: 5 Steps ▶
>	Step: 1 00■00
+	Step: 2 25■25
> then + until	Step: 2 25■30
< then +	Step: 3 50■50
> then + until	Step: 3 50■65
< then +	Step: 4 75■75
> then + until	Step: 4 75■90
ESC	Confirm Changes
ENTER	UC2: 5 Steps ▶
ESC until	EC90sv Rack:01

View Serial Number

You can find the serial number for your rack processor module from the **Rack Config** menu. This is a view only entry, and cannot be changed.

View Panic Map

The panic map lets you see which PANIC switch controls which dimmer. PANIC switches are numbered 1-72 in every rack, but the dimmer numbering depends on the numbers and types of dimmers installed. This display is a "view only" display.

Set Current Reporting mode

This menu option lets you set current reporting mode in cases where all three phases are "strapped" together, or the 3 phases are connected in a different order. You can set the value to 123, 1, 2, 3, 213, 312 etc.

For 3-phase racks (3-phase 4-wire), set this value to "123", or one of the other 5 possibilities, depending on the actual phase arrangement.

For strapped single phase operation (a three phase rack with all phase busses strapped together), set this value to the single phase you are using in that rack.

Set Cable Compensation values

The Cable Comp menu lets you set cable resistance (in milliohms) for each circuit. To activate cable compensation, the you must learn the dimmer loads so that the system knows what current will be drawn at each specified dimmer level, and therefore what voltage to add to the dimmer output.

You must have Reporting dimmer types to use this function, and an elevated mains supply will be beneficial to allow you to achieve the output voltage that you require. Please discuss the benefits of cable compensation with Strand Lighting in the first instance.

Action	Result
	EC90sv Rack:01▶
`>` then `−` until	Rack Config ▶
`>` then `+` until	Cable Comp ▶
`>`	Dim:0<u>1</u> Disabled
`>`	Dim:01 Disable<u>d</u>
`<` `<` `<`	Dim:01 Disa<u>b</u>led
`+` until	Dim:01 ■0<u>1</u>000mΩ
`ESC`	Cable Comp ▶
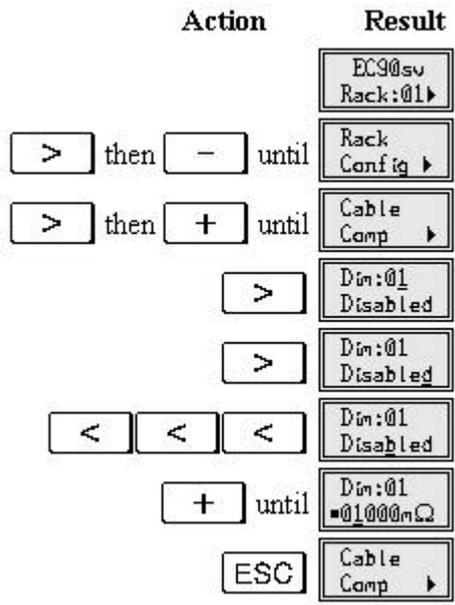
Return the Rack to Default Settings You can return the entire system to its default values, clear all of the learnt load profiles or clear event report config limits by using the Set All Default menu.

Set all Default This menu option sets all values throughout the system to their factory settings. Since some of the defaults may not be correct for your system, check all settings after you use this function.

Important ✋ *Be careful. This setting returns all programmed settings to their factory defaults, including setting the slot type for all dimmers back to "none". If you use this feature, dimmers will not work until the slot type for each dimmer is reset.*

Dimmer Defaults

Slot Type	All module slot types are cleared. On 72 channel processors you still have 12 Analogue Outputs.
Dimmer Level	All=Input. Dimmers take levels from control inputs.
Curve	All dimmers = Square
Response	All dimmers = Medium
Max Voltage	230V
Min Level	Off
Fluorescent Topset	195V
Fluorescent Cutoff	80V
Non-Dim Threshold	5%
Dimmer Mux Mode	A HTP B
Load profiles	cleared
MCB trip mode	O/P = on
Cable compensation	Disabled

Status reporting   Factory defaults
config values

Rack Defaults

Rack Number	1
Rack Language	English.
Fan Speed	Variable.
Processor Enable Mode	Contact.
Processor Enabled	Yes.
Mux Fail Preset	Off. On Mux fail, dimmers fade OFF after 10 seconds.
Mux Fail Hold Time	10 seconds.
Keypad Lock Enable	OFF.
Mux Protocol	DMX512 (Mux A and Mux B).
Mux Patch	1...n sequential (Mux A and Mux B).
User Curves	1:1 exact linear.
Analogue Patch	All inputs disabled and unpatched.
Circuit ID Patch	1, 2, 3,...n for both Mux A and Mux B.
SWC Fade Time	5 seconds.
SWC Preset Levels	0
SWC Preset Number	0 (blackout)
SWC Manual Levels	0
Outlook Fade Time	5 seconds except ON preset, which is 0 seconds. Manual fade time default is also 0 seconds.
Outlook Preset levels	P1=All dimmers 100%, P2=85%, P3=70%, P4=60%, P5=50%, P6=40%, P7=30%, P8=20%
Outlook Power Up	Preset 0. On power-up, no Outlook preset activated.
Outlook Patch	dimmers 1-12 = room 1, channels 1-12, dimmers 13-24 = room 2, channels 1-12, dimmers 25-36 = room 3, channels 1-12, dimmers 37-48 = room 4, channels 1-12, etc.
Outlook Room Links	All rooms unlinked.

Clear Profile   This menu option clears all of the learnt load profiles. This can be handy if you have decided that learning profiles is too much work due to frequently changing loads, and want to return the system to a simple load/no load sensing mode.

Default SR Config   This menu option clears all of the Status Reporting configuration limits to their factory defaults.

Calib Menu

The **Calib** (calibration) menu is accessed through the **Rack Config** menu, and lets you calibrate the various voltages in the rack. The functions in this menu should rarely need to be accessed, since initial calibration is done at the factory. This menu requires a password for access.

```
"Calib"                Password  [▶]              LCD Disp  [▶]          Contrast  [ESC]
from                   >####< ▶                   Contras ▶              =##%
Rack Config Menu
                                       [ESC]      Phase     [▶]          Phase #   [ENTER]
                                                  Voltage ▶              =119V
                                                                         [ESC]
                                       [+/-]
                                                  Phase     [▶]          Do not use without
                                                  Filters ▶              Strand Field Service
                                                                         supervision

                                                  Anlg Mux  [▶]          Calc###%  [ENTER]
                                                  Scaling ▶              RawM###%
                                                                         [ESC]

                                                  Analog    [▶]          Calc###%  [ENTER]
                                                  Input   ▶              RawA###%
                                                                         [ESC]

                                                  Analog    [▶]          Scaling   [ESC]
                                                  Output  ▶              = ##%

                                                  Dimmer    [▶]          Do not use without
                                                  Phase   ▶              Strand Field Service
                                                                         supervision

                                                  Memory    [▶]          Do not use without
                                                  Values  ▶              Strand Field Service
                                                                         supervision

                                                  EventRep  [▶]          Do not use without
                                                  Config  ▶              Strand Field Service
                                                                         supervision
```

Set LCD Display Contrast

This feature sets the contrast for the LCD display screen on the processor module.

Action	Result
	EC90sv Rack:01▶
☐>☐ then ☐−☐ until	Rack Config ▶
☐>☐ then ☐+☐ until	Calib Menu ▶
☐>☐	Password ▶0000◀
Enter password	Password ▶####◀
ENTER	LCD Disp Contras▶
☐>☐	Contrast ▪70% ▶
☐−☐	Contrast ▪60% ▶
ESC until	EC90sv Rack:01▶

Set Mains V Scaling

This option sets the scaling factor the processor uses to adjust for changes in the incoming mains voltage. It is factory set, and should not need to be reset. Please consult Strand Lighting field service before using this function. When you first enter the Mains V Scaling display, the voltage shown is the current incoming voltage multiplied by the current scaling factor. The current scaling factor is an internal variable and cannot be directly displayed or set. To set a new scaling factor for phase B, follow the steps below.

> *You must use a true RMS reading DMM for this calibration.*

Action   Result

	EC90sv Rack:01▶
☐ > ☐ then ☐ − ☐ until	Rack Config ▶
☐ > ☐ then ☐ + ☐ until	Calib Menu ▶
☐ > ☐	Password ▶0000◀
Enter Password	Password ▶####_◀
☐ ENTER ☐	LCD Disp Contrast▶
☐ + ☐	Mains V Scaling▶
☐ > ☐	Phase A ■230V
☐ + ☐	Phase B ■230V
☐ > ☐	Phase B ■230V
	Phase B ■230V
	Phase B ■232V
☐ ENTER ☐	Phase B ■232V
☐ ESC ☐	Confirm Changes
☐ ENTER ☐	Mains V Scaling▶
☐ ESC ☐ until	EC90sv Rack:01▶

Set Phase Filters This ensures that the processor module zero crossover time is synchronized with the mains. Please contact Strand Lighting before attempting to recalibrate the mains phasing. You must **not** activate this while a MUX signal is connected.

Set AMux I/P Scaling This option lets you set the Analogue Mux input scaling factor so that a 100% output from the control console will be correctly read as 100% by the processor. It may need to be reset if you plug in a new console with D54 or AMX192 outputs, or if you move the console so that the length of the cable run to the dimmer rack changes drastically.

This menu displays two values if Mux A is configured for D54 or AMX192 Mux input.

- "RawM" is the unscaled average of Mux A input channels 1 and 2.
- "Calc" is the RawM value scaled by the current Mux input scaling factor.

To recalculate the Mux input scaling factor, **set console channels 1 and 2 to FULL** and follow the steps below.

Action	Result
	EC90sv Rack:01▶
> then − until	Rack Config ▶
> then + until	Calib Menu ▶
>	Password ▶0000◀
Enter password	Password ▶#####◀
ENTER	LCD Disp Contras▶
+ until	Mux I/P Scaling▶
>	Calc 99% RawM 95%
ENTER	Calc100% RawM 95%
ESC	Confirm Changes
ENTER	Mux I/P Scaling▶
ESC until	EC90sv Rack:01▶

Set Analogue Input Scaling

This option lets you set the Analogue Input scaling factor so that a 100% output from analogue controls will be correctly read as 100% by the processor. It needs to be set on-site during commissioning.

This menu displays shows two values.

- "RawM" is the unscaled average of Analogue Input channels 1 and 2.
- "Calc" is the RawM value scaled by the current Analogue Input scaling factor.

To recalculate the Analogue Input scaling factor, **set Analogue Inputs 1 and 2 to FULL** and follow the steps below.

Action	Result
	EC90sv Rack:01▶
[>] then [−] until	Rack Config ▶
[>] then [+] until	Calib Menu ▶
[>]	Password ▶0000◀
Enter password	Password ▶####◀
[ENTER]	LCD Disp Contras▶
[+] until	Analog Input▶
[>]	Calc 99% RawM 95%
[ENTER]	Calc100% RawM 95%
[ESC]	Confirm Changes
[ENTER]	Analog Input▶
[ESC] until	EC90sv Rack:01▶

Set Analogue Output Scaling

This lets you set the Analogue Output voltage. The maximum Analogue Output voltage can be set from 0V to about 10.5V. To adjust the Analogue Output voltage, put a digital voltmeter between ground and Analogue Output 1. Then adjust the scaling factor until the DMM shows the correct maximum voltage. To reset the Analogue Output scaling factor, follow the steps below.

Action	Result
	EC90sv Rack:01▶
> then − until	Rack Config ▶
> then + until	Calib Menu ▶
>	Password ▶0000◀
Enter password	Password ▶####◀
ENTER	LCD Disp Contras▶
− −	Analog Output▶
>	Scaling ▪_75%
	Scaling ▪_75%
	Scaling ▪_82%
ESC	Analog Output▶
ESC until	EC90sv Rack:01▶

> *When panic is activated, any Analogue Output set for PANIC will be sent +10VDC, regardless of how the Analogue Output scaling is set.*

Set Dimmer Phase

This lets you specify non-standard phasing for the dimmers in the rack. If you reset any dimmer incorrectly with this option, the dimmer will not work correctly. Please consult Strand Lighting field service before using this function.

Check Memory Values

This lets a service engineer interrogate the SRAM memory values for troubleshooting. Please consult Strand Lighting field service before using this function.

Event Reporting Configuration

This lets you change the various values that the rack uses for detecting dimmer events. Each dimmer may have different values. Please consult Strand Lighting field service before using these functions, as incorrect use will result in many spurious problems.

Error Log

Sometimes, the software may produce an unexpected message, due to external or internal reasons. Each "Error" has a unique error number and is logged internally in non-volatile memory. If a message appears, write down the error number and call your Strand Lighting service agent or dealer. Press + or - to view all entries in the log. Press ESC to exit from the error log. You will be prompted to clear the error log or leave it intact.

The error log is discussed in more detail in the *Basic Troubleshooting* chapter.

Event Reporting

This chapter provides information on the event reporting functions of EC90sv racks with Reporting dimmers. Trouble-shooting guidelines for Reporting dimmers are included in the *Reporting Dimmer Problems* section of chapter 7, *Basic Troubleshooting*.

All EC90sv dimmer modules, including contactor non-dims and hard fired dimmers, are available in load status reporting versions. Load status reporting versions of dimmers can be mixed in any combination with standard dimmers in EC90sv racks. These dimmers report many dimmer status items back to the processor. The information can be accessed using the optional Reporter PC doftware, or through various menu items. Using this data, the processor can detect a wide range of dimmer and load faults with comprehensive diagnostic data.

Reporter PC™ Software

Reporter PC software, running under Microsoft Windows lets you log the following *dimmer* events with full diagnostic information and time stamp.

- No load
- Load error
- Overload
- CB trip
- Overheat
- Thyristor or Contactor short circuit
- Thyristor or Contactor open circuit
- High DC
- Module swap (Slot type changed)
- SRP fault

The following *rack* events or data are detected with time stamps

- Fan Failure (one or both fans)
- Mux fail A or B
- Phase fail A, B or C
- Panic mode activated
- Processor Enabled (Master or Backup)
- Tracking (Master or Backup)
- Earth Leakage Fault (special EC90sv systems only)
- Input line RMS voltage per phase
- Total RMS load current per phase

Contact Strand Lighting or see the *ReporterPC Software User's Manual* (part number 85083) for more details on how this software works.

Event Report Menu

The **Event Report** menu lets you see the current events for each dimmer, the dimmer load profile statistics, and communications statistics, lets the system "Learn" the load characteristics of installed Reporting dimmers, lets you turn event reporting ON or OFF for any or all Reporting dimmers, and lets you turn ON or OFF the the automatic disabling of dimmers which show a CBTrip event. In addition you can examine the live load current, and output voltage, DC level, and temperature of any dimmer.

The figure below shows the basic **Event Report** menu structure.
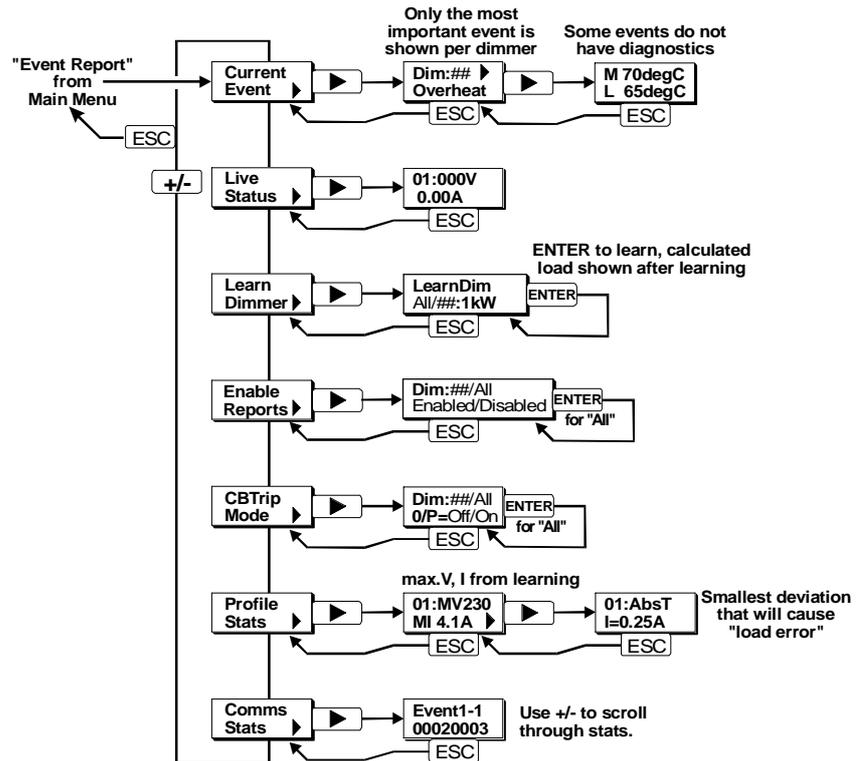
Normally the default display shows the rack number:

If there are any dimmer events logged the display shows the number of events and scrolls to give the Circuit ID and 1 line indication of the event type. As the event list changes, the event count will be updated.

To see full details of the events with their diagnostic data, use the *Current Event* menu item in the **Event Report** menu.

Dimmer Events The defined dimmer events, in priority order, are shown below. The persistence rating is the length of time an event must remain in order to be reported. This minimizes false event reports. The settings for the various thresholds are under the *EventRep Config* item in the **Calib** menu. Please contact Strand Field Service if you think any of these values need to be changed.

Dimmer Events and Fault Codes

Event	Description	Diagnostics	Persistence
CBTrip	Dimmer is not responding to commands or is not present. Circuit breaker is assumed to be tripped.	None. Dimmer is automatically disabled if CBTrip Mode is set to OFF.	3 sec
High DC	DC voltage > threshold was detected.	DC level in volts, and the action being taken by the rack to fix the problem.	2 sec
Overheat	Dimmer temperature > 65°C.	Measured temperature in degrees C.	3 sec
Thyr S/C	Dimmer output voltage > Voltage Profile Max. Threshold and current is not flowing. Short circuit is assumed.	Measured and expected RMS voltages.	3 sec
Cont S/C	Contactor output voltage > Voltage Profile Max. Threshold and current is not flowing. Short circuit is assumed.	Measured and expected RMS voltages.	3 sec
Thyr O/C	Dimmer output voltage < Voltage Profile Min. Threshold and current is flowing. Open circuit is assumed.	Measured and expected RMS voltages.	3 sec
Cont O/C	Contactor output voltage < Voltage Profile Min. Threshold and current is flowing. Open circuit is assumed.	Measured and expected RMS voltages.	3 sec
Overload	Output current > Overload Threshold. Default for Overload Threshold is 110% of breaker rating.	Measured and expected RMS current in Amps.	10 sec
No Load	Load < No Load Threshold.	Measured and expected RMS current in Amps.	3 sec
Load Err	Output current > Load Profile Max. Threshold or < Load Profile Min. Threshold.	Measured and expected RMS current in Amps.	10 sec
SRP Fault	Internal error code returned by module.	Fault codes as follows: 1 = ROM checksum failure 2 = Dimmer/SRP type mismatch 4 = Invalid SRP type A/D value 8 = Invalid dimmer type A/D value 16 = Unassigned 32 = Firing PSU failure (HF dimmers) 64 = General error Fault codes are additive, since more than one can be active at the same time.	3 sec
OK	No problems at this time		

Learning Dimmer Loads

Some things that the rack processor reports about load status reporting dimmers (e.g., Load Err) require a baseline measurement by the system. This is called "Learning" the load. You can learn any or all of the load status reporting dimmers in a rack by using the *Learn Dimmer* menu item in the **Event Report** menu.

If you do not learn a load, the software will not be able to detect deviations from the learned "baseline" measurement, and you will not be able to use cable compensation. All other dimmer events will still be properly detected.

> *Changing a dimmer to a contactor, or changing the fluorescent topset or cutoff values will invalidate the load profile created when the dimmer was learned. Dimmer wattage will then show as "Fail," and you will need to relearn the load.*

To learn a load, follow the procedure below

Action	Result
	EC90sv Rack:01
>	Set Levels▶
+ until	Event Report▶
>	Current Event ▶
+ until	Learn Dimmer▶
>	Learn All:sets
ENTER (this will take about 10 mins)	Learn 1/4:99%
ESC until	EC90sv Rack:01

:

When you learn a single dimmer, the processor takes control of the load, takes it to full, and then fades it down to zero over about 2 minutes.The processor then uses the voltage and current recorded at 100% to give the calculated wattage of the load. The same procedure is used with contactors. If the load is smaller than the no load current setting the load is recorded as "<min," and load profiling is not applied.

When you learn by sets, as in the example, the rack takes control of 1/4 of the dimmer load in the rack at a time. When those dimmers have finished their fade, it goes to the next 1/4 of a rack. This is to limit the total current drawn by a fully loaded rack.

> *You cannot exit learning once it is in progress. Learning the whole rack will take about 10 minutes.*

Important note about learning loads

Learning the loads can be very beneficial in a fixed environment where the loads are not moved around very much (such as in a long-running show or a saturated rig in a TV studio), as it gives you the ability to detect a failure of 1 lamp in 10 in a parrallel arrangement, but it requires considerable operational discipline to use the feature in a situation where loads are moved around, such as REP theatre.

Without learning the loads, all reporting features are available with the exception of load error detection and cable compensation. Please be aware that you are getting the majority of the benefit of this advanced system without the need to learn loads!

Live Status

You can see the values for output current, output RMS voltage, output DC voltage, and dimmer temperature for any reporting dimmers in a rack by using the *Live Status* menu item in the **Event Report** menu.

Enable/Disable Reporting

You can enable or disable reporting for any dimmers in a rack by using the *Enable Reports* menu item in the **Event Report** menu. This lets you turn off reporting for dimmers that you already know have problems.

CBTrip Mode

Normally, dimmers returning an CBTrip message are left enabled. However, you can set a dimmer so that a CBTrip message automatically disables the dimmer. To do this, use the *CBTrip Mode* menu item in the **Event Report** menu to turn the CBTrip Mode for the dimmer to O/P=OFF. This setting can be used to minimize burning of the load contacts on insertion of a replacement module.

Profile Statistics

You can see but not edit the current profile statistics, determined when you use *Learn Dimmer*, by using the *Profile Stats* menu item in the **Event Report** menu. The first entry shows MV (maximum voltage) and MI (maximum current). Using **>** from this display to see the AbsT (absolute tolerance of the current used for calculation allowable load deviations).

AbsT is a percentage of MI (default is 5%), so this tells you the minimum current deviation that the dimmer will detect. For example, if MI is 10A and the AbsT percentage is 5%, then the minimum current deviation the dimmer will detect is 500mA.

Communications Statistics

You can see but not edit the current communications statistics a rack by using the *Comms Stats* menu item in the **Event Report** menu. This menu item gives a live indication of activity on the communications between the

modules and rack processor (Event 1 through Event 4), the master/backup processors (Backup), and the Reporter PC (Reporter).

You can scroll through the various events by using **+** and **-**. the data shown on the second line is of the format XXXXYYYY where XXXX is the error count since power-up and YYYY is the number of successful messages.

Errors can be produced if modules are moved around, or if you swap between master and backup processors.

Chapter **7**

Basic Troubleshooting

This chapter provides basic troubleshooting procedures for EC90sv racks. It does not provide comprehensive maintenance data, but allows you to solve simple problems, and helps 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, 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.

This chapter contains the following main sections:

Understanding the Control Signal Path

The following diagram illustrates the control signal flow through the EC90sv rack. It is included here to show how each of the programmable settings interrelates.
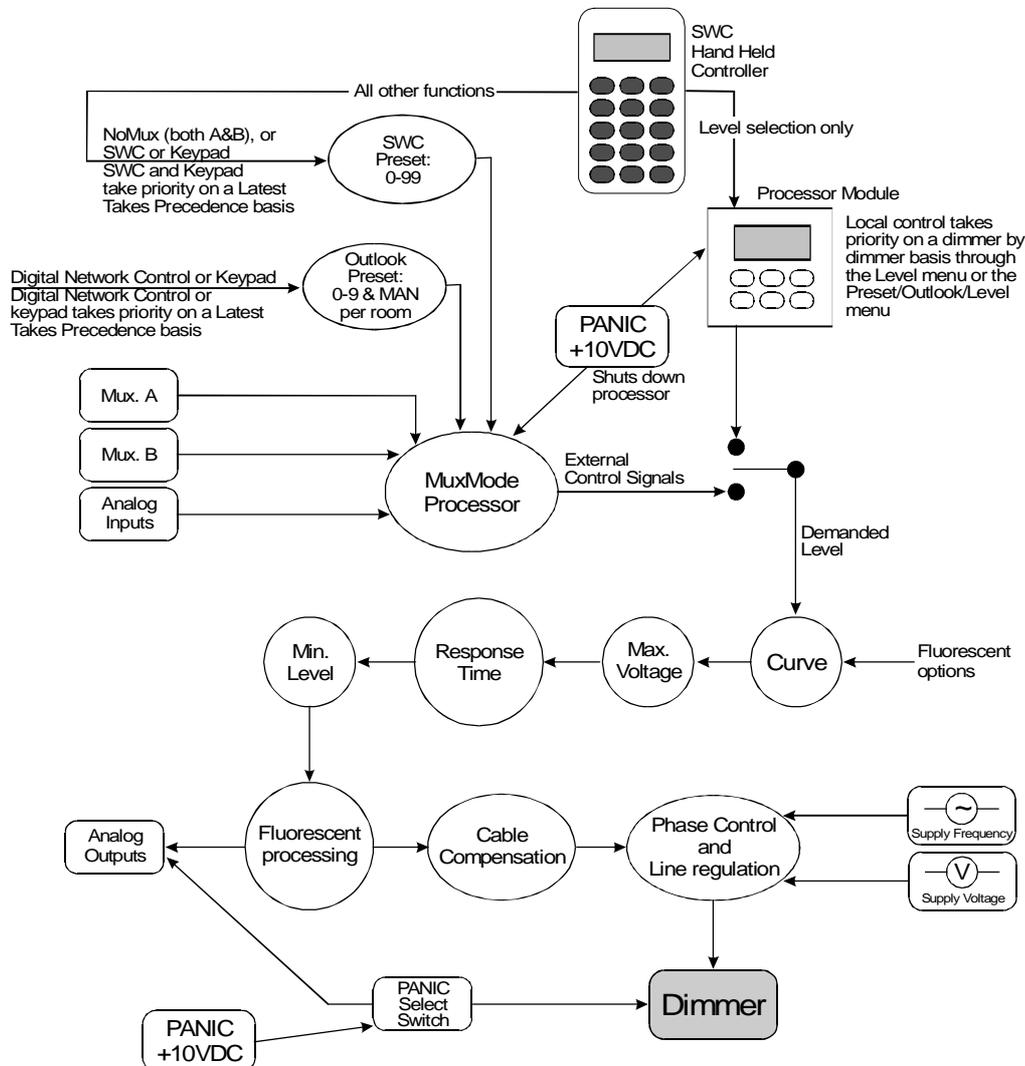
There are several important features of the above diagram:

1. The Outlook presets, SWC presets, Mux A, Mux B, and Analogue Inputs are all active at the same time. The *Dimmer MuxMode* setting in the **Mux Input** menu determines how these inputs interrelate. See chapter 5, *Front Panel Programming* for more details.
2. The local processor module keypad overrides all external control signals.
3. For Analogue Outputs a Max Voltage setting of 250V results in +10V output.
4. Panic switches override everything, providing a signal directly to the selected dimmers when PANIC is ON. The PANIC signal also forces the processor to stop driving dimmers.
5. Cycle-by-cycle voltage and frequency compensation is built into the system software.

Failure & Status LEDs

These are the first level of diagnostics, and provide an immediate visual status indication. The four LEDs on the front of the CIC chassis show (from left to right):

- **Opto Power**   +5V power supply (should be ON).
- **Aux Power**   +12V power supply (should be ON if the rack contains an optional wall station power supply).
- **Fan fail / Overtemp**   (should be OFF).
- **Panic**   (should be OFF).
- Phase indicators L1, L2, and L3 should be ON.

The LEDs on the front of each dimmer module show:

- POWER   (should be ON).
- OUTPUT   (should be ON) if dimmer is being driven.
- ERROR   (Reporting modules only, should be OFF)

Special Note for Reporting modules

Reporting modules are fitted with a red LED to indicate dimmer status. There are 4 possible states, providing immediate indication of dimmer problems:

- OFF: Nothing is wrong with the module or load.
- ON CONSTANT: The rack processor is not communicating with the module. This is most likely to be caused by the slot type being set wrongly. Refer the the chapter on *Front Panel programming* for details.
- FLASHING: 50/50 on/off time: The dimmer or contactor has a problem. Observe the LCD display for event type details.
- FLASHING: 66/33 on/off time: The Status Reporting processor in the module has an internal error. It may produce some diagnoistic on the LCD display, or may not. This may require module swap and repair.

Error Log

Sometimes, the software may produce an unexpected message, due to external or internal reasons. Each "Error" has a unique error number and is logged internally in non-volatile memory.

> *En error appearing in the error log indicates a serious problem which should be reported to Strand Lighting. Do not just ignore error log entries. Write down the error number, find the software version, and call your Strand Lighting service agent or dealer. Press* S *to exit from the error log.*
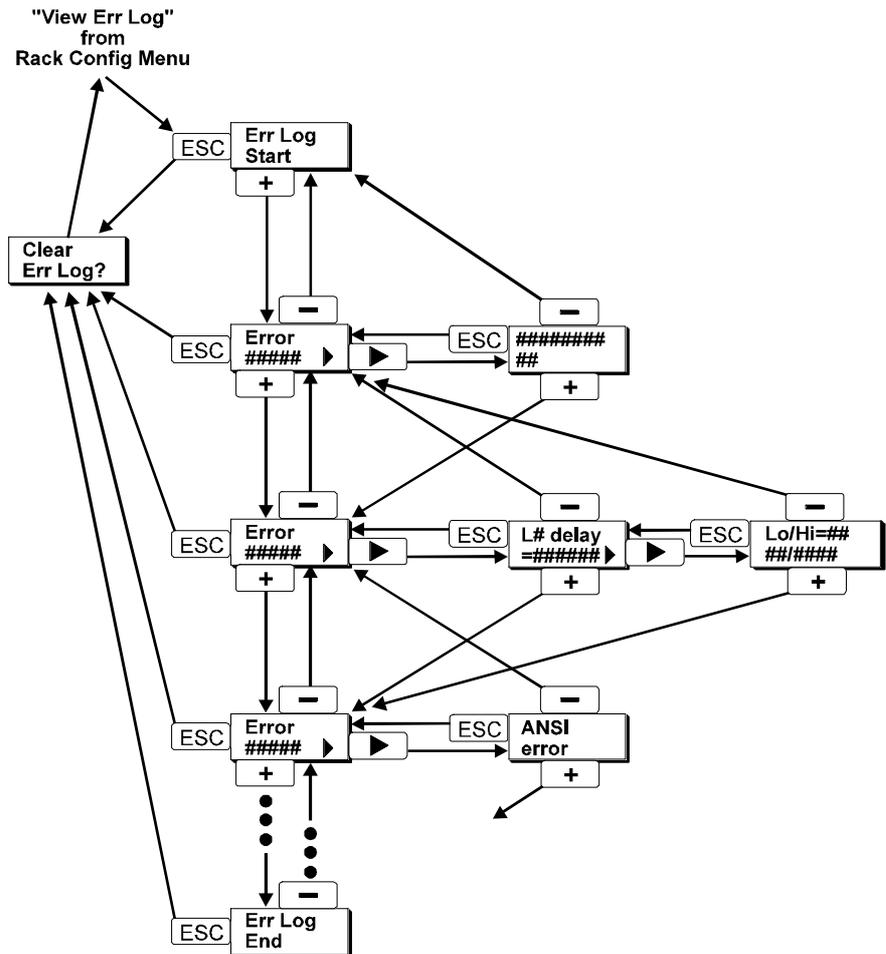
If there are any new software or hardware errors the Error Log display, with the latest error number, appears when you use ESC to leave any other display.

Startup Errors

If you are installing a system that has been on-site for a long period of time (more than 5 months), have a new processor module which has been on the shelf at Strand Lighting, or have had the dimmer rack turned OFF for a long period of time, the battery may be low. You may get an error #06065 (battery empty), or this error with an additional error #06058 (bad NVRAM checksum).

Battery Empty (error #06065)

This error by itself tells you that the battery is low (less than 3.0VDC). If you do not also have error #06058, no information has been lost. Clear the message and leave the dimmer rack ON for at least 12 hours.

Bad NVRAM Checksum (error #06058)

This message tells you that the data stored in Non-Volatile RAM on the processor daughterboard has been corrupted. It will appear if the battery voltage drops below 2.2VDC and data cannot be maintained. When the system is powered up, the memory is checked to make sure it has not changed. If it has, the system automatically resets all data to default values. You will need to reprogram the rack, including slot type information, if this message appears.

Other Errors

If any other error messages appear, write down the error number and contact Strand Lighting for more information.

Loading New Software

EC90sv software is stored in Flash ROM and can be updated on site from a PC running MS-DOS. In order to perform a software reload, you will need the following items:

- An EC90sv processor module, installed in a rack.
- An IBM compatible PC, preferably 80386 or better, with COM1, COM2, COM3, or COM4 serial port.
- An RS232 serial reload cable.

The following files must be in the same directory on the PC:
- RELOAD.EXE
- MAINLOAD.HEX
- FLASH.DEV
- The EC90sv software (name will vary with version number - refer to issue notes).

The procedure for single processor racks involves only three steps. Detailed instructions for each step are in the folowing sections.

1. Insert the reload cable into the processor.
2. Put the processor into Reload mode.
3. Load the software into the processor.

The procedure for dual processor racks is a bit more involved. A processor's RS232 port is automatically enabled when the processor goes in to Reload mode. If a dual processor rack has been set for Auto Backup, putting the main processor into Reload mode will automatically transfer the rack to backup and enable the backup processor's RS-232 port, causing conflicts. To avoid this, you must do the following:

1. Disable the active processor ("main") by setting the *Proc Control* item in the **Rack Config** menu to "Disabled."
2. Insert the reload cable.
3. Put the backup processor into Reload mode (see below).
4. Load the software into the backup processor (see below).
5. Disable the backup processor by setting the *Proc Control* item in the **Rack Config** menu to "Disabled."
6. Put the main processor into Reload mode (see below).
7. Load the software into the main processor (see below).
8. Reset the Proc Control values for the two processors as required.

> *To ensure that some lights remain ON while you are reloading, you can use PANIC to turn the lights ON.*

Connect the PC to the rack

Connect a 9 way female "D" type connector to COM1 on the PC, with an RJ11 telephone style connector, using the following wiring configuration:
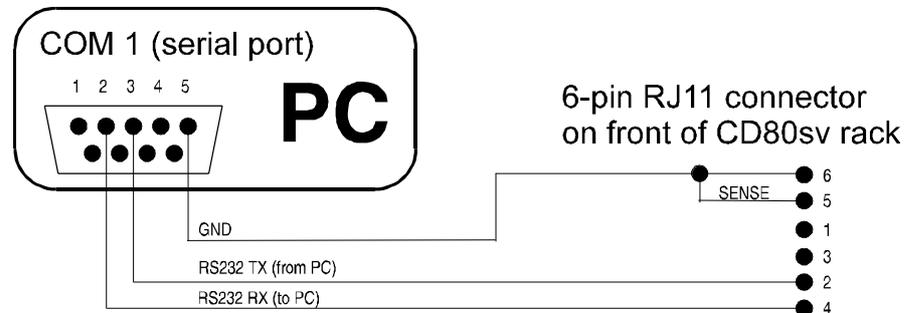
Software Reload Cable

Put the processor into Reload mode

- Press <
- Then hold down < and press >
- Then hold both < and > and press +

Once the processor is in Reload mode, the LCD display is blank. Reload mode can be entered at any time when the processor is powered up. The process is entirely driven by hardware.

The most usual reason for not entering reload mode successfully is the lack of an RS232 SENSE connection (pins 5/6 of the RJ11 connector).

Start the Reload Software on the PC

1. Turn the PC ON and make sure you are in DOS.
2. Switch to the directory that contains the reloader software.
3. Type "Reload /COM*n* /*baudrate* /c *filename*" where:
    - *n* is the COM port to which the system is connected (1, 2, 3 or 4).
    - *Baudrate* is the data transfer rate. (e.g. 38400, 19200, 9600). Note that some slow PCs may only support 9600 baud. 386 or better PCs should support 38400.
    - The /c flag suppresses confirm prompts. You can skip this flag if you want to watch the progress of the reload more carefully.

For online instructions, type "Reload" and press **Enter**.

4. Press **Enter**. The reload will start. At 38400 baud it will take less than 1 minute.

If any error messages appear, write them down and contact your nearest Strand Lighting service department.

Replacing Major Parts

The modular design of EC90sv dimmers and the immediate visual identification of a faulty module using the rack LEDs and the LCD display allows for very rapid replacement of a suspect dimmer while the system is in operation. The system is designed so that any failure will usually disable, at most, a single dimmer or processor module.

Servicing Power Modules
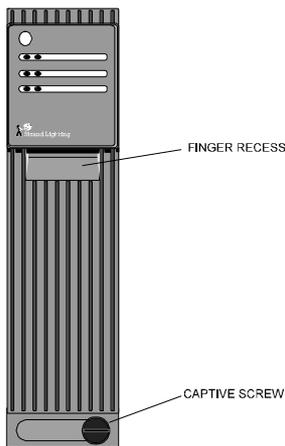
Power modules may be removed after turning OFF the circuit breaker(s) for that module, without the need to turn OFF the rack, and without exposing any live components. You can use another power module of the same type to verify that the problem is in the power module and not in the rack, lamp, or load wiring.

FINGER RECESS

CAPTIVE SCREW

To replace a power module:

1. Turn OFF the circuit breaker(s) on the defective power module.
2. Release the plastic captive screw in front of the power module,(quarter turn).
3. Pull the power module straight out of the dimmer rack by using the finger recess.
4. Troubleshoot and repair the power module as required.
5. Firmly push the power module back into its slot.
6. Re-secure the plastic screw, (quarter turn).

Replacing Processor Modules

Processor modules may be unplugged live and replacements inserted in an emergency, but the rack should normally be turned OFF to do this.

- If you have only a **single processor** per rack, but have more than one rack, you may be able to use a processor module from a less important rack to replace a failure in a critical rack. Otherwise you will need to request a replacement from Strand Lighting. When you remove the defective processor, remove the memory daughter board from it, and use this board to replace the memory daughter board in the good unit (see procedure overleaf). This way you will not loose the setup information for the rack.
- If you have **Reporter PC** software and have saved the configuration information for the rack, and were unable to recover the rack configuration by swapping the memory daughter board, you can download the configuration information from the PC to the rack.
- If you have a **dual electronics system**, make sure that the backup processor is active when you plug in the replacement master, or more the backup to the master slot. This makes sure that the correct data is copied from the rack's configuration held in the backup to the new processor. If you do not do this, you run the risk of copying the new processor's useless data into the backup!

The processor removal is exactly the same as for the power modules.

Replacement is the reverse of removal procedure.

Reconfiguring a Processor Module

If you have saved the configuration information with the optional Reporter software, you can replace the processor and reload the configuration by downloading the software.

If the configuration has not been saved, you can reconfigure the new processor module by swapping the daughter board with the one on the defective processor.

> *The daughter board is static sensitive. Do not attempt removal and replacement without using proven anti-static precautions, such as a grounded wrist strap and grounded anti-static working surface. You can ground yourself and the working surface to the dimmer rack earth ground bus. If you are in doubt, do not proceed.*

1. Remove 8 screws holding the cover. Do this for both processors.
2. Remove 4 screws that hold the daughter board to the defective processor module and unplug the daughter board.
3. Remove 4 screws that hold the daughter board to the new processor module and unplug the daughter board.
4. Swap the daughter boards and plug them back into the processor modules.
5. Secure both daughter boards with the screws you removed earlier.
6. Replace and secure the covers.

> *When you next turn on the processor, you will get error 666S with the message "Csum updated". This is normal and indicates that the software has recognised the new daughterboard.*

MAIN PCB

DAUGHTER BOARD
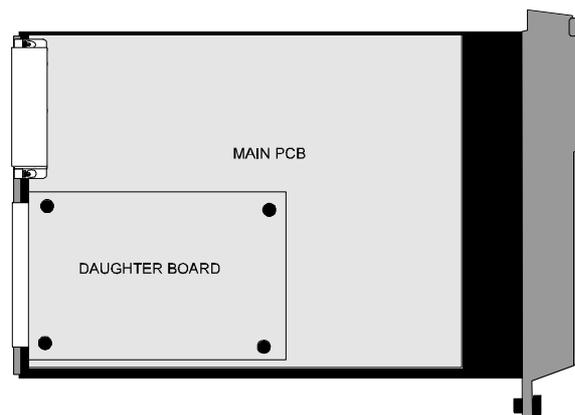
Isolating Problems

In case of failures in the system, you can speed up fault isolation by considering the following categories of malfunctions:

- Major system problems common to all dimmers or to a whole phase.
- Dimmer problems common to a single rack.
- Dimmer problems not related by phase or rack.
- Reporting problems.

Establish fault location by interchanging Power modules as required. You can swap modules between racks or within a rack. Correct the problem by module replacement once you have identified the defective component.

System Problems

None of the lights will come ON throughout the system.

- Rack power is turned OFF.
- If power is ON and no MUX OK message is present in status displays in any rack, the Mux cable is probably at fault. Check the connectors at each end, and, using a ohmmeter, check that the signal(s) and shield are not shorted. If they are not shorted, then the most likely cause is an open circuit somewhere along the line.
- Dimmer slot types have been cleared or incorrectly set.
- Mux protocol is incorrectly set.
- Mux start number and/or patch are incorrectly set.

Some lights can't be turned off.

Since EC90sv dimmers take their level control signal from multiple locations, you need to make sure that none of the control signals are present. Some possible control sources follow:

- The PANIC switch is ON.
- Presets are being called up from a handheld control or wall station.
- Dimmer level has been set from a handheld control or from the processor keyboard.
- An Outlook or SWC preset may be ON.
- The Outlook *Power-up preset* may be selected.
- MIN LEVEL may be set for a particular dimmer. There is no way to turn OFF a dimmer with a min level set.
- Mux has been lost and the system has gone into its backup preset.

If all control signals appear to be OFF the problem may be a faulty thyristor in a power module. Check using the rack keypad **Set Level** menu to isolate the module from all external control. Swap the power module to verify the problem.

The lights flash or become erratic. The MUX OK message appears / disappears erratically.

This problem may be caused by one Mux signal wire being loose or disconnected. It is most often seen with DMX512 installations. Both DMX512 signal connections and ground (screen) must be connected to all dimmer racks and the control desk. A common installation fault with DMX512 is the reversal of the two signal connections, or a signal connection and screen. Check that all cables have the correct wiring.

Problems can also be caused by over-terminating the line, or not terminating the line at all. Make sure that the last rack in the control run, and only this rack, is terminated.

The lights occasionally flash or misbehave.

This may be caused by interaction with other systems. Try to isolate the occurrence of the problem and tie it in with activity in other parts of the building. Arc welding or unsuppressed motors (lifts, other large motors, etc.) can cause mains disturbances or corruption of control signals. The EC90sv processor module is highly immune to such problems, but in extreme cases interference can occur.

If you can leave all dimmers ON long enough for one of the disturbances to happen, use *Set Level* in the **Main** menu to set All dimmers to a given (low) level from the processor module keypad. This isolates the external control signals and allows observation of the dimmers alone. If the problem still occurs, then it is a mains-borne interference. The solution will be to re-route the feeder cables to another supply (if at all possible), or suppress the offending equipment. If, however, the problem goes away, then it may be in the signal wiring (see above), the routing of the wiring (make sure it is not near noisy equipment), or a fault in the control desk.

The handheld control or wall station operates erratically.

The wiring between the dimmer racks and control system is similar to the handheld or wall station wiring. The same rules as above apply.

PANIC is not working.

- No DIP switches are in the "ON" position. Turn ON the appropriate DIP switches.
- Improper Panic station wiring. Check wiring from Panic station.

Cooling fans are not working.

- Check the fans by setting *Fan Speed Control* in the **Rack Config** menu to Fixed. The fans should come ON at full immediately. When this setting is Variable, the fan speed runs proportionately on a HTP basis with the dimmer levels, i.e if any dimmer is at Full then the fan runs at full speed; if ALL dimmers were at 50% then the fan would run at a lower speed.

Cannot control dimmers from a single control station.

- Incorrectly wired control station. Check wiring from the control station to the rack.
- Defective control station. Swap control station with a known good control station to verify problem. Replace the defective station.
- Defective processor module. Replace the processor module.

Cannot control dimmers, but PANIC is working.

- Slot types cleared. Check and set them as necessary.
- Incorrectly seated processor module. Reseat the processor module.
- Possible bent pin on the processor module rear connectors if unit has been removed or replaced.
- Defective processor module. Replace the processor module.

One rack doesn't work properly, the others do.

This can be caused by the wiring faults as described above. It may also be caused by incorrect programming. It is quite easy to set a dimmer to a level from the keypad, and in so doing disable Mux control. Setting the level from the keypad verifies electrical operation of the dimmer regardless of control system.

An extreme example of a wiring fault is a loose power connection to the rack. Loose neutral connections are particularly troublesome.

Some dimmers don't appear to work.

Check the Slot Type setting for the dimmer. Dimmers will not operate correctly if the Slot Type is not set right. They will not operate at all if the Slot Type has never been set, or has been cleared (set to "-").

Use the **Set Level** menu to check dimmer operation.

- If the dimmer fails to work, and all load wiring and connected load has been tested, then the power module will require service.
- If the dimmer works from the keypad, but not from the control desk, check that the START NUMBER or PATCH are set correctly.

Check the dimmer patch in the control desk. If you are using AMX output from your control desk, make sure that any 6K/12K assignments you may have made in the control desk patch are cleared. The 6K/12K assignments in analogue output consoles treat two adjacent dimmer numbers as a single dimmer, and each such assignment will offset the dimmer numbers above it by one dimmer number.

Make sure that the Dimmer Mux Mode and Curve settings for the dimmer are correct.

Lights don't appear to track each other in fades.

This can be caused by using different dimming curves on each dimmer or setting dimmers to different max. output voltages. The keypad can be used to set ALL dimmers in a rack to the same curve and voltage (see above) to rectify the problem.

Lights don't reach 100% intensity.

MaxVoltage is set incorrectly.

Individual Dimmer Problems

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

- Dimmer Circuit Breaker is OFF.
- Load wiring is disconnected.
- Burned out lamp in fixture.
- Too much load on dimmer caused circuit breaker to trip.
- Short circuit in load wiring or fixture caused circuit breaker to trip.
- Defective dimmer (probably the thyristor).
- Defective processor module (probably the output driver section).
- Faulty Status Reporting Processor in the module.

Load circuits and dimmers are protected by circuit breakers in the dimmer rack. These safeguard the thyristors in case of a dimmer overload or short-circuit in the load. Although you can quickly reset a circuit breaker to turn a circuit back ON, you should always first determine what caused the circuit breaker to trip.

> *Although the circuit breakers are rated for continuous operation at full nominal current, occasional "nuisance" tripping may occur when running a dimmer close to or at its rated maximum load, especially in improperly ventilated dimmer rooms.*

Make sure that the problem is not in the load or load wiring by shifting the load to another dimmer.

Set all PANIC select switches OFF except for the suspect dimmer, and enable PANIC. This puts a signal directly to the input of the module. If the dimmer stays OFF, it is probably at fault.

Verify the faulty power module by swapping it with an identical known good unit. If the problem moves, replace or repair the power module.

Make sure that all of the connectors between the dimmer rack and the processor module are seated correctly.

Check for bent pins on the rear connectors of the processor module.

Check for problems in any external analogue circuitry by measuring the DC voltage from the suspected Analogue Input to GND. When the dimmer is supposed to be at 100%, this voltage should be about +10VDC (subject to the calibration programmed for that input).

Reporting Dimmer Problems

Before troubleshooting for specific troubles which may be encountered with Reporting dimmers, all other power module problem categories should be investigated.

Reporting dimmer won't produce any events.

The *slot type* is incorrect or Status Reporting Processor PCB is defective. The SRP can be unplugged and exchanged once the module is opened. This operation should be left to a Strand service agent.

Reporting dimmer keeps generating load profile errors.

The load profile % and abs. tolerances have probably been set too tight. Set them back to default by using the "Default SR Config" option in the *Set All Default* item of the **Rack Config** menu. If this fails, try widening these variables a little at a time until the problem goes away. Please consult Strand Field Service for how to adjust these variables.

Reporting dimmer keeps generating Thyristor O/C or S/C messages.

The voltage % and abs. tolerances have probably been set too tight. Set them back to default by using the "Default SR Config" option in the *Set All Default* item of the **Rack Config** menu. If this fails, try widening these variables a little at a time until the problem goes away. Please consult Strand Field Service for how to adjust these variables.

In addition, the module may be reporting current when no current is actually flowing, due to an internal fault. This type of fault is generally caused by bad connections to the current sensing components and requires module repair.

Can't control a Reporting dimmer, though it has output

The dimmer is currently being learnt, or has detected excess DC and disabled itself, either in the full-on of off state.

No output from a Reporting dimmer. Event menu says "CBTrip" but circuit breaker is OK.

Power cycle the dimmer by turning the circuit breaker OFF and ON If the dimmer still fails to respond, the Status Reporting Processor is faulty. Swap module and send it to be repaired or replaced.

Fluorescent Dimmer Problems

Before troubleshooting for specific troubles which may be encountered with fluorescent circuits, all other power module problem categories should be investigated.

Fluorescent lamps operate best on hard fired dimmers, and when the dimmer response is set to "Slow".

For any additional information on fluorescent dimming, please refer to the Strand Lighting fact sheet *A Guide to Fluorescent Dimming*.

Chapter 8

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, a basic checklist is provided to show what is involved. Users wishing to do these procedures on their own should consult Strand Lighting Field Service.

1. Disconnect the rack from power or turn OFF power to the rack .
2. Inspect the dimmer rack for loose connections and build-up of dust which may impede air flow. Tighten any loose connections found at this time.
3. Vacuum out any excessive dust build-up in the dimmer rack while power to the rack is shut down.
4. Reconnect the rack, turn ON power to the rack, and make sure all dimmers work correctly. Check the Panic switches on the CIC to make sure they turn ON the selected dimmers.
5. Make sure that the fan(s) are operational. If not, trouble-shoot as necessary and replace or repair the defective fan or electronics.
6. Make sure that ventilation to the rack has not been blocked.
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.

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