

SENSOR[®]3



Sensor+ Touring Rack (SP+ Series) CEM+ to CEM3 Retrofit Manual

Revision B

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Introduction

This manual is intended to guide ETC Service Technicians through the process of upgrading existing Sensor[®]+ Touring Racks to Sensor3 racks with a CEM3 control module. This manual covers SP48+, SP96+, and SP96+ “double small” touring dimming racks.

Contacting Technical Services

If you have questions about the retrofit process that are not answered in this manual, please contact ETC Technical Services.

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Warnings and Notice Conventions

These symbols are used in Sensor documentation to alert you to danger or 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.*

Safety

Please note the following safety warnings before use:

- Disconnect power from the racks before all maintenance.



WARNING: *Dimmer racks without an accessible power disconnect device cannot be serviced safely. 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.*

Overview of this Manual

Reference this manual throughout the retrofit procedure

- [Preparation, page 5](#) - before you open the rack
- [Remove the Old, page 6](#) - labeling and removing the existing equipment.
- [Control Input Panel Replacement, page 6](#) - replacing the circuit board in the control input panel
- [Make Connections and Install the New Backplane, page 8](#) - transfer the wiring and install new components
- [CEM3 Power Harness Termination, page 10](#) - terminate the new power harness wires
- [Replace AF Cards \(AF Racks Only\), page 11](#) - remove the existing Advanced Feature cards and install the new ones
- [Upgrading the Rack Door, page 11](#) - making alterations to or replacing the rack door
- [Verify the Retrofit, page 13](#) - put the dimmers back in the rack and power up the rack
- [Configure the CEM3, page 13](#) - put a configuration in the CEM3.

When viewing this document in electronic form (pdf file) with Adobe Acrobat Reader, blue italicized text followed by a page number such as "[Overview of this Manual, page 2](#)" is a link within the document. If you click on the link, it will jump to that section or topic.

Section 1

Unpack and Organize

The table below lists the parts and components needed to retrofit a Sensor+ touring rack (SP+ 48, 96, or 96 “Double Small”) to become a Sensor3 rack with a CEM3. Each part is listed to reflect the different quantities for the different kits and types of racks.

	Parts/Components ETC Part Number	SP+48/96 Universal Kit 7143K1005
Parts Included in the Kit	Touring Backplane Baffle 7053A3023	1
	CEM3 SP DMX/Beacon Control Assembly 7142B5610	1
	Sensor3 Touring Rack Door Label 7143A4119	1
	CEM+ to CEM3 Backplane Power Adapter Harness 7141B7007	1
	Sensor3 Rack Backplane Assembly 7142A2006-CFG	1
	Sensor Touring Rack CEM+ to CEM3 Retrofit Manual 7143M2300	1
	Second Fan Indicator Label 7143A4001	1
	Screw 8-32 X 3/8 Ph PH MS CP W/Patch HW377	5
	Cable tie 4" Hi-temp Black HW7121	5
	Screw M3.5 x 4 mm HWM1036	2
	CEM3 Backplane 1/8" #8 screw spacer HW9343	5

	Additional Items	SP48	SP96	SP96 “Double Small”
Additional Line Items	SP48/96 Door Baffle Replacement Kit 7143A2002	1*	2*	1*
	SP96 “Double Small” Right Baffle Replacement Kit 7143A2005	0	0	1*
	SP48/96 Left Door Replacement Kit 7143B3004	1*	2*	1*
	SP96 Right Door Replacement Kit 7143B3007	0	0	1*
	Sensor3 AF Card (Optional) 7150B5623	2	4	4
	CEM3 7140A1000	1	1	1

* Need/quantity based on specific rack or door type. See *Sensor3 Touring Rack Retrofit Kit* order sheet for details or contact ETC Technical Services (see [Contacting Technical Services, page 1](#)).

Required Tools
#1 Phillips screwdriver
#2 Phillips screwdriver
Flat-blade or square-drive screwdriver
5/16" nut driver or socket
Diagonal wire cutter
Permanent marker
Wire strippers

Section 2

The Retrofit

Rack Geography

Throughout this manual directions are given which refer to the front, back, left, and right sides of the rack. For clarification, these references are detailed below.

Front - face of the rack with the dimmer modules and CEM.

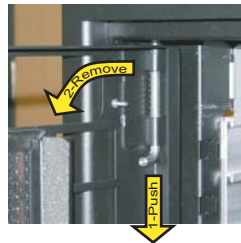
Back - face of the rack with output and control connections (VEAM, DMX).

Left - when facing the front of the rack, this is the side to your left.

Right - when facing the front of the rack, this is the side to your right.

Preparation

- Step 1: Turn off the main breaker and disconnect all of the Cam-Lok[®] connectors from the touring rack.
- Step 2: Remove the top eight or more dimmer modules from the rack.
- Step 3: Use a digital voltmeter to VERIFY that power is off by checking voltages for all combinations between the phase bars, neutral and ground.
- Step 4: Remove the CEM+ from the rack.
- Step 5: Remove the rack door in front of the CEM+ slot by pushing down on the tab in the top hinged corner.



- Step 6: Remove the left side panel of the touring rack (10 Phillips head screws) and set it aside.

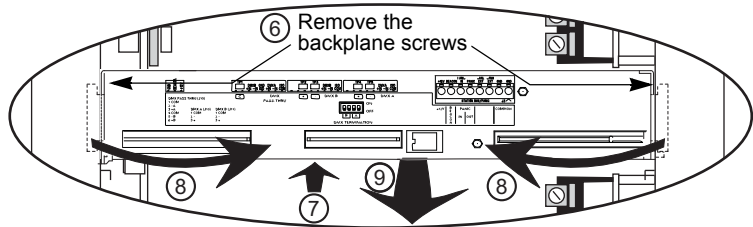


Note:

You may find it necessary to remove the right side panel as well, depending on your preferred method of performing some of the following steps. Feel free to do so as needed.

Remove the Old

- Step 1: Accessing the rear of the backplane through the rack side panel, disconnect the multi-colored DMX ribbon cable and CAT5 cable from the backplane.
- Step 2: Disconnect the power cable from the rear of the CEM+ backplane.
- Step 3: Disconnect the dimmer output ribbon cables from the backplane. As you remove the ribbon cables, mark them with a permanent marker to indicate the proper order for reattachment (Dimmers 1-24, 25-48, and so on). There may be stickers on the ribbon cables already, however these may refer to cable length and not dimmer outputs. They should not be used as a reference to these instructions.
- Step 4: Unscrew the backplane metal from the rack. (One screw in each side upper-corner - two screws total.) Discard these screws. Replacement screws with thread locker are provided (ETC Part# HW377) and will be used later.



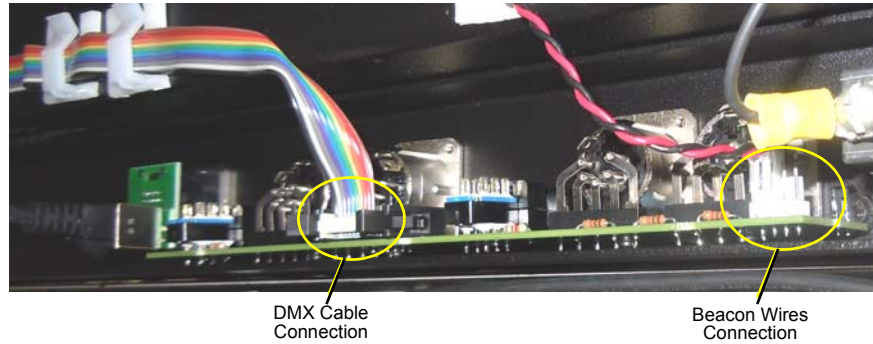
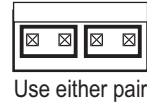
- Step 5: Push the backplane towards the back of the rack to free the backplane side tabs.
- Step 6: Bend the sides in towards the center (out of the sides of the rack).
- Step 7: Slide the backplane metal forward in order to allow easier working space while removing the data terminations
- Step 8: Pull one side forward to angle the backplane then remove the backplane metalwork from the rack. Discard the old backplane.

Control Input Panel Replacement

- Step 1: Disconnect the DMX ribbon cable from the rear of the input panel circuit board.
- Step 2: Disconnect the beacon connector red and black twisted pair(s) from the beacon header (one pair - either left or right - for small racks; two pairs in 96-channel racks).
- Step 3: Unscrew and remove the plastic collars from around the DMX termination buttons on the control input panel.
- Step 4: Remove the screws that hold the DMX A and B connectors in place (8 screws total - save these screws as you will need them in a later step). You do not need to remove the screws for the network connector.
- Step 5: Slide the old control panel circuit board out of the panel and remove it from the rack.



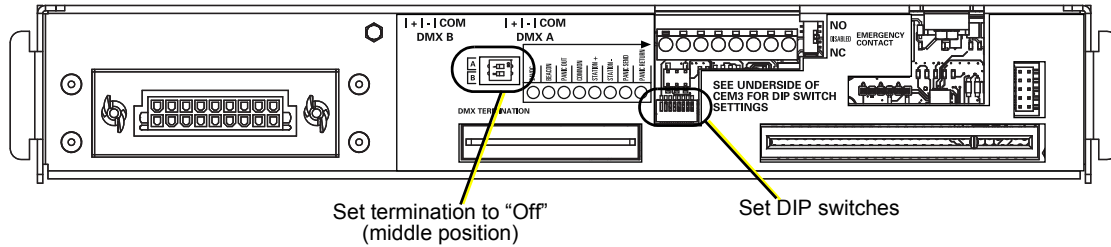
- Step 6: Unscrew and remove the plastic collars from around the termination buttons on the new control panel circuit board.
- Step 7: Slide the new circuit board into the control input panel.
- Step 8: Secure the circuit board in place using the 8 screws for the DMX A and B connectors.
- Step 9: Screw the plastic collars in place around the termination buttons.
- Step 10: Connect the multi-colored DMX ribbon cable to the new circuit board.
- Step 11: Connect the beacon connector red and black twisted pair(s) to either the first or last pair of the beacon header (shown here). SP96 racks will use both pairs.



- Step 12: If your rack has a neon indicator to the right of the control inputs, this is a "second fan indicator". If yours is not labeled, place the label found in the kit (7143A4001) above the neon indicator.

Backplane Settings

Upgrade kit backplanes ship from the factory with all DIP switches in the off (down) position. You will have to set the DIP switches on the new backplane to match your rack. You will also have to verify the termination switch settings.



- a: Set both termination switches to "Off" (middle position).
- b: Using a precision screwdriver, set the DIP switches to match your rack type according to:
 - number of dimmers (48 or 96)
 - whether the rack has Advanced Features (AF)

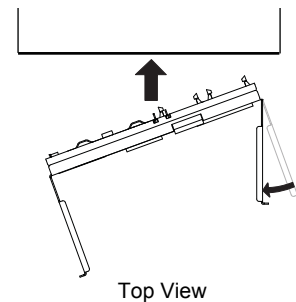
Use the following chart to determine your required DIP switch settings:

Rack Model	DIP switch Number							
	1	2	3	4	5	6	7	8
SP+48								On
SP+48 AF		On						On
SP+96								
SP+96 AF		On						
"Double Small" +96								
"Double Small" +96 AF		On						

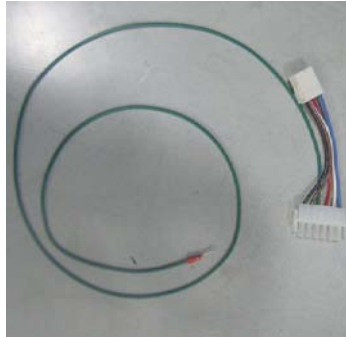
"On" position = switch pushed to the top

Make Connections and Install the New Backplane

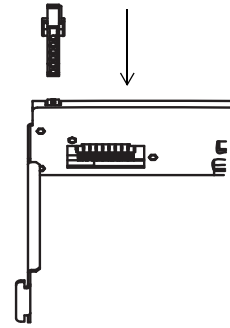
- Step 1: Bend one arm of the backplane metal in towards the opposite arm (about 30 deg). Bend the metal as little as possible to get it inside the rack.
- Step 2: Insert the backplane metal at an angle. Then straighten it once it is past the face of the rack. Push it into the rack far enough that it stays in place, but leave yourself some room to make the power and data connections.



- Step 3: Connect the new power adapter harness to the backplane power header. Note the pin shapes for proper orientation. It will only fit one way. You will connect the old power harness to the adapter in a later step.

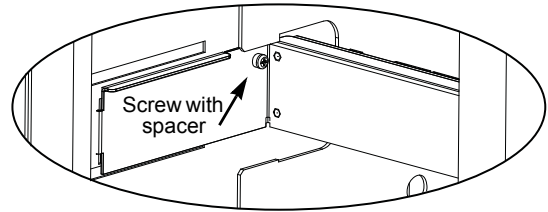


New Power Harness



Connect harness

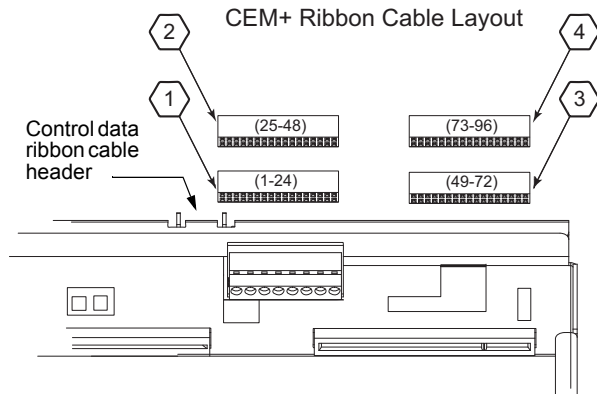
- Step 4: Push the backplane completely into the rack. Be careful of the power harness connection you just made. Make sure that the wiring does not become stressed or pinched.
- Step 5: Insert the backplane side tabs into the sides of the rack.
- Step 6: With the tabs fully inserted in the sides of the rack, pull the backplane towards the front of the rack to line up the screw holes in the upper corners.
- Step 7: Install one screw with a spacer in the upper-corner of each side of the backplane.



Note:

You cannot use the old screws without the additional spacer as they will block the CEM3 from being fully inserted.

- Step 8: Install the dimmer output ribbon cables.
- a: Open the black retaining tabs for each connector until they are at a 45° angle to the backplane.
 - b: Press the connectors into their respective locations until the tabs lock in place at a 90° angle to the backplane. The order of the ribbon cables is the same as for the CEM+ backplane (see graphic). **Make sure the proper side is facing up on each connector and that each connector is fully seated.**



- Step 9: Plug the control input ribbon cable into the blue header on the backplane. The connector is keyed - the ribbon cable will travel upwards from the backplane.
- Step 10: Plug the 2' Ethernet cable into the RJ45 connector on the rear of the backplane.
- Step 11: Dress the control data ribbon cable, the beacon cable and the Ethernet cable through the cable clips neatly across the top of the rack. The cables should be supported every 6" to 8" from the control input panel to the backplane. Use the provided ribbon cable mounts (ETC Part# HW726) as needed.



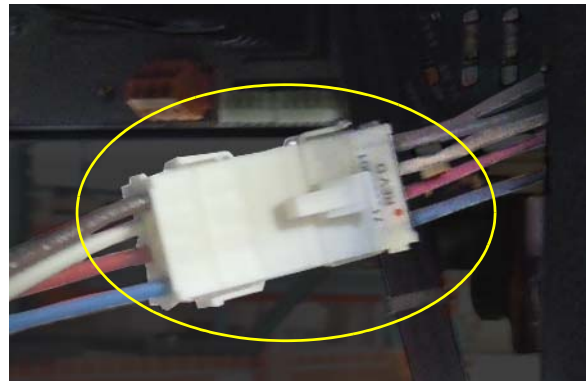
Cable routing on the input panel side



Cable routing on the CEM3 side

CEM3 Power Harness Termination

- Step 1: Connect the old power connector to the new power harness. The connectors are keyed - the power connectors only fit one way.
- Step 2: Run the green ground wire from the power harness adapter down to an open terminal in a grounding strip for any outlet panel (such as VEAM, twistlock, or other outlet type - VEAM is preferred). Grounding terminal screws can be loosened or tightened with a flat-blade or square drive screwdriver.



Note:

Depending on the interior of your touring rack, you may wish to secure the power harness wires out of the way using tie wraps and sticky-back mounts if necessary.

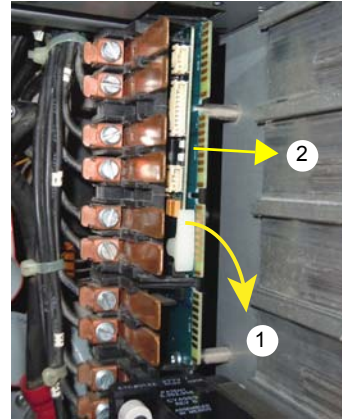
Replace AF Cards (AF Racks Only)

If your touring rack supports Advanced Features (AF) you will need to replace the AF cards as well.

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

To replace the AF cards:

- Step 1: Remove the old AF cards by flipping the white retainer tab on the cards into the down position.
- Step 2: Pull the old cards out of the slots.
- Step 3: Set the DIP switches on the new cards according to the chart below (SP48 - #1-2; SP96 - #1-4).
- Step 4: Slide the new AF cards completely into the vacant slots starting with card #1 in the top left slot. The number of cards depends on rack size.
- Step 5: Flip the white tab up to lock the new card in place.



Flip tab down, pull card out

AF Card Addressing

	S W 1	S W 2	S W 3	S W 4
Card 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Card 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Card 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Card 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Upgrading the Rack Door

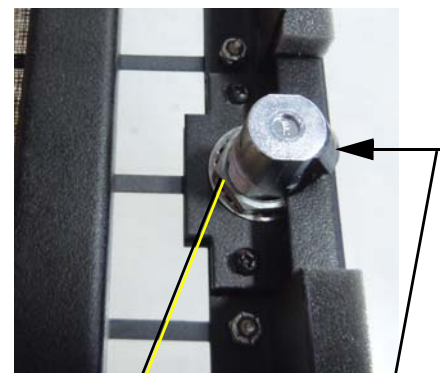
Depending on the kit you ordered, you may be replacing the rack door or you may only be replacing the baffle at the top of the existing door. If you are replacing the door, and your old door has a cylindrical lock *without* a flip lever handle, you will need to remove that lock and install it in the new door that you received. If you would like a new lock, you may purchase one separately.

If your rack has the flip lever handle, you do not need to remove it. On these doors, only baffle replacement is necessary.

Rack door replacement

Doors with curved baffles and cylindrical locks will need to be replaced. The lock from the old door must be removed and installed on the new door. The new door will come with the required baffle installed.

- Step 1: Remove the retention nut from the lock using a 7/8" open end wrench
- Step 2: Continue loosening the nut while sliding the lock assembly out through the front of the door.



Remove nut

Press to slide lock through door

- Step 3: Place the lock assembly in the new door and secure it with the retention nut using a 7/8" open end wrench.



Note: *Locks must go back in the same door location from which they were removed. If you removed the lock from a left opening door, it must be installed back in a left opening door.*

Rack door baffle replacement

Doors with straight baffles (regardless of lock type) will need to have the baffles replaced with new, curved baffles. The doors will be reused and the locks need not be removed.

- Step 1: Remove the old CEM rack door baffle from the door (outlined below) by removing the four 5/16" nuts.



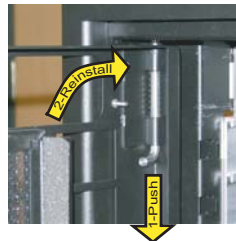
- Step 2: Install the new CEM3 door baffle on the rack door with the four 5/16 nuts.

Finish Up

- Step 1: Remove the CEM baffle from the spare CEM slot (if available). It is held by two screws, one in each upper side corner, similar to the backplane screws. You must bend the baffle to get it out of the spare module slot.

- Step 2: Install the new CEM3 baffle into the spare module slot using the screws and spacers provided in the kit.

- Step 3: Install the rack filter door(s) on the rack by pushing down on the tab in the hinged corner and sliding the door back in place.



- Step 4: Reinstall any removed side panels of the rack with their original screws.



Note: *Use caution when starting the six screws along the outer edges, being careful not to damage the spring retaining clips.*

- Step 5: Remove the Sensor+ sticker from the appropriate door.

- Step 6: Apply the new Sensor3 sticker to the door.

- Step 7: Dispose of all waste materials in a safe manner per local ordinances.



Verify the Retrofit

- Step 1: Put the dimmer modules back in the rack in the correct/original order.
- Step 2: Put the CEM3 in the rack making sure it is fully seated.
- Step 3: Power up the rack.
- Step 4: Check that the CEM3 powers up and the rack fan turns on. (The only rack errors should be a lack of DMX on the ports if the DMX source is not present.)

Configure the CEM3

- Step 1: Configure the rack to reflect the dimmer module types installed. Verify that the rack type is correct (CEM3 should have determined this from the DIP switch settings - see [Backplane Settings, page 8](#)). Configuration of the CEM3 is done using the front face panel interface. See the *CEM3 Quick Guide* that ships with the CEM3 for more information.
- Step 2: Configure the data types that will be used (DMX and sACN) including the rack patch.



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