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FDX2000 vs. FDX3000 Dimmer Curve Comparison . . 66
Welcome to your new CEM3 Power Control system.

This manual is designed to introduce you to the CEM3 user interface and the primary features and functions available to you in the setup and use of your CEM3 power control system.

Using this Manual

The following graphics and conventions are used throughout this manual to convey important information.

Note: Notes are helpful hints and information that is supplemental to the main text.

CAUTION: A Caution statement indicates situations where there may be undefined or unwanted consequences of an action, potential for data loss or an equipment problem.

WARNING: A Warning statement indicates situations where damage may occur, people may be harmed, or there are serious or dangerous consequences of an action.

WARNING: RISK OF ELECTRIC SHOCK! This warning statement indicates situations where there is a risk of electric shock.

Text Conventions

- Bold is used to indicate something in the CEM3 user interface, such as a parameter or button.
- [Brackets] are used to indicate a tactile button on the face of the CEM3 (such as [Setup], [Test], and [Enter]).

Please email comments about this manual to: TechComm@etcconnect.com.
Help from ETC Technical Services

If you are having difficulties, your most convenient resources are the references given in this user manual. To search more widely, try the ETC website at etcconnect.com or the Dimming and Networking Systems page at community.etcconnect.com.

If none of these resources are sufficient, contact ETC Technical Services directly at one of the offices identified below. Emergency service is available from all ETC offices outside of normal business hours.

When calling for help, please have the following information handy:
- Product model and serial number (located on the bottom of the CEM3)
- Installation type
- Other components in your system (Unison®, other consoles, etc.)

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Chapter 1
Getting Started

The User Interface
This section explains the physical features of the hardware interface and their general functionality with the software.

CEM3 Face Panel
The diagram shows the components of the hardware interface. These terms are used throughout this manual.

CAUTION: Power down the rack before removing the CEM3 face panel.

Navigation

Scroll Wheel
Use the scroll wheel and up/down arrows to move the selection cursor on any menu screen until the desired item is highlighted. Menus that do not fit on one screen will have a scroll bar on the right side of the display window, and additional menu options can be accessed with the scroll wheel. You can also tap the top or bottom of the scroll wheel to move the display cursor up or down.

The scroll wheel also lets you scroll through number fields (such as circuit number) or through the available options for a selected item (such as Module Type).

The center button of the scroll wheel functions as [Enter]. Press [Enter] to select the highlighted item on the display window or to commit entered data.

Keypad
Use keypad to enter values for any value fields in the display window. When setting levels you can select individual dimmers or ranges of dimmers using the [and] and [thru] buttons.

Both the center button of the scroll wheel and the bottom right keypad button function as [Enter]. Press [Enter] to select the highlighted item on the display window or to commit entered data.
Navigation Buttons

The navigation buttons ([Test], [About], [Setup]) and the [Back] button are used to navigate menus in the display window (see Menu Structure on page 11). Press [Back] to return to the previous screen on any menu.

Performing a Quick Setup

Quick Setup is used to set up your rack using a minimum amount of data to achieve a basic configuration.

Note: Prior to performing a Quick Setup, make sure that your rack DIP switch settings are set appropriately for your rack type. See Setting Rack DIP Switches and Termination on page 35.

CAUTION: Quick Setup will overwrite some of the data in your rack. Only perform a Quick Setup when you want to reconfigure your system or are instructed to do so by ETC Technical Services.

You can begin a Quick Setup by selecting Quick Setup from the main screen or by navigating to [Setup]>Quick Setup>[Enter].

From this screen you can use the CEM3 interface to enter data in up to four screens to quickly establish your rack configuration: Module, Circuit, Dimmer Double, and Patching (see below for screen descriptions).

Once you have entered data in the screens, select OK and press [Enter] to save the setup changes.

Module

The current Rack Type is listed. To change the module type select Module. Select a module type and model from the list, then select Next.

Circuit

Set Numbering to either Renumbering or Unchanged to indicate whether to renumber the rack. If you select Renumbering, set these two additional parameters:

- Set the Starting At value to the number for the first circuit in the rack. If this is your first or only rack, this number is typically 1. If this rack is one of many in your system, this number typically continues the numbering sequence from the previous rack. Default is 1.
- Set the Balance type: Straight, 1-Phase, or 3-Phase. The CEM3 processor defaults to the balance type that is appropriate for the detected power source, but you can change this value if desired.

- Straight results in circuit numbering that will proceed sequentially straight through the entire rack.
- 1-Phase or 3-Phase results in circuit numbering that distributes the circuits evenly across the different power phases so that neighboring circuits do not place an uneven load on any phase.
These tables compare the circuit numbering of an SR3-6 filled with D20 modules when set to **Straight** numbering, **3-Phase** numbering, or **1-Phase** numbering:

<table>
<thead>
<tr>
<th>Phase</th>
<th>SR3-6 Straight Circuit Numbering</th>
<th>SR3-6 3-Phase Circuit Numbering</th>
<th>Phase</th>
<th>SR3-6 1-Phase Circuit Numbering</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>1</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>7</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>8</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>3</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>9</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>10</td>
<td>C</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>5</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>6</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>11</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dimmer Double**

Choose between **Yes** and **No** to activate or deactivate dimmer doubling for the rack. Default is **No**. See *Dimmer Doubling (UL/120V 60Hz Systems Only)* on page 6.

You can also set a **DMX Offset** (default = 256) or **sACN Offset** (default =10000), which determines the start address of the B side of the dimmer doubled dimmers.

**Patch**

Select an automatic patching method to patch the entire rack sequentially.

There are three automatic patching methods:

- **Simple**: This patching method specifies the same starting address for all three data ports (DMX A, DMX B, and sACN) at once. Enter the starting address for the patch. If the patch count exceeds 512, the patch will “wrap” and start numbering again at 1.

- **Independent**: This method allows you to specify different starting addresses for each data port in the patch (DMX A, DMX B, and sACN). Select a data port and assign the desired starting address for the rack. If the rack count then exceeds 512 (for DMX ports) the remainder of circuits in the rack will be patched to zero for that DMX port.

- **Universe Split**: This patching method should be used when a DMX universe will end midway through the rack’s patch. Enter the starting address for the patch. If the patch sequence exceeds 512 (256 if dimmer doubling is enabled) DMX A will patch the rest of the circuits to 0 and DMX B will restart the patch addresses at 1 for those remaining circuits.

**Other Setup Functions**

Once you have completed the quick setup, you may wish to proceed to these other common setup tasks:

- Setting the module type in *Circuit Assignment* on page 14
- Setting up Panic on page 31
- Setting up CEM3 on the Network on page 34
Chapter 2
System Reference

This chapter includes the general concepts behind the features of your CEM3, the general menu structure of the software, definitions of all dimmer properties, and illustrations of the various dimmer curves available in your system.

Important Concepts

This section introduces some of the primary concepts. Topics are listed alphabetically.

Advanced Features (AF)

Advanced Features (AF) allow you to receive feedback from your dimmer modules about their current state, including the amount of current being drawn on each circuit, whether the module is installed or not, and whether the circuit breaker on the module has tripped. This information is available both at the front panel of the rack and at remote devices, including ETC Eos® and Cobalt® control systems and other ACN-capable devices.

Advanced Features also allow you to monitor circuit loads by recording and running a rig check (see Rig Check on page 10).

In order to use Advanced Features, you need AF-capable modules (modules with AF in the module name, such as D20AF or ED15AF) and AF cards installed in the rack.

Circuit

A circuit is a user assignable number between 1 and 99999. The circuit is the reference number for that dimmer in the rack. Circuit numbers must be unique per space; it is possible to have multiple circuits of the same number, but they must be in different spaces.

Configuration

The rack configuration is a collection of all of the data stored about the rack and all of its circuits. The configuration is stored automatically in the CEM3 whenever you make a change (for example, changing a circuit from switched to dimmed).

The configuration of any rack is automatically stored on both the CEM3 module and the CEM3 backplane. Therefore, you can remove a CEM3, replace it with a new, unconfigured CEM3, and the configuration from the backplane will be loaded to the new CEM3.

You can save and load rack configurations by connecting a USB removable media device to the USB port on the front of the module, by connecting to a computer on the network (using the CEM3 web interface), or by connecting to an FTP server. Saving and loading are performed from the File Operations menu. See Saving or Uploading Files and Firmware on page 29.

Dimmer Doubling (UL/ 120V 60Hz Systems Only)

ETC’s Dimmer Doubler™ technology allows you to double the number of controllable circuits in your system without adding dimmer modules or running additional cable. The key to this feature is the Dimmer Doubler two-fer.

The Dimmer Doubler two-fer is installed between a Sensor dimmer module and two ETC Source Four 77-volt fixtures. It splits the output of a single dimmer into two separately controlled outputs.
Latch-Lock

Latch-Lock is a control mode available to any dimmer circuit (see Control on page 16). Similar to switched mode, Latch-Lock features an additional safeguard so that circuits cannot be turned on or off as easily. The circuit only turns on when a defined control level range is held for a specified amount of time, and only turns off when a different control level range is held for another amount of time. Latch-Lock is useful for avoiding accidental dowsing of arc lamps during shows (often caused by running the grandmaster down). By requiring a level range and time, most master fades will not hover in a given range for long enough to trigger on or off.

The level ranges and times can be edited on a per dimmer basis (see Dimmer Property Definitions on page 16). On and Off level ranges may not overlap.

Diagram of How Latch-Lock is Applied to a Circuit

Lug

“Lug” refers to a physical position in the rack. Lugs are always numbered counting downwards from the top of the rack, starting at 1. Some modules may take up multiple lug positions in the rack.
Panic

CEM3 offers a panic capability that complies with the UL 924 standard.

When a properly connected and enabled CEM3 has a panic “look” stored, it will automatically play the recorded look when it receives a signal over the panic circuit.

Panic can be enabled when a maintained (normally open or normally closed) contact closure is properly wired to the backplane. For more information, see the data termination guide or installation guide that was supplied with the rack.

For information on how to configure panic on your CEM3, see Setting Up Panic on page 31.

Note: To configure panic mode through an electrical override without using the CEM3 module software, order the Hardwired Panic Accessory (7140K1002). Contact your local dealer for more information.

Patch

Patching governs the relationship between control input sources (DMX A, DMX B, and sACN) and the control of circuits in the rack. This relationship can be edited to match the needs of your control sources and rack constraints. For information on patching, see Patching on page 33.
Preset Functions

CEM3 supports a built-in preset control system allowing the recording and playback of preset looks. Once recorded, preset looks can be played back either from the CEM3 face panel, connected Echo preset stations, or the web interface. For more information on recording and playing back presets see Recording and Playing Presets on page 26.

CEM3 allows the circuits within the rack to be divided up into spaces (performed in Circuit Assignment on page 14) with up to 64 presets available per space. Each space can only have one active preset at a time.

CEM3 includes default presets that include all circuits in the space. The default presets for any space start with level at 100% and then cycle through 75%, 50%, 25%, 100% and so on.

The built-in EchoConnect® power supply on a Sensor3 rack is limited to powering 6 racks or panels and 6 stations. However, you can expand the system with external equipment. For more information about Echo systems, visit etcconnect.com.

CAUTION: Do not activate station power on more than one CEM3 on the same EchoConnect® bus. Doing so may cause undesirable station function.

When you activate a preset, this action is propagated across the Net3 network. For example, if you activate a given preset for space 1, all CEM3 modules on the network will activate that preset for space 1.
**Rig Check**

In Sensor3 racks with Advanced Features (see *Advanced Features (AF)* on page 6) you can record a special preset called Rig Check, which includes both circuit levels and the amount of load (current) expected on each circuit.

Once recorded, the Rig Check can be played back, either from the CEM3 face panel or remotely, and the CEM3 will post *load high, load low, or no load* messages based on how the load of the circuit has changed since you recorded the Rig Check preset. These messages will be available on the CEM3 display or on a connected console that monitors AF feedback.

You can record, run, and clear a rig check on the *Test* menu (see *Test* on page 12).

**Spaces**

Spaces are logical divisions within a system (such as different rooms) that isolate station control (preset and sequence control) to the defined group of controllable outputs in that division. CEM3 supports separation of its controllable circuits into spaces.

**Station Functions**

Presets can be played back from preset stations in the system.

- Press a preset station button to activate a preset.
- Press it again to deactivate the preset.
- Stations can be configured with an Off button. This option is performed at the station and should only be done by a qualified technician.
- The group of presets controlled by any station can be altered at the station. This should only be done by a qualified technician.

For more information see the *Echo Preset Station Installation Guide* available at etcconnect.com.

**Redundant Tracking (ESR and FDX Racks Only)**

Redundant tracking provides extra security in the event of system failure, allowing a secondary CEM3 control module to immediately take control of the rack. For more information, see *Redundant Tracking Systems* on page 59.
Variable Speed Fan

The variable speed fan reduces the amount of noise generated by a Sensor3 rack, specifically when the rack is lightly loaded. The variable speed fan (where available) is supported in the following product models:

- ESR24
- ESR36
- ESR48

The fan operates at two speeds: High and Low. The fan uses the AF Features of the rack to run more slowly when less current is being drawn.

Operation in an Advanced Features Rack

In an Advanced Features (AF) rack, the modules are equipped with current feedback. The processor uses the feedback data from the modules to determine the speed to run the fan.

If all modules have a measured current of 10 amperes or below, the fan will run in low speed mode. If the current rises above the 10A threshold, the fan will increase to the higher speed.

If the rack or any modules have errors that might lead to increased heat, including the loss of communication to AF cards, module over-temperature warnings, or ambient over temperature, the fan will run in the higher speed mode.

Operation in a non-Advanced Features Rack

In a non-AF rack, the fan speed is determined by the modules in the rack. If all modules are of a 10A or below rating (e.g. all ED10 or below), the fan will run at the lower speed. The presence of any higher current modules will cause the fan to run at the higher speed.

Menu Structure

This section describes the menu structure of the software. Press the desired button to access the menu items below. Use the standard navigation method to select and enter options in the menus (see Navigation on page 3).
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Set Circuits  | Set levels for chosen circuits in a space. If necessary, press [Back] to clear the command line during any of the following steps.  
1: Use the keypad to enter a circuit number between 1 and 99999.  
2: Press [and] to enter multiple circuits or press [thru] to enter a range of circuits.  
- Press [Last/A] or [Next/B] on the keypad to set a level for the A or B side of dimmer doubled circuits. See example below.  
3: Press [at] or [Enter]. The command line ends with "at".  
4: Use the keypad or scroll wheel to enter a level if desired.  
5: Press [Enter]. The selected circuits will be set to the specified level or released if you did not enter a level. The command line ends with "*".  
6: If you selected a single circuit, press [Next] or [Last] on the keypad to increment or decrement the circuit number to set the level of another circuit, if desired. |
| Dimmer Check  | Quickly run through all circuits in a space to test their output at a given percentage.                                                                                                                     |
| Release Set Lvl| Release any active levels for a given space at once.                                                                                                                                                    |
| Presets       | Record or play back presets. See Recording and Playing Presets on page 26.                                                                                                                                  |
| Sequences     | Record or play back sequences. See Recording and Playing Sequences on page 28.                                                                                                                             |
| Release All Arch| Release all architectural control such as presets, sequences, and set zone levels.                                                                                                                         |
| Record Rig Check | Record a rig check preset to facilitate AF reporting. Rig Check features are only available if the rack property AF Enabled is set to Yes. See Rig Check on page 10, Advanced Features (AF) on page 6, and Rack Property Definitions on page 19 for more information. |
| Run Rig Check | Run a rig check preset. You will be notified of any load inconsistencies found during the rig check.                                                                                                      |
| Clear Rig Check | Clear the recorded rig check from all racks for a given space.                                                                                                                                             |

**Example:** Setting the A and B sides of one dimmer doubled circuit at a time is straightforward using the A and B keys. It is possible to set ranges of dimmer doubled circuits. The following are valid examples:

A side only
- 1 at 100 or 1A at 100 sets 1A to full
- 1 thru 6 at 100, 1 thru 6A at 100, 1A thru 6 at 100, or 1A thru 6A at 100 sets the A sides of 1 through 6 at full

B side only
- 1B at 100 sets 1B to full
- 1B thru 6B at 100 sets B sides of 1 through 6 at full

Some A and some B sides
- 1 thru 6B at 100 or 1A thru 6B at 100 sets the A and B sides of 1 through 6 to full
- 1B thru 6 at 100 or 1B thru 6A at 100 sets 1B and the A sides of 2 through 6 to full
### About

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimmers</td>
<td>View all properties for any circuit in a space or in any rack on the network. See <em>Dimmer Property Definitions</em> on page 16.</td>
</tr>
<tr>
<td>Rack</td>
<td>View all properties for the host Sensor rack. See <em>Rack Property Definitions</em> on page 19.</td>
</tr>
<tr>
<td></td>
<td>• Status: displays &quot;Rack OK&quot; or &quot;Errors Exist&quot;</td>
</tr>
<tr>
<td></td>
<td>• Panic State: displays &quot;Ready&quot; when not in a panic condition and &quot;Active&quot; when in a panic condition.</td>
</tr>
<tr>
<td>Errors</td>
<td>View any current errors or other status messages. See <em>Error Messages</em> on page 56.</td>
</tr>
<tr>
<td>Source Info</td>
<td>View the current control source (Highest-Takes-Precedence or “HTP”) and related output level being received by all dimmers in a space.</td>
</tr>
<tr>
<td></td>
<td>• &quot;DMXA&quot; is DMX Port A</td>
</tr>
<tr>
<td></td>
<td>• &quot;DMXB&quot; is DMX Port B</td>
</tr>
<tr>
<td></td>
<td>• &quot;sACN&quot; is Streaming sACN</td>
</tr>
<tr>
<td></td>
<td>• &quot;AF&quot; means Advanced Features is using the dimmer for load recording</td>
</tr>
<tr>
<td></td>
<td>• &quot;SetLevels&quot; means Set Levels or Dimmer Check is in use on the dimmer</td>
</tr>
<tr>
<td></td>
<td>• &quot;ACNDirect&quot; is ACN Direct Control</td>
</tr>
<tr>
<td></td>
<td>• &quot;Preset&quot; followed by a number means a preset is running on the dimmer</td>
</tr>
<tr>
<td></td>
<td>• &quot;Panic&quot; means the panic settings are in effect</td>
</tr>
<tr>
<td></td>
<td>• &quot;--&quot; means no control of the dimmer</td>
</tr>
<tr>
<td>About CEM3</td>
<td>Displays the current software version on your CEM3 processor. You can also save a copy of the <em>CEM3 User Guide</em> to a USB drive.</td>
</tr>
</tbody>
</table>
Setup

Commonly used features found here include:

- changing dimmer, rack, and network settings
- enabling control ports
- changing operating mode
- upgrading software or backing up the rack configuration
- changing curve and firing mode

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimmers</td>
<td>View and adjust the settings for any circuit in any rack connected to the network. See Dimmer Property Definitions on page 16.</td>
</tr>
<tr>
<td>Rack</td>
<td>View and adjust the settings for the host Sensor3 rack. See Rack Property Definitions on page 19.</td>
</tr>
<tr>
<td>Circuit Assignment</td>
<td>Assign the space, circuit number, and module type for any circuit slot in the rack. You can auto assign or manually edit the options for any circuit. For single and half-density modules such as the D20F, select Edit Circuit Layout to adjust circuit numbering before you perform final patch updates.</td>
</tr>
<tr>
<td>Patching</td>
<td>Edit the patch and functionality for any port (DMX or sACN). See Patching on page 33.</td>
</tr>
<tr>
<td>Network</td>
<td>Set up and edit network properties for the CEM3. See Setting Up CEM3 on the Network on page 34.</td>
</tr>
<tr>
<td>File Operations</td>
<td>Save configurations, load configurations, or upgrade CEM3 software using either a USB memory device or an FTP server. See Saving or Uploading Files and Firmware on page 29.</td>
</tr>
<tr>
<td>Panic</td>
<td>Record a panic look and set the specific details (such as fade and delay times) for when a panic look is executed. See Setting Up Panic on page 31.</td>
</tr>
<tr>
<td>Time/Date</td>
<td>Set the rack's time and date, or switch between automatic or manual time setting.</td>
</tr>
<tr>
<td>Quick Setup</td>
<td>Quickly set up the rack configuration. For more information see Performing a Quick Setup on page 4.</td>
</tr>
<tr>
<td>UI Preferences</td>
<td>Adjust various settings regarding the user interface. See UI Preferences on page 15.</td>
</tr>
</tbody>
</table>
UI Preferences

Adjust various settings regarding the user interface. Edit these settings in the **UI Preferences Setup** screen > UI Preferences.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backlight Mode</td>
<td>Adjust the settings of the backlight behind the display window. Choices are On, Off, and Auto. <strong>Auto</strong> will illuminate the window after a button press or boot up for the time specified in <strong>Backlight Time</strong>. Default is Auto.</td>
</tr>
<tr>
<td>Backlight Time</td>
<td>Appears only when Backlight Mode is set to Auto. Specify the time in minutes and seconds (between 0:10 and 9:59) for the backlight to stay lit after a reboot or button press. Default is 3:00.</td>
</tr>
<tr>
<td>Contrast</td>
<td>Set the contrast of the display window. This can also be done from the home screen by holding the back arrow and using the scroll wheel.</td>
</tr>
<tr>
<td>Language</td>
<td>Set the display language for the display window. Default is English.</td>
</tr>
<tr>
<td>Temp Locale</td>
<td>Set the units used for the temperature display, Celsius (C) or Fahrenheit (F). Default is F.</td>
</tr>
<tr>
<td>sACN</td>
<td>Set the method of displaying sACN addresses: Universe/Channel (Uni/Ch) or absolute address (Abs). Default is Uni/Ch.</td>
</tr>
</tbody>
</table>
### Dimmer Property Definitions

Each dimmer has specific properties that dictate how the dimmer functions and how CEM3 will control it. Edit these properties in the Dimmer Setup screen [Setup] > Dimmers.

<table>
<thead>
<tr>
<th>Dimmer Setup screen</th>
<th>Submenu (if applicable)</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ckt</td>
<td>Circuit Number. A user-assigned number for a unique circuit within a space. Typically the circuit number matches the labelling at the corresponding power outlet.</td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td>The type of module controlling the circuit. Defines module density, ratings, and features to ensure proper function of the connected equipment and power devices in the module.</td>
<td></td>
</tr>
</tbody>
</table>
| Control             | Set the control mode of the dimmer.  
  • Off: Circuit ignores incoming levels and will not turn on even with local overrides.  
  • Switched: Circuit operates as a relay with output unregulated AC voltage when the control level is above the control threshold level.  
  • Always-On: Circuit ignores incoming levels and will not turn off even with local overrides.  
  • Latch-Lock: Similar to switched mode, Latch-Lock functions as a relay but features an additional safeguard so that circuits can not be turned on or off so easily. See Latch-Lock on page 7.  
  • Dimmable: Circuit dims according to curve within the minimum and maximum scaled voltages.  
  • Smoothing: The dimmer adds a deliberately slow reaction time to changes in control level to “smooth out” dimming performance with loads that react quickly such as LEDs or low wattage lamps.  
  • TPAuto: Allows control of ThruPower behavior using one single DMX address, where full closes the relay and any other level is dimmed.  
  • TPDMX: Allows control of ThruPower behavior using two DMX addresses; the first address provides control, the second acts as a mode selector. |
<p>| Firing              | The firing mode of the dimmer module. Options are: Normal, Dimmer Double, or Fluorescent. Specific module types will also offer respectively: Reverse Phase and Thru-Power. |</p>
<table>
<thead>
<tr>
<th>Dimmer Setup screen</th>
<th>Submenu (if applicable)</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Settings</td>
<td>Curve</td>
<td>The current operating curve for the dimmer. Options are: Square, Mod-Square, Linear, Mod-Linear, and more. See Dimmer Curves on page 20 for a complete listing of curves and their descriptions.</td>
</tr>
<tr>
<td></td>
<td>Threshold%</td>
<td>In switched mode the threshold value defines the control percentage at which the output turns on. In dimmed mode, the threshold defines the level at which preheat is applied. See Dimmer Output Diagram on page 25 for an illustration of how threshold works with other dimmer properties.</td>
</tr>
<tr>
<td></td>
<td>On Level%</td>
<td>Latch-Lock only. The control level range (as percentage) that causes the On Time to start counting down. Ranges available in 10% increments. Default is 41–50%. See Latch-Lock on page 7.</td>
</tr>
<tr>
<td></td>
<td>Off Level%</td>
<td>Latch-Lock only. The control level range (as percentage) that causes the Off Time to start counting down. Ranges available in 10% increments. Default is 81–90%. See Latch-Lock on page 7.</td>
</tr>
<tr>
<td></td>
<td>On Time (sec)</td>
<td>Latch-Lock only. The time that a level must be maintained before a circuit is switched on. Available range is 1–360 seconds. Default is 5 seconds. See Latch-Lock on page 7.</td>
</tr>
<tr>
<td></td>
<td>Off Time (sec)</td>
<td>Latch-Lock only. The time that a level must be maintained before a circuit is switched off. Available range is 1–360 seconds. Default is 5 seconds. See Latch-Lock on page 7.</td>
</tr>
<tr>
<td>Patching</td>
<td>DMX A</td>
<td>The DMXA channel to which the circuit is patched.</td>
</tr>
<tr>
<td></td>
<td>DMX A 16-Bit</td>
<td>Control whether the circuit receives 16-bit data from DMX A. Options are Yes or No (Default = No).</td>
</tr>
<tr>
<td></td>
<td>DMX B</td>
<td>The DMXB channel to which the circuit is patched.</td>
</tr>
<tr>
<td></td>
<td>DMX B 16-Bit</td>
<td>Control whether the circuit receives 16-bit data from DMX B. Options are Yes or No (Default = No).</td>
</tr>
<tr>
<td></td>
<td>sACN</td>
<td>The sACN channel to which the circuit is patched. Displayed as either universe/channel or absolute, based on UI Preferences settings (see UI Preferences on page 15).</td>
</tr>
<tr>
<td></td>
<td>sACN 16-Bit</td>
<td>Control whether the circuit receives 16-bit data from sACN. Options are Yes or No (Default = No).</td>
</tr>
<tr>
<td>Dimmer Setup screen</td>
<td>Submenu (if applicable)</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Dimming Settings</strong></td>
<td>Min Scale (VAC)</td>
<td>Set the minimum scale voltage of the circuit. See Dimmer Output Diagram on page 25 for an illustration relating to this property.</td>
</tr>
<tr>
<td></td>
<td>Max Scale (VAC)</td>
<td>Set the maximum scale voltage of the circuit. See Dimmer Output Diagram on page 25 for an illustration relating to this property.</td>
</tr>
<tr>
<td></td>
<td>Regulation</td>
<td>Set whether voltage regulation is enabled for the circuit (Yes/No). Default is Yes.</td>
</tr>
<tr>
<td></td>
<td>Preheat</td>
<td>Set whether the Preheat setting is on (Yes = On). Default = No (off).</td>
</tr>
<tr>
<td></td>
<td>Time (sec)</td>
<td>Preheat Time value allows the preheat level to ramp back in after a blackout to allow rapid snap blackouts. This property specifies the length of time for the ramp back to preheat level. Default = 2 seconds.</td>
</tr>
<tr>
<td></td>
<td>DC Out Prevent</td>
<td>If enabled, ensures that both positive and negative half-cycles of the dimmer output are always equal. This setting is typically used for loads sensitive to DC (for example, transformers and electronic loads). Default is No (No = Off, Yes = On).</td>
</tr>
<tr>
<td></td>
<td>Inrush Protect</td>
<td>Provides a soft-start feature when lamps are turned on from 0 by ramping up the level over three mains cycles. Default is No (No = Off, Yes = On).</td>
</tr>
<tr>
<td></td>
<td>Scale Load</td>
<td>The scale load setting allows hyper-accurate regulation of the voltage of the dimmer output. The scale load allows the CEM3 dimming engine to compensate for power losses occurring in the choke of the dimmer. The scale load is calculated as the load on the channel divided by the channel's capacity (in amperes) and is expressed as a percentage. For example, a 5A load on a 20A channel would have a scale load of 25% (5A/20A x 100% = 25%).</td>
</tr>
<tr>
<td><strong>Panic/Arch Settings</strong></td>
<td>Allow in Panic</td>
<td>Control whether this circuit is included in the panic look.</td>
</tr>
<tr>
<td></td>
<td>Allow in Preset</td>
<td>Control whether this circuit is included in any presets that may be recorded in the future.</td>
</tr>
<tr>
<td></td>
<td>Arch Zone</td>
<td>Number of the zone for which you are setting the Panic/Arch parameters.</td>
</tr>
<tr>
<td><strong>Advanced Features</strong></td>
<td>AF Enabled</td>
<td>Enable or disable advanced features for this circuit. Yes = AF enabled. This field is not available for circuits set to Dimmer Double.</td>
</tr>
<tr>
<td></td>
<td>AF Mode</td>
<td>Set the load reporting mode for this circuit. Options are: Off, No-Load, and Load Change. Default for AF modules is Load Change. This field is only available if the rack property AF Enabled is set to Yes, and the Dimmer property AF Enabled is set to Yes.</td>
</tr>
<tr>
<td></td>
<td>AF Reaction</td>
<td>Set the length of time for an AF reaction to occur. Default = 5 seconds. This field is only available if the rack property AF Enabled is set to Yes, and the Dimmer property AF Enabled is set to Yes.</td>
</tr>
<tr>
<td></td>
<td>Sensitivity</td>
<td>Set the threshold a load can be within before triggering a load error. Available in 0.5A increments. 2A is default. This field is only available if the rack property AF Enabled is set to Yes, and the Dimmer property AF Enabled is set to Yes.</td>
</tr>
</tbody>
</table>
### Rack Property Definitions

Each rack has specific properties that dictate how the rack is identified and functions. Edit these properties in the **Rack Setup** screen (Setup>Rack).

<table>
<thead>
<tr>
<th>Rack Property</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rack Number</td>
<td>Select a rack number between 1–999.</td>
</tr>
<tr>
<td>System Number</td>
<td>Select a system number between 1–999. Default is 1. Changing the system number will require a reboot.</td>
</tr>
<tr>
<td>DMX A</td>
<td>Enable or disable the DMX A port. When <strong>Disabled</strong> the respective <strong>Priority</strong> field is not visible, and <strong>Off</strong> is displayed on the home screen. Default for DMX A is <strong>Enabled</strong>.</td>
</tr>
<tr>
<td>Priority (DMX A)</td>
<td>Visible only when DMX A output is <strong>Enabled</strong>. Configure the priority of the DMX A output signal from the rack. Range is between 1–200 (200 = highest priority). Default is 100.</td>
</tr>
<tr>
<td>DMX B</td>
<td>Enable or disable the DMX B port. When <strong>Disabled</strong> the respective <strong>Priority</strong> field is not visible, and <strong>Off</strong> is displayed on the home screen. Default for DMX B is <strong>Disabled</strong>.</td>
</tr>
<tr>
<td>Priority (DMX B)</td>
<td>Visible only when DMX B output is <strong>Enabled</strong>. Configure the priority of the DMX B output signal from the rack. Range is between 1–200 (200 = highest priority). Default is 100.</td>
</tr>
<tr>
<td>sACN</td>
<td>Enable or disable the sACN port. When <strong>Disabled</strong>, <strong>Off</strong> displays on the home screen. Default for sACN is <strong>Enabled</strong>.</td>
</tr>
<tr>
<td>Arch Priority</td>
<td>Set the priority used for preset playback. Range is between 1–200 (200=highest priority). Default is 100.</td>
</tr>
<tr>
<td>Fan</td>
<td>The length of time (in minutes) the rack fan will stay on after the last load in the rack has reached 0%. Select a time between 30–180 minutes or <strong>Always-On</strong>. Default is 30.</td>
</tr>
<tr>
<td>AF Enabled</td>
<td>Set whether Advanced Features (AF) are enabled (Yes/No). Default is based on the backplane DIP switch setting.</td>
</tr>
<tr>
<td>Presets on Boot</td>
<td>If <strong>Enabled</strong> and the rack is rebooted when a preset (or presets) are active, those same presets will be reactivated when the rack reboots.</td>
</tr>
<tr>
<td>Setup at Home</td>
<td>Set whether <strong>Quick Setup</strong> is displayed on the home screen. Default is <strong>Yes</strong> for portable racks and <strong>No</strong> for install racks.</td>
</tr>
<tr>
<td>Volt High Warn</td>
<td>Set the threshold voltage to report an “over voltage” condition. Default is 140VAC for 100–120VAC systems and 250VAC for 230–240VAC systems.</td>
</tr>
<tr>
<td>Temp High Warn</td>
<td>Set the threshold temperature to report an “over temperature” condition. The range is between 32–158°F (0–70C). Default is 149°F (65C).</td>
</tr>
<tr>
<td>Station Power</td>
<td>Set whether the preset station power supply for this CEM3 is turned on. Default is <strong>Off</strong> (see <strong>Preset Functions</strong> on page 9 for more information).</td>
</tr>
<tr>
<td>Remote Record</td>
<td>Set whether presets can be remotely recorded from preset stations. Default is <strong>No</strong>.</td>
</tr>
<tr>
<td>[Data Loss Behavior]</td>
<td>Opens the <strong>Data Loss Behavior</strong> submenu (see <strong>Setting Data Loss Behavior</strong> on page 34).</td>
</tr>
</tbody>
</table>
Dimmer Curves

Dimmer curves determine voltage output in response to control signal input. To accommodate designer preferences and load response variations, Sensor3 offers several dimmer curves, which can be applied to individual dimmers (see Curve on page 17).

The available curves in CEM3 are as follows.

**Linear**

The linear curve matches the control input percentage to Root Mean Squared (RMS) voltage output. Each percent increase in control level increases dimmer voltage output by the same amount.

![Linear Curve Diagram](image)

**Modified Linear (Mod-Linear)**

A modified linear curve reduces the voltage change at low control levels for better performance in low-wattage fixtures.

![Modified Linear Curve Diagram](image)
Square Law (Square)
At low control levels, much of a traditional incandescent fixture’s light output is in the invisible infrared spectrum. This results in poor visible response to low control levels. A square law curve applies a multiple derived from the square root of the control level (with full output equal to 1.00) to increase voltage response at low control levels to compensate for the infrared loss.

Modified Square Law (Mod-Square)
A standard square law curve may overcompensate for infrared loss, resulting in “steppy” response to incremental control changes at low levels. The ETC modified square law curve applies a second multiple to the standard square law curve for more uniform response to control levels changes across the entire range of dimmer output.
Sensor 2.0
The Sensor 2.0 curve is the previous version of the ETC modified square law curve. It provides backwards compatibility for shows created using earlier versions of ETC equipment and familiar response for designers who prefer the earlier version.

Stage 1
This curve matches the stage curve of the Transtechnik PM90 dimming system.
**Stage 2**
This is a traditional German stage lighting curve.

![Stage 2 Graph](image)

**Fluro1**
This curve is specifically for Nesys fluorescent devices.

![Fluro1 Graph](image)

**Fluro 2**
This curve is tuned to work with common 3-wire fluorescent ballasts.

![Fluro 2 Graph](image)
ANDI
This curve is tuned to match the curve of Strand ANDI dimmer systems.

VIP 90
VIP90 is a curve specifically tuned to produce good dimming performance with the VIP-90 fluorescent ballast from SE Light management AG, commonly used in European theatrical fluorescent luminaires.

Custom
You can use ETC’s Concert software to configure up to five custom curves.
Dimmer Output Diagram

This diagram illustrates the relationship between min scale, max scale, curve, threshold, and preheat for the dimmer output from a CEM3 channel.

With Preheat Disabled
- Output goes to zero

With Preheat Enabled
- Output is at min scale below threshold

Threshold(%)
Chapter 3
Common Tasks

Replacing the CEM3 Processor

When you remove a CEM3 processor from a rack the CEM3 configuration is stored in the backplane. If you replace the processor with a different CEM3 processor you will be prompted to select the desired configuration.

Configuration Selection

When a CEM3 processor that contains an existing configuration is moved to a different rack, the CEM3 will detect that it has been moved and prompt you to select the rack configuration to use. A timer counts down from 15 seconds before defaulting to [Use the Rack Config]. Within 15 seconds you can choose to [Abort] the operation.

- If the rack type is suited to work with the backplane configuration or the CEM3 configuration, you can choose to use either configuration.
- If the rack type is not suited to work with the backplane configuration, you will be given an option to select the backplane configuration or to clear the configuration and generate a new configuration.

Incorrect Version

When switching CEM3 processors, the software version of the backplane may not match the software version of the CEM3. This results in a backplane version mismatch. You can either [Generate New Config] or [Use CEM3 Config].

When switching CEM3 processors, the rack type configuration may not match the configuration set on the backplane switches. If this occurs the CEM3 processor will display a rack mismatch. Select [Generate New Config] to generate a new default configuration.

Recording and Playing Presets

CEM3 has the ability to record and play back snapshot looks called “Presets.”

Presets can be recalled from the CEM3 or from any compatible Echo preset stations or the web interface. For information on wiring preset stations, see the Sensor3 CEM3 Data Terminations Guide and the Echo preset Station Installation Guide.

Up to 64 presets can be recorded for each space, numbered from 1–64. Only one preset can be active at a time in the same space.
Presets are recorded by taking a snapshot of the current levels for all circuits assigned to the space that are set to be included in presets (see Allow in Preset on page 18). If a circuit is not set to be included in presets, any level it is currently using will be withheld from the record action.

**To record or play back a preset:**

1. Set the desired output levels for any dimmers in your rack using any method (methods include [test]>Set Circuits on a CEM3 module, using a DMX source, or using a sACN source).
2. Using the CEM3 face panel, navigate to [test]>Presets. The Select Space screen will appear (if multiple spaces exist).
3. Select the space for which you want to record the preset (if applicable) and then select OK. The Preset screen will open.
4. Select the preset (1–64), and then choose the appropriate options:
   - [Activate/Deactivate]: [Enter] toggles the preset between on and off.
   - [Record]: [Enter] records the current levels for the space to the selected preset.
   - Fade Time(s): Set the desired time (in seconds) for the preset to fade in when activated and fade out when deactivated. Range is from 0–360 seconds. Default is 2 seconds.
5. After you have recorded the preset, release the output levels ([test]>Release Set Levels) or turn off the control source data.
Recording and Playing Sequences

CEM3 has the ability to record and play back a series of steps called Sequences.

Sequences can be recalled from the CEM3 or from any compatible Echo preset stations or the web interface. Only one sequence can be active at a time in the same space.

Sequence Menu

Sequences are recorded by taking a snapshot of the current levels for all circuits assigned to the space that are set to be included in a step. If a circuit is not set to be included in a step, any level it is currently using will be withheld from the record action.

To record or play back a sequence:

1: Set the desired output levels for any dimmers in your rack using any method (methods include [Test]>>Set Circuits on a CEM3 module, using a DMX device, or using a sACN device).
2: Using the CEM3 face panel, navigate to [Test]>>Sequences. The Select Space screen will appear (if multiple spaces exist).
3: Select the space for which you want to record the sequence (if applicable) and then select OK. The Sequence screen will open.
4: The Sequence screen displays your selected space and whether the sequence is active or deactivated. From this menu you can now perform the following actions:
   • [Activate/Deactivate]: [Enter] toggles the sequence on or off.
   • [Edit Steps]: [Enter] opens the Edit Step menu:
     - Step: Set the number of the step that you want to edit (maximum of 6 steps).
     - Fade Time(s): Set the desired time (in seconds) for the sequence to fade in when activated. Range is from 0–360 seconds. The default is 0 seconds.
     - Hold Time(s): Set the desired time (in seconds) for the sequence to hold when activated. Range is from 0–360 seconds. The default is 5 seconds.
     - [Record]: [Enter] records the current levels of the space to the selected sequence step.
     - [Delete Step]: [Enter] deletes the current selected step.
     - [Insert Step After]: [Enter] adds a new step to the sequence.
   • [Auto Setup]: Select Auto Setup to create a sequence to turn on all switched mode circuits. Set the number of steps in the sequence. The maximum is 6.
5: Release the output levels ([Test]>>Release All Arch) or turn off the control source data.
Saving or Uploading Files and Firmware

CEM3 allows you to save configurations to USB removable media, a computer connected to the network (using the CEM3 web interface), or an FTP server on the network. Before you can use an FTP server, you must configure it on the CEM module. See Working with Net3 Conductor Over FTP on page 35.

You can also upload a configuration or update the CEM3 software using the same methods.

Saving Configurations

To USB Media

1: Navigate to [Setup]>File Operations>Save to USB. The Save As screen will appear.
2: If desired, edit the name of the configuration using the scroll wheel and keypad.
   a: Select the file name using the scroll wheel and press [Enter]. The first character of the rack name will be highlighted.
   b: Use the keypad to alter the selected character. Keypad numbers have standard keypad text input letters. Multiple presses of any key will cycle through the number, lowercase letters, and then uppercase letters for that key.
   c: When the desired character is displayed, use the scroll wheel to move to the next character in the rack name. If you want the name to be longer, press [Next] to add another character.
   d: Repeat steps b–c until the desired rack name is displayed.
   e: When the rack name is correct, press [Enter].
3: Select OK and press [Enter]. The configuration will be saved to the device.

To a Computer

To save a configuration to a computer on the system network, see Using the CEM3 Web Interface on page 41.

To an FTP Server

Navigate to [Setup]>File Operations>Save to Server. You can edit the file name prior to saving using the scroll wheel and the keypad to enter letters.

Loading Configurations

From USB Media

2: Use the scroll wheel to navigate the file structure to the desired configuration file (the file name will end in ".etc") and press [Enter]. The configuration will load.

From a Computer

To load a configuration from a computer on the system network, see Using the CEM3 Web Interface on page 41.

From an FTP Server

Navigate to [Setup]>File Operations>Load from Server and choose the desired file from the list that appears (CEM3 configuration file names end in ".etc").
Loading CEM3 Software

You can upgrade your CEM3 software using the same methods as loading configurations (see above). CEM3 software can be obtained by contacting ETC Technical Services (see page 2).

From USB Media

1: Back up the rack configuration using the steps outlined in Saving Configurations on page 29.
3: Use the scroll wheel to navigate the file structure to the desired configuration file (CEM3 software file names will end in “.bld”) and press [Enter]. A confirmation screen will appear.
4: Select Yes to continue, or select No to cancel the upgrade. The software upgrade process will take several minutes.

From a Computer

To load a configuration from a computer on the system network, see Using the CEM3 Web Interface on page 41.

You can also use ETC UpdaterAitor software to upgrade your CEM3. UpdaterAitor can be downloaded from the ETC website at etcconnect.com.

From Net3 Conductor or an FTP Server

Navigate to [Setup]>File Operations>Load from Server and choose the desired file from the list that appears (CEM3 software file names end in “.bld”). See Working with Net3 Conductor Over FTP on page 35 or contact ETC Technical Services for assistance with setting up an FTP Server for use with CEM3.
Setting Up Panic

To fully enable panic functionality for your CEM3, the following criteria must be met:

- A maintained contact closure from a UL924-Listed triggering device has been wired to the panic circuit on the CEM3 backplane (for more information, see the Sensor3 CEM3 Data Terminations Guide that ships with the Sensor3 rack).
- The Emergency Contact switch on the CEM3 backplane is the correct position for the contact closure type, either normally open (NO) or normally closed (NC).
- A snapshot of the desired panic look has been recorded in the CEM3 software.

### Note:
A panic look can be recorded regardless of whether you have a wired panic circuit.

### Note:
To configure panic mode through an electrical override without using the CEM3 module software, order the Hardwired Panic Accessory (7140K1002). Contact your local dealer for more information.

### To set the Emergency Contact switch on the CEM3 backplane:

#### WARNING:
Power must be turned OFF when you perform this procedure. Before removing dimmer or control modules for service, de-energize main feed to dimmer rack and follow appropriate Lockout/Tagout procedures as described in NFPA Standard 70E. It is important to note that electrical equipment such as dimmer racks can present an arc flash safety hazard if improperly serviced. This is due to available large short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

1. Remove the CEM3 control module.
2. Move the switch labeled EMERGENCY CONTACT to the appropriate setting:
   - **NC**: Use this setting if the emergency contact closure is a Normally Closed contact closure.
   - **Disabled**: This setting disables the panic function for this CEM3 control module.
   - **NO**: Use this setting if the emergency contact closure is a Normally Open contact closure.

### To record a panic look:

1. Set the desired output levels for any dimmers in your rack using any method (methods include [Test] Set Circuits on a CEM3 module, using a DMX device, or using a sACN device).
2. Using the CEM3 face panel, navigate to [Setup] Panic Record Panic Look> [Enter]. If a panic look was already recorded, a confirmation screen will appear asking you if you wish to overwrite the panic look.
   - Select Yes/Save to overwrite the old panic Look. The new look will be saved.
   - Select No/Cancel to cancel overwriting the old panic look.

After a panic look is recorded, the panic look will be activated when the emergency contact closure is triggered. When the contact closure is returned to its normal state, the panic look will be deactivated.
Other Panic Settings

In the Panic Setup menu ([Setup]>Panic) you can configure the following panic settings:

- **In Delay (sec)**: Length of time (in seconds) for the panic look to delay before activating (default is 0)
- **Out Delay (sec)**: Length of time (in seconds) for the panic look to delay before deactivating (default is 0). To require manual intervention to turn off panic from the face panel or via ACN, press [Last] when Out Delay is set to 0 or use the scroll wheel to select Man.
- **Fade In (sec)**: Length of time (in seconds) for the panic look to fade in when activated (default is 2)
- **Fade Out (sec)**: Length of time (in seconds) for the panic look to fade out when deactivated (default is 2)
- **Shed Other Loads**: This Yes/No setting determines if active levels at the moment of the panic trigger should remain active or be forced off. Default is N (No).

The following image illustrates how these settings affect panic function.
Patching

Patching governs the relationship between control sources (DMX A, DMX B, and sACN) and the rack’s circuits, and is editable from the CEM3 face panel. Typically, repatching is used in portable rack situations where the dimmer rack must adapt to different control sources and lighting systems. For permanent rack installs, repatching is rarely needed.

You can patch racks that have only one assigned space using one of two methods: manual or automatic. Racks with multiple assigned spaces can only be edited manually. For racks edited using an automatic method, circuits will be numbered sequentially from the specified starting address following the designated Balance setting (Straight, 1-Phrase, or 3-Phase) in Quick Setup. See Performing a Quick Setup on page 4.

Any circuit set to a patch of 0 cannot be controlled from the data source specified.

Automatic Patching

Automatic patching is the final step in the Quick Setup utility. See Performing a Quick Setup on page 4.

Manual Patching

Note: Module density can affect patching. Prior to patching, make sure you set up the module type in [Setup] > Circuit Assignment.

Manual patching allows you to patch on a circuit-by-circuit basis. There are two independent options for manual patching: DMX and sACN. Both can be set individually for your needs.

1: Navigate to [Setup] > [Patching], and then select either Edit DMX Patch or Edit sACN Patch.
2: Press [Enter]. The Select Space screen will appear (if multiple spaces exist).
3: Select the desired space (if applicable) and then select OK. The Patch Table will open.
4: Use the scroll wheel or keypad to select the DMX port (A or B) or sACN universe and channel for the desired circuit.
5: Press [Enter]. The field will become editable.
6: Scroll to or enter the desired channel from the keypad.
7: Press [Enter].
8: Repeat steps 4–7 for all desired circuits in the space.
10: Select the appropriate option:
    • [Yes/Save]: Save the changes
    • [No/Cancel]: Cancel the changes
    • [Continue Editing]: Edit additional circuits
11: Repeat steps 2–10 for any additional spaces.
Setting Data Loss Behavior

You can designate the rack's reaction to a loss of data from any of the three data ports (DMX A, DMX B, or sACN). For each of the ports you can select one of the following behaviors:

- **Crossfade**: On loss of data, the look will transition to a specified internal preset (DMX only).
- **Wait & Fade**: On loss of data, the rack will wait for a specified amount of time and then fade to black over another specified time.
- **Hold Last Look**: On loss of data, no transition occurs. The levels will stay at the last known look until data is restored to the port. Resetting the processor will release the levels.
- **Hold Last Source**: On loss of data, if other sources are available the rack will switch to them. Otherwise, the levels will switch to whichever source was most recently lost.

To set the data loss behavior for any port:

2: Use the scroll wheel to highlight the desired port behavior (DMX A, DMX B, or sACN) and press [Enter]. The behavior will be highlighted.
3: Use the scroll wheel to select the desired behavior (see above) and press [Enter].
   a: Select Fade Time (if applicable) and set the desired time (range is 0–360 seconds).
   b: Select Wait Time (if applicable) and set the desired time (range is 0–360 seconds).
   c: Select Preset Space (Crossfade only) and select the space that contains the desired crossfade preset.
   d: Select Preset Number (Crossfade only) and select the desired preset (1–64) for the crossfade.
4: Repeat for the remaining data ports if desired.

Setting Up CEM3 on the Network

Network setup allows editing of the CEM3 network properties to establish the rack's IP address. Three options for setting network characteristics are available: Link Local, DHCP, and Custom. The default is DHCP.

You can access this menu by navigating to [Setup]>Network>[Enter]. After the desired method is set, a confirmation window will open asking you to confirm or cancel the changes.

**Link Local**

Choose Link Local if you work in a touring system where equipment changes frequently. Link Local automatically assigns a randomly generated IP address within a given range.

**DHCP**

Choose DHCP if your system includes a DHCP server (for example, an Eos console).

This setting will attempt to acquire an IP address from a DHCP server. If the request fails, CEM3 will acquire its address through Link Local (see above) for this boot cycle only. If rebooted, the rack will attempt a DHCP request again.

**Custom**

With this method you can set the IP address (IP), Subnet (SN), and Gateway (GW) using the keypad. The ETC convention for IP addressing is 10.101.xxx.yy (“x” varies by ETC product line, “y” is an incremental value for products of the same type).
Network Setup for Redundant Tracking Racks

The Redundant Tracking option is only available for ESR and FDX systems.

In a redundant tracking system, each processor has a separate network connection to which a separate IP address may be assigned. When working in a redundant tracking system CEM3 will prompt you to select the processor (A or B) for which you want to change the IP settings.

Working with Net3 Conductor Over FTP

CEM3 supports automatic or manual backup of the dimmer rack configuration to a server on an Ethernet network using the FTP (File Transfer Protocol) standard. See Saving or Uploading Files and Firmware on page 29. By default, CEM3 is configured to interact with Net3 Conductor.

Before you can save to Conductor, you must set up the server from the CEM3 face panel.

To set up a Net3 Conductor server from CEM3:

2: Press [Enter] to change Enabled to Yes.
3: Specify the IP address of the Net3 Conductor.
4: Specify the file name in Filename.
5: Set the AutoSave option:
   • Yes: Every time a change is applied to the configuration, it will be saved to the server.
   • No: You must manually save configuration changes to the server.

Upgrades and CFG Path display the upgrade file path and configuration path where files will be stored on Conductor.

Contact ETC Technical Services for assistance with configuring an FTP Server for use with CEM3.

Setting Rack DIP Switches and Termination

WARNING: To avoid the possibility of electric shock, power must be turned OFF when you perform this procedure. Before removing dimmer or control modules, de-energize main feed to dimmer rack and follow appropriate Lockout/Tagout procedures as described in NFPA Standard 70E. It is important to note that electrical equipment such as dimmer racks can present an arc flash safety hazard if improperly serviced. This is due to available large short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

On the CEM3 backplane, located in the rack behind the CEM3 control module, there is a small bank of 8 DIP switches. These switches were set when your system was commissioned by an ETC technician to match the specific size, features, and desired behavior of your dimmer rack. Generally, you will not need to alter these settings after commissioning. However, in the event that you must replace your CEM3 control module or backplane, you will need to ensure these settings match the previous controller.

Use this section to determine the required settings for your dimmer rack. There is also a label on the underside of the CEM3 that explains the function of each switch.

When setting the DIP switches, you may also need to check the DMX A and DMX B termination settings for the rack. See the backplane label to determine the appropriate position of the termination switch.
DIP Switch Settings

The eight DIP switches relate to behavior, features, or the module size of the rack. In the descriptions below, switches set in the up position are On and switches set in the down position are Off.

**DIP 1 : DBM**

This switch disables the backplane memory so that the configuration is not stored on the rack itself. Default is Off.

**DIP 2 : AF**

This switch should be set to On if your rack has Advanced Features (see *Advanced Features (AF)* on page 6).

**DIP 3 : HSR 240V**

This switch should be set to On if your rack is an HSR rack intended for use with 240 VAC power feeds.

**DIP 4 : ESR 230V**

This switch should be set to On if your rack is an ESR rack intended for use with 230 VAC power feeds.

**Note:** For JSR dimmer racks intended for use with 100 VAC power feeds, both DIP 3 and DIP 4 should be set to On.

**DIP 5 : ND**

This switch should be set to On if your rack includes a neutral disconnect.

**DIPs 6–8**

These DIP switches are used together to determine the number of module slots in your rack. Refer to the table below to find the desired settings for your rack size.

<table>
<thead>
<tr>
<th>Rack size</th>
<th>DIP Number</th>
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<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td>6 module slots</td>
<td>Off</td>
</tr>
<tr>
<td>12 module slots</td>
<td>Off</td>
</tr>
<tr>
<td>24 module slots</td>
<td>Off</td>
</tr>
<tr>
<td>36 module slots</td>
<td>On</td>
</tr>
<tr>
<td>48 module slots</td>
<td>Off</td>
</tr>
</tbody>
</table>

DMX Termination Switches

DMX signal requires a signal termination at the end of a data run. If your rack is the last device on the data run for either DMX A or DMX B, set the termination switch for the appropriate run to ON. The switches are labeled B or A on the backplane label.

If the rack is not the last device on either data run, leave these set to Off.
Maintaining and Cleaning the Rack

Proper air flow is necessary for your Sensor3 rack to function properly and consistently. Perform the following procedures regularly to keep dust and foreign debris from impeding the proper function of your rack.

Cleaning Rack Air Filters

Clean the air filter in the Sensor3 rack door a minimum of every six months, more often if your system operates in a dusty environment. This will also provide an opportunity to inspect the dimmer module air vents and clean them if necessary (see Vacuuming Dimmer Modules on page 38).

To clean your rack air filter:

1: Open the dimmer rack door. The air filter is mounted on the inside of the door, secured by a metal lip at the bottom of the door frame.

2: Slide the filter upwards approximately 0.5 in. (1.25 cm) until the base of the filter clears the top of the metal lip.

3: Pull the bottom of the air filter out and away from the door far enough to clear the retaining lip and slide the filter downwards and out of the door frame.

4: In an area away from your dimmer rack and other dust-sensitive equipment, remove all dust or debris from the filter using either compressed air or a vacuum.

5: Slide the top of the filter up into the slot at the top of the door until the base clears the metal retaining lip at the bottom.

6: Ease the filter back into the door frame and carefully let it drop back into place.

Note: Sensor3 48-module racks have two filters, one stacked on top of the other with a retention bar in the middle of the rack. Remove the top filter screen before removing the bottom one.

CAUTION: You may rinse the filter under cold tap water, but it must be completely dry before you reinstall it. Do not use soap or other chemical cleaners to clean the filter. They may damage the filter screen.

Note: For Sensor3 48-module racks, install the bottom filter first. The top filter rests on the top edge of the bottom filter.
Vacuuming Dimmer Modules

As with cleaning the air filters, you should inspect the dimmer module air vents and SCR power cube inlets every six months and clean if necessary. Clean with greater frequency if your system operates in a dusty environment.

**WARNING:** To avoid the possibility of electric shock, power must be turned OFF when you perform this procedure. Before vacuuming dimmer or control modules de-energize main feed to dimmer rack and follow appropriate Lockout/Tagout procedures as described in NFPA Standard 70E. It is important to note that electrical equipment such as dimmer racks can present an arc flash safety hazard if improperly serviced. This is due to available large short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

Do not remove dimmer modules when vacuuming. Phase voltages inside the rack can be deadly, and therefore only qualified technicians should be allowed to remove modules and expose the inside of the dimmer rack.

To vacuum the dimmer module air inlets:

1: Open the rack door and inspect the air vents on the CEM3 and the air vents and SCR power cube inlets on the dimmer modules for any collection of dust or other debris.

2: If necessary, use a vacuum cleaner and nozzle to remove any visible dust or other accumulated matter from the front of the modules without removing them from the rack. Most dust collects on the dimmer choke vents and SCR power cube air inlets of the modules (shown below).

**CAUTION:** Be careful not to push any foreign matter into the module.

3: Close the rack door when you are finished vacuuming.
Replacing AF Cards

AF cards are located on the right side of the dimmer module slot between the copper neutral busses and the dimming circuitry cards.

**WARNING:** To avoid the possibility of electric shock, power must be turned OFF when you perform this procedure. Before removing modules or AF cards de-energize main feed to dimmer rack and follow appropriate Lockout/Tagout procedures as described in NFPA Standard 70E. It is important to note that electrical equipment such as dimmer racks can present an arc flash safety hazard if improperly serviced. This is due to available large short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

Phase voltages inside the rack can be deadly, and therefore only qualified technicians should be allowed to remove modules and expose the inside of the dimmer rack.

To replace the AF cards:

1. Note the module types and positions, and then remove the modules from the rack.
2. Remove the old AF cards by flipping the white tab on the cards into the down position.
3. Pull the old cards out of the slots.
4. Set the DIP switches on the new cards according to the chart below. Only the first two DIP switches are used.
5. Flip the white tab up to prevent it from interfering with the dimmer module.
6. Slide the new AF cards completely into the vacant slots starting with card #1 in the top. The number of cards depends on rack size (see table below).

### AF Card Addressing

<table>
<thead>
<tr>
<th>Card</th>
<th>SR3-6</th>
<th>SR3-12</th>
<th>SR3-24</th>
<th>SR3-48</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<table>
<thead>
<tr>
<th>Card</th>
<th>ESR3-36</th>
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<tbody>
<tr>
<td>1</td>
<td>ESR3-36</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
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</tr>
</tbody>
</table>

Common Tasks 39
Restoring Rack Defaults

Restoring rack defaults is a fast way to completely reset all rack settings back to their original state. This feature is only intended for users with touring or portable racks where a complete reset is a common requirement.

Restoring defaults on an installed rack is not recommended unless you are expressly told to do so by ETC Technical Services.

| CAUTION: | Restoring rack defaults will erase all rack data. Do not perform this procedure unless you absolutely intend to restore the rack back to its original factory settings. |

To restore the factory defaults to your CEM3:

1: Save a backup of the rack configuration (see Saving Configurations on page 29).
2: Press and hold [Setup].
3: Tap [Reset], found in the upper left corner of the CEM3 interface.
4: Continue holding [Setup] until the Deep Clear screen appears.
5: Select Yes to clear all rack settings and restore the factory defaults, or select No to cancel.
This chapter describes the CEM3 web interface and the Sensor3 ThruPower System Reporter.

**Using the CEM3 Web Interface**

CEM3 features a basic web interface accessible over the system network using any internet browser that allows you to view the system status, perform some basic functions, update software, and upload or download the rack configuration.

*To access the CEM3 over the network:*

1. Connect an internet browsing device (such as a computer or mobile device) to the system network. You can connect using the network connector on the face of the CEM3.
2. Set the connected device to the proper IP address range if using a system of fixed IP addresses. If your system uses dynamically assigned addresses (DHCP), your address will be assigned from the system server.
3. Open an internet browser on the connected device.
4. In the browser address bar, enter the IP address of the CEM3 you wish to view. The address can be found by navigating to [Setup] > [Network] and noting the digits in the IP: field. The CEM3 System page will appear in the browser.

The home page menu provides access to the five available pages of the interface: System, Dimmers, Set Levels, Setup, Presets, and Files.

**System**

This page displays the software and power information for the rack, as well as any currently active error messages.

**Dimmers**

This page allows you to view the current status of all circuits in the rack.
Set Levels

This page allows you to set and release levels for any circuit in the rack.

You can use the displayed keypad or a connected keyboard to input commands into the green command window.

Once the command line reaches complete syntax it will be automatically entered as signified by a ‘*’ at the end of the command line.

- Select the desired space using the Select Space field at top (if applicable).
- Use the and button and thru button to select multiple circuits or ranges of circuits.
- Use the A/B button to specify any dimmer doubled circuits (if applicable).
- Use the rel button to release channels.
- Use Release All to release all current levels.
- Use Previous and Next to cycle through successive channels.
- Clear clears the command line.

Setup

This page allows you to alter the Control Mode or Curve for any circuit in the rack. Click Apply Changes when you have completed all the desired changes.

Presets and Sequences

Use this page to activate or deactivate a sequence or activate, deactivate, or record a preset for a selected space. For more information on presets, see Recording and Playing Presets on page 26, and for more information on sequences, see Recording and Playing Sequences on page 28.
Files

This page allows you to upload CEM3 firmware or configurations as well as download the current rack configuration.

1: To upload a file, select the file type (Configuration or Firmware) by clicking the appropriate box at top.
2: Use the Browse button to navigate to the desired file on your connected device.
3: Once the file is selected, click Begin Upload.

Using the Sensor3 ThruPower System Reporter

The Sensor3 ThruPower System Reporter app allows you to scan QR codes affixed to distribution using a smart device (smartphone, tablet, etc.) and configure the relevant dimmer.

The ThruPower app is available for download from the App Store® Store (Apple iOS) and Google Play™ store (Android devices).

1: Make sure that your device is connected to a wireless network with access to the racks that you want to configure.
2: Start the ThruPower app. When the app opens, the camera on your smart device becomes active.
3: Center the QR code affixed to the distribution for the dimmer that you want to configure on your smart device screen. The app identifies the QR code and prompts you to configure the dimmer or cancel the action.
4: Tap Configure. The app searches for the associated dimmer.
   • If only one dimmer is associated with the QR code, the Configure Dimmer screen displays.
   • If several dimmers are associated with the QR code that you scanned, the app displays the dimmer names. Tap the dimmer that you want to configure. The Configure Dimmer screen displays.
   • If the app cannot find the associated dimmer, tap Search Manually at the bottom of the screen and enter search criteria to identify the dimmer.
5: Modify the dimmer information as needed. See Dimmer Property Definitions on page 16 for information on dimmer configuration parameters.
Appendix A

CEM3 Menu Flow Chart

The following screens and menus are covered in this section:

- **Boot Screen**
  - Normal Operation
  - Rack Type Mismatch
  - Configuration File Conflict
  - Backplane Mismatch
- **Home Screen**
  - Normal Operation
  - Panic
  - AF Card Upgrade
  - Battery Backup or RideThru Active
  - Redundant Tracking
- **Quick Setup and Info** menus flow chart. For further information, see Performing a Quick Setup on page 4.
- **Test** menu flow chart. For further information, see Test on page 12.
- **About** menu flow chart. For further information, see About on page 13.
- **Setup** menu flow chart. For further information, see Setup on page 14.
Boot Screen

Normal Operation

![Diagram of CEM3 Menu Flow Chart]

Rack Type Mismatch

This boot screen is shown if the rack type in the CEM3 configuration does not match the rack type detected from the backplane and there is no communication with the backplane processor.

Configuration File Conflict

This boot screen is shown if the CEM3 and the backplane have different configuration files that are both valid for the detected rack type.

Backplane Mismatch

This boot screen is shown if the version of the binary configuration saved in the backplane does not match the version of the CEM3 and the backplane cannot be read.
Home Screen

Normal Operation

Rack #1 - CEM3 Rack
System OK
Presets Active
DMX A: Off  DMX B: Off
sACN: 1/1

[Quick Setup] [Info]

Panic

Rack #1 - CEM3 Rack
System OK
Presets Active
DMX A: Off  DMX B: Off
sACN: 1/1

[Quick Setup] [Info]

AF Card Upgrade

Rack #1 - CEM3 Rack
Upgrading AF Card #1
Presets Active
DMX A: Off  DMX B: Off
sACN: 1/1

[Quick Setup] [Info]

Battery Backup or RideThru Active

Rack #1 - CEM3 Rack
System OK
Presets Active
DMX A: Off  DMX B: Off
sACN: 1/1

[Quick Setup] [Info]

Redundant Tracking

Processor A in Control

Rack #1 - CEM3 Rack
System OK
Presets Active
DMX A: Off  DMX B: Off
sACN: 1/1

[Quick Setup] [Info]

Redundant Tracking

Processor B in Control

Rack #1 - CEM3 Rack
System OK
Presets Active
DMX A: Off  DMX B: Off
sACN: 1/1

[Quick Setup] [Info]

Redundant Tracking
Quick Setup and Info

(General Notes: Select [Abort] on any screen to return to the home screen.
Quick Setup) is shown on the home screen if the rack property “Setup at Home” is set to Yes. See Rack in the Setup menu flow chart.

Module Types and Modules displayed vary by rack type. Modules with no configurable settings (AFM, CC) are not displayed.

This screen is shown for SR or SP type racks only.

Patch mode Universe Split is not available when dimmer doubling.

View/Clr Errors: [All]
General Note: Rig Check options are only available in racks with AF enabled and are not available in non-AF and FDX racks.

Note:
This screen is not shown if lugs in the rack are configured to one space.

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About

Select Space

Space: [1] Space1

[Cancel] OK

About Dimmer

Circuit:
Space: 1
Rank: 1
Level: 0%

Control Src: sACN
Ctrl Mode: Dimmable
Recorded Load: 0.0A
Actual Load: 12.0A

Note:
Select an error and press Enter to clear it. If the error cannot be cleared, it will stay in the list.

About Rack 1

Name: CEM3 Rack

Rack Type: SR48
CPU Temp: 97°F
Temp 1: 34°C
Temp 2: 22°C
Status: Errors Exist
Ver: 1.6.1.9.0.XX

Patch:
DMXA: 1 ~ 96
DMXB: 1 ~ 96
sACN: 1/1 ~ 1/96

Panic State: Ready

About

Source Information

Space: 1
Ckt    HTPSource Lvl
1       Preset 33 33%
2       sACN      FL%
3       SetLevels 55%
4       ACNDirect FL%
5       sACN      45%

About CEM3

ETC CEM3 v1.6.1
To save a copy of the user manual, insert a USB key and press enter.

[Save Manual]
CEM3 Menu Flow Chart

Setup

Select Space

Setup

Select Module Type

Select Module

Control Mode

Firing Mode

Patching

Drawing Settings

Panic/Arch Settings

Advanced Features

Select Space

Setup

Module Types and Module Types are not shown if the system has only one space.

This screen is not shown if the system has only one space.

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Temp High Warn is in Fahrenheit (F) or Celsius (C) depending on the Temp Locale setting in Setup/UI Preferences.
Appendix B

Error Messages

The table below lists all of the possible error/status messages that may be listed on the CEM3 display followed by the probable cause and any possible corrective action to remedy the error.

If you have any problems resolving errors, or do not feel comfortable performing the corrective action, contact ETC Technical Services (see Help from ETC Technical Services on page 2).

WARNING: To avoid the possibility of electric shock, power must be turned OFF before removing dimmer or control modules. Prior to any action that involves removing any module, de-energize main feed to dimmer rack and follow appropriate Lockout/Tagout procedures as described in NFPA Standard 70E. It is important to note that electrical equipment such as dimmer racks can present an arc flash safety hazard if improperly serviced. This is due to available large short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

Phase voltages inside the rack can be deadly, therefore only qualified technicians should be allowed to remove modules and expose the inside of the dimmer rack.

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
<th>Possible Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Temp High</td>
<td>The temperature detected at the CEM3 has exceeded the limit set under the Temp High Warn option in [Setup]&gt;Rack</td>
<td>Decrease ambient temperature, or adjust temperature warning level. Ensure that fan is functioning properly.</td>
</tr>
<tr>
<td>DMX Error Port A</td>
<td>The DMX signal on port A is corrupt or invalid</td>
<td>Check DMX wiring and termination</td>
</tr>
<tr>
<td>DMX Error Port B</td>
<td>The DMX signal on port B is corrupt or invalid</td>
<td>Check DMX wiring and termination</td>
</tr>
<tr>
<td>No DMX Port A</td>
<td>No DMX signal is detected on port A</td>
<td>Check DMX wiring, termination or transceiver chip</td>
</tr>
<tr>
<td>No DMX Port B</td>
<td>No DMX signal is detected on port B</td>
<td>Check DMX wiring, termination or transceiver chip</td>
</tr>
<tr>
<td>Frequency Error</td>
<td>The power frequency is out the supported range of 47–63Hz</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase A Off</td>
<td>No power is detected on Phase A</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase B Off</td>
<td>No power is detected on Phase B</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase C Off</td>
<td>No power is detected on Phase C</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase A Volts High</td>
<td>The power on phase A is above the volts high warning level (in [Setup]&gt;Rack)</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Message</td>
<td>Cause</td>
<td>Possible Corrective Action</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>Phase B Volts High</td>
<td>The power on phase B is above the volts high warning level (in [Setup]&gt;Rack)</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase C Volts High</td>
<td>The power on phase C is above the volts high warning level (in [Setup]&gt;Rack)</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase A Volts Low</td>
<td>The voltage on phase A is below the minimum required value for the CEM3</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase B Volts Low</td>
<td>The voltage on phase B is below the minimum required value for the CEM3</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase C Volts Low</td>
<td>The voltage on phase C is below the minimum required value for the CEM3</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase A Overvolts</td>
<td>The voltage on phase A is above the maximum value for the CEM3</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase B Overvolts</td>
<td>The voltage on phase B is above the maximum value for the CEM3</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Phase C Overvolts</td>
<td>The voltage on phase C is above the maximum value for the CEM3</td>
<td>Check the incoming power supply to the rack. Contact a qualified electrician.</td>
</tr>
<tr>
<td>Rack Memory Error</td>
<td>The CEM3 is unable to communicate with the memory chip on the backplane</td>
<td>Check the CEM3 is seated correctly; Replace backplane</td>
</tr>
<tr>
<td>Rack Detect Error</td>
<td>The CEM3 is unable to detect the rack type from the DIP switches on the backplane</td>
<td>Check the CEM3 is seated correctly; Replace the backplane</td>
</tr>
<tr>
<td>Fan Fail</td>
<td>The CEM3 detects that the rack fan is drawing current outside the expected value</td>
<td>Check the rack fan and fan fuse.</td>
</tr>
<tr>
<td>Config Rejected</td>
<td>A config was loaded that contained invalid data or values</td>
<td>Regenerate configuration; contact ETC Technical Services</td>
</tr>
<tr>
<td>AF Card Error 1</td>
<td>The CEM3 is unable to communicate with AF card 1</td>
<td>Check the AF cards and CEM3 are seated correctly; Check rack hardware for damage. Check DIP switch settings.</td>
</tr>
<tr>
<td>AF Card Error 2</td>
<td>The CEM3 is unable to communicate with AF card 2</td>
<td>Check the AF cards and CEM3 are seated correctly; Check rack hardware for damage. Check DIP switch settings.</td>
</tr>
<tr>
<td>AF Card Error 3</td>
<td>The CEM3 is unable to communicate with AF card 3</td>
<td>Check the AF cards and CEM3 are seated correctly; Check rack hardware for damage. Check DIP switch settings.</td>
</tr>
<tr>
<td>AF Card Error 4</td>
<td>The CEM3 is unable to communicate with AF card 4</td>
<td>Check the AF cards and CEM3 are seated correctly; Check rack hardware for damage. Check DIP switch settings.</td>
</tr>
<tr>
<td>AF Card 1 Loading</td>
<td>AF card 1 is loading software</td>
<td>Wait until software load has completed</td>
</tr>
<tr>
<td>AF Card 2 Loading</td>
<td>AF card 2 is loading software</td>
<td>Wait until software load has completed</td>
</tr>
<tr>
<td>AF Card 3 Loading</td>
<td>AF card 3 is loading software</td>
<td>Wait until software load has completed</td>
</tr>
<tr>
<td>AF Card 4 Loading</td>
<td>AF card 4 is loading software</td>
<td>Wait until software load has completed</td>
</tr>
<tr>
<td>Message</td>
<td>Cause</td>
<td>Possible Corrective Action</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>AF Dim Removed &lt;Dimmer Nr&gt;</td>
<td>AF detects that a dimmer has been removed</td>
<td>Reinsert dimmer; check dimmer module</td>
</tr>
<tr>
<td>AF Bkr Trip &lt;Dimmer Nr&gt;</td>
<td>AF detects that a dimmer circuit breaker has tripped</td>
<td>Reset circuit breaker; check dimmer module</td>
</tr>
<tr>
<td>AF RCD Trip &lt;Dimmer Nr&gt;</td>
<td>AF detects that a dimmer circuit with RCD has tripped due to earth leakage</td>
<td>Reset circuit breaker; check dimmer module and load</td>
</tr>
<tr>
<td>AF Load High &lt;Dimmer Nr&gt;</td>
<td>AF detects that the current load on a circuit is higher than the recorded load</td>
<td>Check load/lamps</td>
</tr>
<tr>
<td>AF Load Low &lt;Dimmer Nr&gt;</td>
<td>AF detects that the current load on a circuit is lower than the recorded load</td>
<td>Check load/lamps</td>
</tr>
<tr>
<td>AF No Load &lt;Dimmer Nr&gt;</td>
<td>AF detects that there is no load on a circuit</td>
<td>Check load/lamps</td>
</tr>
<tr>
<td>Dim Overtemp &lt;Dimmer Nr&gt;</td>
<td>An overtemperature condition has been detected on a dimmer module</td>
<td>Clear the error from the home screen and see if it returns. Check rack cooling fan is running and that room is in recommended temperature range. If normal temp, replace module.</td>
</tr>
</tbody>
</table>
Appendix C
Redundant Tracking Systems

CEM3 features the ability to support dual redundant controllers in ESR24, ESR36 and ESR48 rack types, as well as in the FDX3000 rack.

Redundant controllers provide extra security in the event of system failure, allowing a secondary processor to immediately take control of the rack.

**Redundant Tracking Switch**

The redundant tracking switch determines which controller runs the output to the dimmers. It has three positions.

- When the switch is set to A (upper position), the upper controller has control of the dimmers.
- When the switch is set to B (lower position), the lower controller has control of the dimmers.
- When the switch is set to Auto (center position), control is automatically allocated based on the health of the system (see below for details).

**Automatic Control**

Typically, in a redundant tracking system, the switch should be left in the auto position. When the switch is set to auto, the A processor will have control by default. Control will switch to B when any of the following events occur.
Loss of network

If network connectivity is lost to one processor but not the other, control will switch to the one which still has network connectivity.

Loss of DMX

If DMX is lost by one processor but not the other, control will switch to the one still able to receive DMX (note that the DMX data line is interconnected between both, so this would only occur in the event of the failure of a DMX transceiver on the processor itself).

Power errors

If one processor experiences power errors but the other does not, control will switch to the one that does not. Again, note that the same power is connected to both processors so this would only occur in the event of an internal failure in the processor.

Total processor loss

If communication is completely lost to one processor but not the other, then control will switch to the processor which is still available.

Display Status

When tracking is active and the A processor is in control, the displays will show as follows:

Processor A

Rack 1 - CEM3 Rack
System OK
DMXA: 1
DMXB: Off
sACN: 2/1

Processor B

CEM3 Control
Backup Ready
When control switches to the B processor (either by automatic failover or manual control using the switch), the displays change to the following:

![Display Change](image)

The switchover from A to B for dimming happens instantaneously, so that control of lights is not lost. However, the switchover of the user interface has built in hysteresis to eliminate bounce in certain circumstances (for example, when DMX is lost, both processors may not see and account for the DMX loss at exactly the same time). For this reason it may sometimes appear to take a long time for the user interface of the backup unit to start up; however, bear in mind that despite this apparent delay, dimming control always transfers near-instantaneously.

**Configuration Management in Redundant Tracking Systems**

In a tracking CEM3 system, the two processors automatically communicate and synchronize their configurations though the backplane. No external Ethernet network is needed for the two processors to synchronize data.

Once you make a configuration change on one processor, that change is automatically transferred to the second processor.

When the system boots up, it is assumed that the A processor has the most recent configuration, so the configuration will be automatically transferred from A to B if B has a different configuration.

**Firmware Upgrades in Redundant Tracking Systems**

When you upgrade firmware in a redundant system (either via the network or using a USB key), the firmware upgrade is automatically transferred to both processors. Once the firmware is transferred the upgrade will occur on both processors simultaneously. Therefore it is not necessary to update both processors independently in a rack.
Appendix D
FDX 3000 Dimmer Racks

CEM3 may be used as a control module in the ETC FDX3000 dimming system, providing networking facilities, dual redundant control modules, and precision 16-bit dimming. This appendix provides information needed to work with CEM3 in an FDX3000 system, as well as outlining the hardware of your FDX3000 rack.

Hardware

Front Panel
The FDX3000 carrier contains two CEM3 modules in a dual redundant configuration.

PSU Indicators
The PSU indicators show the status of the two internal power supplies that supply the 15 VDC required by FDX dimmer modules.

The two indicators should be lit at all times. If either is not lit, this could indicate a failure of the internal power supply. If you see this condition, contact ETC Technical Services (see page 2).

Redundant Tracking Switch
The redundant tracking switch allows you to test the ability to switch from the upper (A) processor to the lower (B) processor. If it is set to the (A) or (B) position, the A or B processor will preferentially have control. In normal operation, the switch should be set to the center Auto position. This will ensure that A has control unless communication is lost to A, or certain hardware failures occur on A but not B (for example if A does not see DMX but B does).
Rear Panel

**Dimmer Outputs**

The dimmer outputs connect from the FDX3000 processor to the dimmer module trays. They should generally be preconfigured from the factory. They are grouped in blocks of 12 dimmers, from A (1–12) through H (85–96).

**Feedback**

The feedback connections allow the FDX3000 to determine the status of voltage and current for modules that support sensing. The two feedback connections should be made from the factory.

**15 VDC**

The 15 VDC connection provides 15 V power to the FDX dimmer modules.

**Option Connector**

The option connector allows field connection of the rack options such as panic (see page 31), stations (see page 10), and a remote beacon. For information on these connections, see the termination markings on the rear of the FDX3000 carrier.

**DMX Connections**

The FDX3000 processor features DMX In and Thru connections on two industry-standard 5-pin XLR connectors. The two DMX ports, A and B, are fed to both of the redundant processors.

**Ethernet Connections**

Two Ethernet connections are provided using Neutrik® etherCON® connectors, which may be either connected to a Neutrik etherCON jack or a standard RJ45 connector. Net A connects to the A (upper) CEM3, and Net B connects to the lower. The CEM3s feature an internal switch allowing use of the rear and front panel Ethernet connections at the same time.

**Power Input**

The power input connector is a three phase supply, fed from the supply in the rack. The FDX3000 processor will function regardless of any phase loss; as long as at least one phase is still active the processor will still dim any dimmers which still have power.
**Fuses**

The power input has three panel-mount fuse holders to protect against internal failure. The fuses should only be replaced with the same type (2.5 A, 20 mm).

**Regulatory Information**

The FDX3000 rack is certified to the following CE standards:

- Safety: EN61439-1 (Low voltage Switchgear and Controlgear assemblies)
- Electromagnetic Immunity: EN61547 (EMC Immunity for Lighting Systems)

**Initial Setup**

**Module Count**

The FDX3000 controller supports between 1 and 96 dimmers. The number of dimmers is configured using DIP switches on the backplane of the controller.

To configure or alter the number of modules configured in your FDX system:

1. Turn off power to the rack.
2. Remove the two CEM3 modules from the FDX3000 carrier.
3. Set the DIP switches in binary to the number of modules in your rack. The DIP switches are counted from left to right as follows:

   ![DIP Switch Configuration]

   For example, to set up the rack for 96 modules, set DIP switches 32 and 64 to ON.
4. Reinstall the CEM3 modules.
5. Power up the rack.

**Module Types**

The following module types are supported in FDX:

- **Blank**: Used where a blank plate is fitted; gives no control and no feedback
- **NoV-NoI**: A dimmer module with no current or voltage feedback
- **V-NoI**: A dimmer module with voltage feedback but no current feedback
- **NoV-I**: A dimmer module with current feedback but no voltage feedback
- **V-I**: A dimmer module with voltage and current feedback

**Advanced Features in FDX**

FDX3000 supports all module types available in the FDX series of racks, including the DP90 and DP90S series of modules.

Advanced Features in an FDX rack allow modules that provide Voltage or Current feedback data to be monitored and to report errors both at the local UI and at ETC console products and feedback software.
Feedback Modes and Module Types

FDX modules may be set to one of the following module types:

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Purpose</th>
<th>Error Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoV-NoI</td>
<td>Module provides no monitoring</td>
<td>No AF Error messages will be produced</td>
</tr>
<tr>
<td>NoV-I</td>
<td>Module monitors current, not voltage</td>
<td>No Load messages will be produced if the channel is turned</td>
</tr>
<tr>
<td>V-NoI</td>
<td>Module monitors voltage, not current</td>
<td>Breaker Trip messages will be produced if the channel is turned on with the breaker turned off.</td>
</tr>
<tr>
<td>V-I</td>
<td>Module monitors both voltage and current</td>
<td>Both Breaker Trip and No Load messages may be produced and the roasting short protecting feature will be enabled.</td>
</tr>
</tbody>
</table>

To configure the module type see *Menu Structure* on page 11.

Roasting Short Protection

FDX3000 features a unique method for providing additional safety in the event of a roasting short. A roasting short can occur when a dimmer is at a low level and driven into a short circuit load with a long cable.

Because the dimmer is at a low level, the roasting short does not draw enough current to trip the circuit breaker. However, a roasting short is still a dangerous condition as currents can flow at a high enough amperage to cause heat or, in extreme circumstances, fire.

The FDX3000 rack has the capability to detect this condition. When a roasting short is detected by a module set to V/I mode, the dimmer is automatically driven to full, allowing the high current of the short circuit to trip the circuit breaker.

This utility is automatically enabled on any modules set to V/I mode.
FDX2000 vs. FDX3000 Dimmer Curve Comparison

Curves in FDX3000 reference voltage rather than power. Therefore the following table will help to show the correlation between FDX2000 curve names and FDX3000 curve names.

<table>
<thead>
<tr>
<th>FDX2000 Curve English / German</th>
<th>FDX3000 Curve English</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Linear (default)</td>
<td>Square</td>
<td>Proportional to RMS power output (FDX2000 Linear)</td>
</tr>
<tr>
<td>2 = Stage1</td>
<td>Stage 1</td>
<td>Built to match an old Siemens curve</td>
</tr>
<tr>
<td>3 = Stage2</td>
<td>Stage 2</td>
<td>Built to match an old Siemens curve</td>
</tr>
<tr>
<td>4 = Log</td>
<td>Linear</td>
<td>Proportional to RMS voltage output</td>
</tr>
<tr>
<td>5 = Fluor1</td>
<td>Fluor 1</td>
<td></td>
</tr>
<tr>
<td>6 = Fluor2</td>
<td>Fluor 2</td>
<td></td>
</tr>
<tr>
<td>7 = Pow/2</td>
<td>n.a.</td>
<td>Obsolete</td>
</tr>
<tr>
<td>8 = 10%</td>
<td>n.a.</td>
<td>Obsolete</td>
</tr>
<tr>
<td>9 = VIP90</td>
<td>VIP</td>
<td></td>
</tr>
<tr>
<td>10 = ANDI</td>
<td>ANDI</td>
<td></td>
</tr>
<tr>
<td>n.a</td>
<td>Mod-Square (Default)</td>
<td></td>
</tr>
<tr>
<td>n.a</td>
<td>Mod-Linear</td>
<td></td>
</tr>
<tr>
<td>n.a</td>
<td>Sensor 2.0</td>
<td>Older mod square law</td>
</tr>
</tbody>
</table>