SENSOR

Rack Installation Manual

With CEM Control

Product information and specifications subject to change.
Part Number: 7051M1014 Rev C
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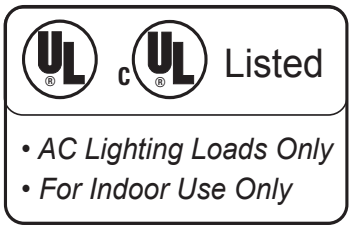
ETC intends this document, whether printed or electronic, to be provided in its entirety.

Contents

Introduction



Welcome to the Installation Manual for Sensor® dimming systems with CEM (Control Electronic Module) control. This manual contains the procedures for safe and efficient installation of Sensor dimming systems. There are four sizes of Sensor installation racks:

- SR6 – Six dimmer slots
- SR12 – Twelve dimmer slots
- SR24 – Twenty-four dimmer slots
- SR48 – Forty-eight dimmer slots

How to use this guide

Use this guide during system installation. It contains complete installation instructions.

- *Introduction* on page 5 describes general requirements for installation.
- *Installation* on page 9 contains procedures for installing your rack.
- *Finishing installation* on page 27 tells how to finish installation and test rack functioning.
- When viewing this document in electronic form (pdf file) with Adobe Acrobat Reader, blue italicized text followed by a page number such as "*How to use this guide* on page 5" is a link within the document. If you click on the link, it will jump to that section or topic.

Contacting ETC®

For questions about Sensor rack system delivery, contact ETC Systems Group at 608/831-4116.

For general information questions about Sensor rack systems, contact ETC Technical Support at 608/831-4116.

Warnings and notice conventions

These symbols are used in Sensor documentation and on Sensor equipment to alert you to danger or important information:

Warning! Warns you when electricity may cause injury.

Caution: Alerts you to important information relating to equipment performance or reliability.

Note: Provides you with additional helpful information.

Preparing for Installation

Unpack and Inspect

Before you begin installation, check your shipment so you know it arrived complete and undamaged.

1. Check the shipping container for physical damage.
2. If you find damage, document it to help with a claim against your shipper.
3. Unpack your order and check the contents against the packing list to be sure your order is complete.
4. If you discover a problem, call ETC Customer Service at 608/831-4116.

Note: *SR48 racks ship with two additional loose parts. SR12 and SR24 racks do not have these parts.*

Table 1: Loose parts shipped with Sensor SR48 rack

SR48 Qty	ETC Part Number	Descriptions
2	7051A4013	Insulator, conduit panel

Main Circuit breaker protection

Before beginning installation of your Sensor dimmer rack(s), make sure you have installed a main circuit breaker cabinet or other readily accessible input power disconnect device. See *Sensor Rack specifications* on page 37 for individual rack power requirements.

Warning! ***Dimmer racks installed without an accessible power disconnect device cannot be serviced or operated safely.***

Before removing dimmer or control modules, de-energize the 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 short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

Obtaining ETC approval to energize the system

You need ETC approval to apply power to your dimming system. You can get pre-approval for some installations during the purchase process, or pass a wiring inspection by an authorized ETC representative after the system is installed. Wiring errors in unauthorized installations may endanger operators or cause system damage and failure.

Warning! ***Do not attempt to energize the system without proper approval. Energizing the system without ETC approval may result in serious injuries.***

Caution: ***Energizing your system without ETC approval may result in equipment damage that may void your warranty!***

Caution

A two-wire circuit with separate hot and neutral conductors is required for every branch circuit that will be connected to the dimmer rack. Shared neutral (multiwire) branch circuit arrangements are not recommended for phase-control dimming systems due to harmonics and potentially elevated neutral currents in a shared neutral arrangement.

For retrofit installations where shared neutral circuits are already installed, or track lighting installations where the track has a shared neutral, consult ETC Technical Services for rack installation guidelines.

Using 90°C copper wire

To comply with UL® requirements for wiring ampacities:

> "Use Copper Conductors Only", the torque rating for each Non-Class 2 field-wire connector, and "Use 90°C Conductors at the 75 Ampacities", where readily visible in the field-wiring compartment; "Class 2" adjacent to each Class 2, field-wiring connector.

Use only 90°C-rated copper wiring installed in accordance with all applicable electrical codes.

Dimming system installation summary

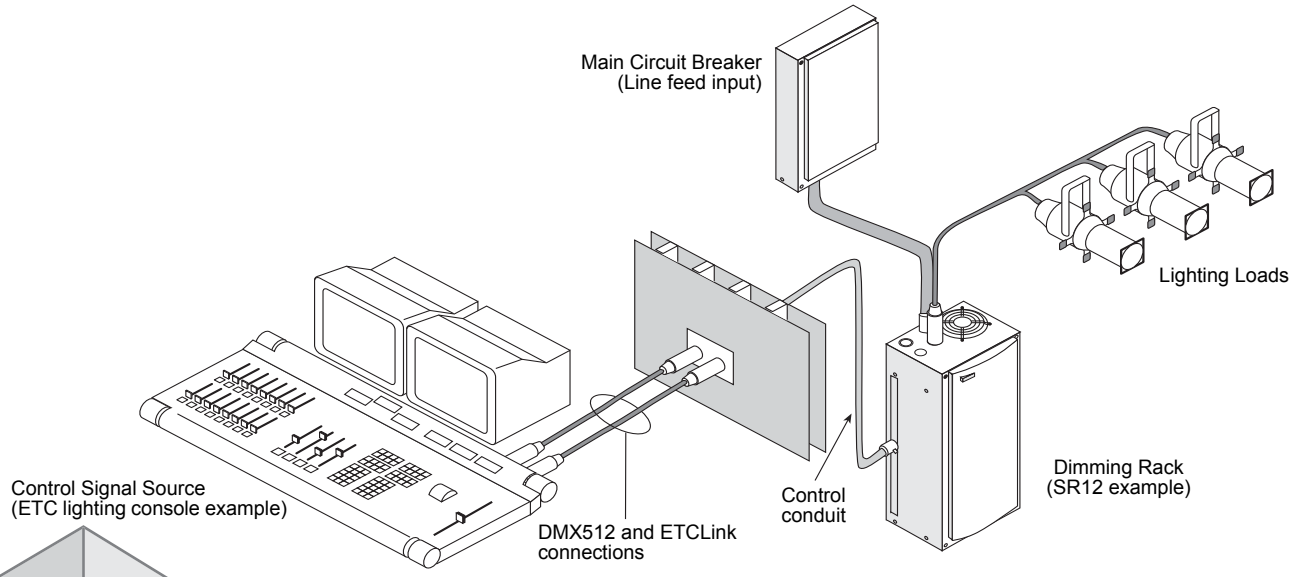


Figure 1: A basic lighting system using Sensor dimming

Deciding where to mount the rack

Sensor dimmer racks require 10 inches of top clearance for proper airflow through the cabinet. To allow the door to open sufficiently to install and remove modules, install the rack with 17 inches of front clearance and 6 inches clearance to the left of the door hinge from walls or other equipment.

Note: *Additional Sensor racks are the single exception to the 6 inch left clearance rule. They can be installed side by side without problems.*

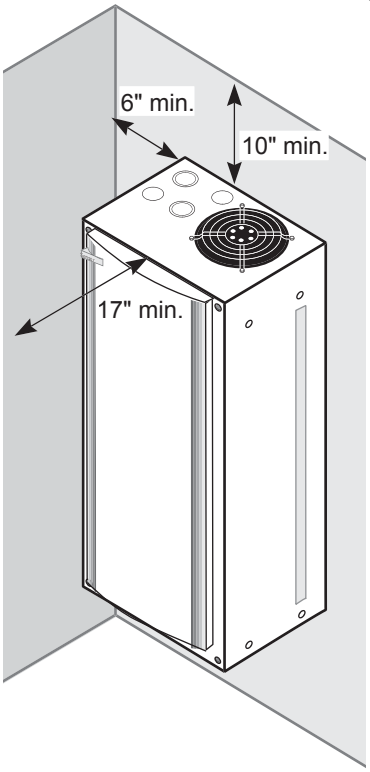


Figure 2: Sensor rack clearances

Dimmer room requirements

- A main circuit breaker cabinet or other readily accessible input power disconnect device
- A clean (not dusty) temperature-controlled environment
- Restricted public access to prevent tampering
- Soundproofing or performance area separation to muffle ventilation fan noise

Please see *Appendix A: Sensor Rack specifications* on page 37 for environmental details.

SR6 and SR12 racks are normally wall-mounted. SR24 racks can be wall or pedestal mounted. SR48 racks are designed to be free standing.

Install racks with the CEM between two and five feet from the floor. In SR6, SR12 and SR24 racks, the CEM is in the bottom slot. In the SR48 rack, the CEM slot is in the middle.

Wire routing

Sensor racks have conduit knockouts or access panels at the top and bottom. Line, and load wiring can enter from the top or bottom. Control cables can enter from the top, bottom or side. Signal and power wiring must be run in separate conduit.

Installation

Mounting the rack

- SR6 and SR12 racks are normally wall-mounted.
- SR24 racks can be mounted to a wall or floor-mounted on an optional pedestal.
- SR48 racks are floor standing. For stability, SR48 racks must also be secured to the floor or wall after installation.

Note: *Store unsecured racks where they cannot fall over and use caution to keep racks stable during installation.*

Mounting racks on a wall (SR6, SR12 and SR24)

The wall must be strong enough to hold the racks. See *Sensor Rack specifications* on page 37 for rack and module weights.

1. Determine where your rack will be installed using *Figure 4* and use the appropriate diagram from *Figure 3* to mark your mounting holes.

Note: *Additional Sensor racks are the single exception to the 6 inch left clearance requirement. They can be installed side by side without problems.*

2. Use the mounting slot dimensions to mark the hole locations. You must supply your own 3/8 inch mounting hardware (lag bolts recommended).
3. Drill the holes and install the hardware.
4. Attach the rack to the wall.

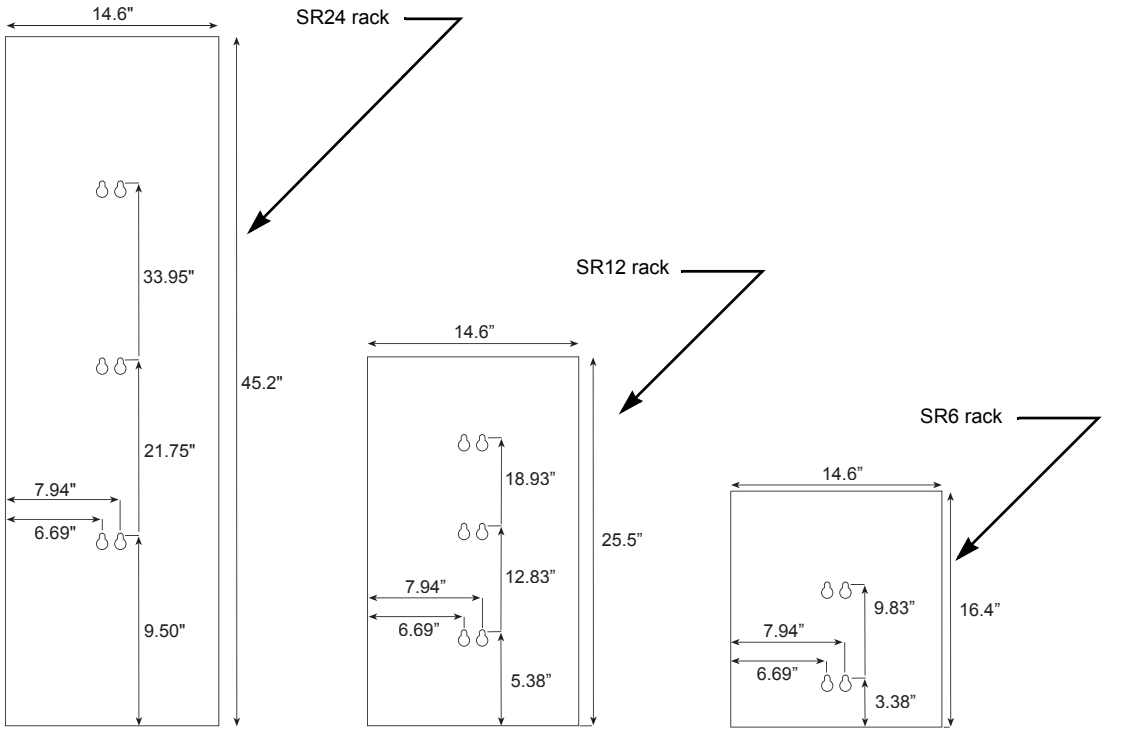


Figure 3: SR6, SR12 and SR24 wall mount hole diagrams

Installing SR48 racks on the floor

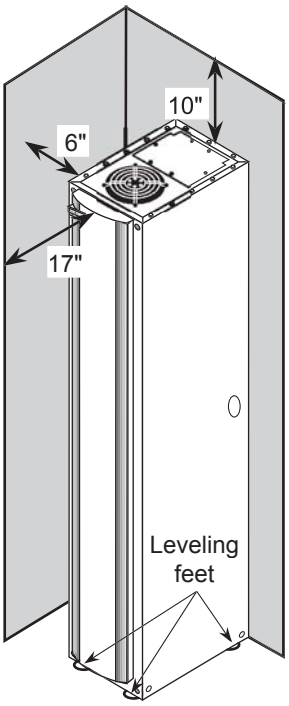


Figure 4: Floor mounted rack clearances

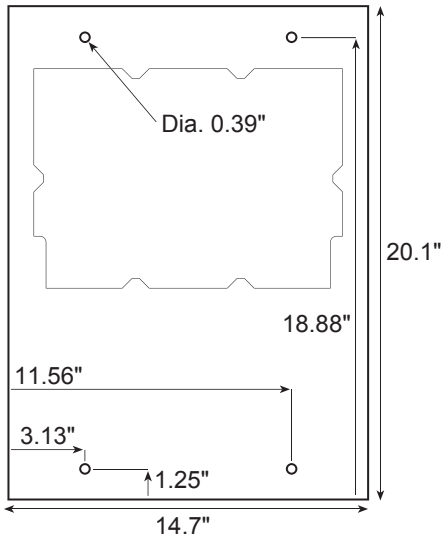
1. Determine where your rack will be installed using *Figure 4* and use the appropriate diagram from *Figure 5* to mark your mounting holes.

Note: *Additional Sensor racks are the single exception to the 6 inch left clearance requirement. They can be installed side by side without problems.*

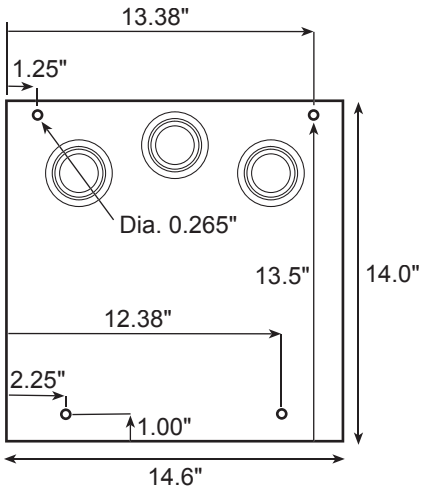
2. Drill the holes and install your own 3/8 inch mounting hardware.
3. Position the rack in the desired location.
4. Adjust the leveling feet with an open end 1/2 inch wrench until the rack is level.

Note: *SR48 installation racks are tall, narrow, and heavy. Use caution to keep racks stable until conduit is installed.*

5. Secure the rack to the floor using your mounting hardware.



SR48 Floor mount hole diagram



SR24 pedestal mount hole diagram

Figure 5: Hole diagrams for mounting racks to the floor or a pedestal

Pedestal mounting an SR24 rack

1. Use Figure 5*: Hole diagrams for mounting racks to the floor or a pedestal* on page 10 to mark the location of the SR24 mounting holes. The SR24 pedestal has the same floor mounting dimensions as the SR24 rack.

Note: *You must supply 1/4 inch mounting hardware. The pedestal has four mounting holes into the floor and four securing the rack.*

2. Drill holes or mount floor hardware and position the pedestal on them.
3. Secure the pedestal base to the floor.
4. Position the rack on the pedestal so the mounting holes align.
5. Bolt the rack into place.

Securing SR24 or SR48 racks to a wall

Racks installed on the floor or a pedestal can also be secured to a wall for greater stability.

1. Prepare the rack for floor or pedestal mounting (see the previous page).

Note: *SR48 rack enclosure do not have wall mounting holes. Drill two or more securing holes through the top third of the cabinet.*

Warning! ***Make sure the holes for the mounting hardware are located where the hardware cannot come into contact with electrical wiring. Bussing and wire configurations will vary depending on installation types. Make all modifications in accordance with applicable electrical codes.***

2. Mark the locations for your securing hardware on the wall.
   - For SR24 racks, use the diagram in *Figure 5* to determine where you need to install your hardware
   - For SR48 racks, put the rack in position and mark the holes directly.

Note: *You should level SR48 racks before marking the hole positions.*

3. Drill holes or install mounting hardware in the marked locations.
4. Finish mounting the rack to the floor or pedestal.
5. Attach the rack to the wall with your securing hardware.

Wall mounting racks using vibration fittings

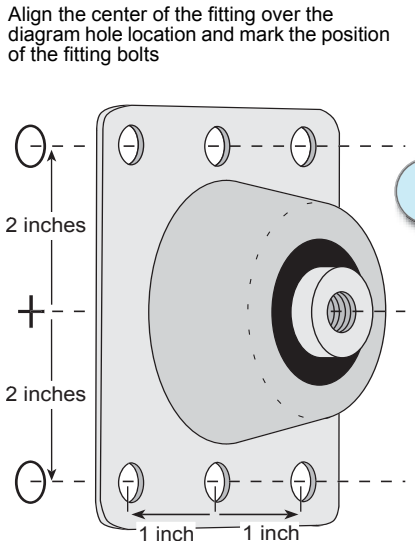


Figure 6: Positioning a vibration fitting on a wall

Vibration damping fittings are available as an option for wall mounted racks (SR6, SR12 and SR24). The wall must be strong enough to hold the racks. See *Sensor Rack specifications* on page 37 for rack and module weights.

1. Mark the hole locations on the wall from Figure 3*: SR6, SR12 and SR24 wall mount hole diagrams* on page 9.

Note: *ETC's wall mount vibration pads (ETC Part# HW6111) attach to racks with 1/2 inch bolts that are slightly larger than the top of the keyhole slots. The bolt works fine installed in the lower portion of the slot, but the rack will mount slightly higher (~1/2 inch) than the diagram indicates.*

2. Align the center of the fitting over the hole locations from the diagram. Mark the position for two fitting bolts for each vibration pad (the middle holes are recommended).
3. Drill the holes and secure the fittings to the wall. You must supply your own 7/16 inch mounting hardware (lag bolts recommended).
4. Remove the included 1/2 inch lag bolt and washer from each vibration fitting.
5. Position the rack on the wall so the centers of the vibration fittings align with the wall mounting slots.
6. Secure the rack to its vibration fittings with the lag bolts and washer.

Floor mounting racks using vibration fittings

SR48 racks can be floor mounted on optional vibration damping fittings *(ETC Part# HW6109)*.

1. Determine where your rack will be installed using Figure 4*: Floor mounted rack clearances* on page 10.

Note: *You can ignore the 6 inch door clearance between Sensor racks installed together. They are designed not to cause door interference.*

2. Use the appropriate diagram from Figure 5*: Hole diagrams for mounting racks to the floor or a pedestal* on page 10 to mark your hole locations.
3. Align the center of the vibration fitting over the hole locations from the diagram. Mark the positions for two bolts for each vibration pad.
4. Drill the holes and secure the pads to the floor. You must supply your own 11/32 inch mounting hardware (lag bolts recommended).
5. Remove the included 3/8 inch lag bolt and washer from each vibration pad.
6. Position the rack on the pads so the center holes of the pads align with the mounting holes in the base of the rack.
7. Secure the rack to a wall.
   - Follow instructions from *Securing SR24 or SR48 racks to a wall* on page 11 to drill holes in the back of the rack for wall mounting.
   - Mount the rack to the wall using the procedure from *Wall mounting racks using vibration fittings*, above. You will have to mark the hole locations directly from the rack (Step 1).

Caution: ***Floor standing racks on vibration pads must be secured to a wall or other stabilizing structure, even if the fittings are bolted to the floor.***

8. Secure the rack to the pads with the lag bolts.

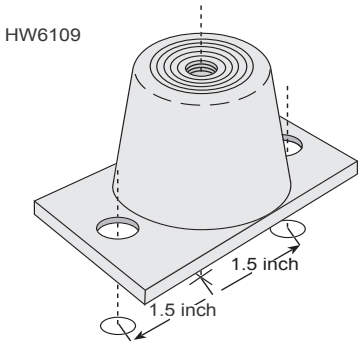


Figure 7: Floor vibration fitting

Securing multiple racks (optional)

Multiple racks can be connected to each other for greater stability.

Note: *If you want to install the control cable through the side of the racks, you should remove the side cable knockouts before connecting the rack. See DMX512 and ETCLink data connections on page 21 for details.*

1. Use 1/2 inch bolts and lock nuts in the front and at the back to bolt the racks together at the bottom.

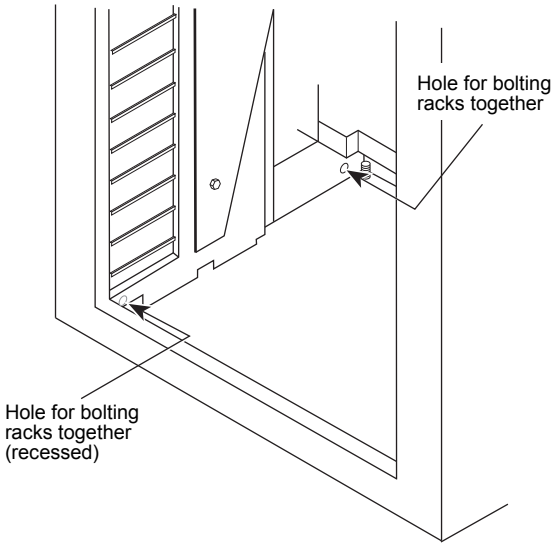


Figure 8: Placement of connecting holes

Note: *The front bolt is difficult to reach – you may need a magnetic bolt-driver or socket extension.*

2. Remove 6 screws from the tops of adjacent racks, as shown below.

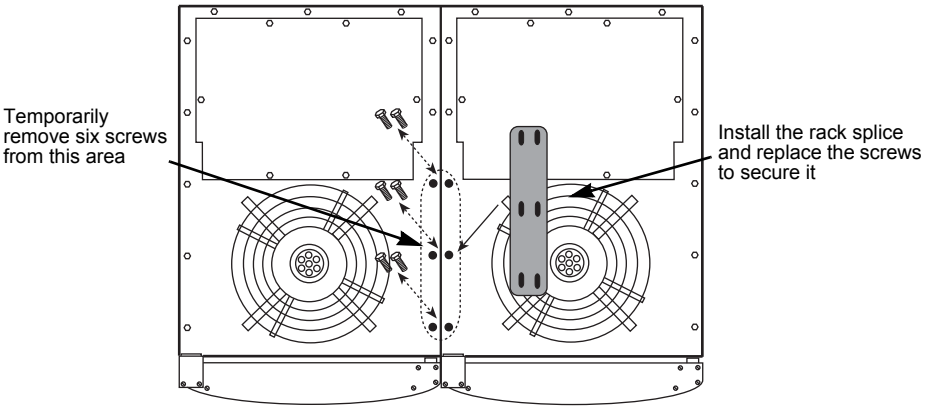
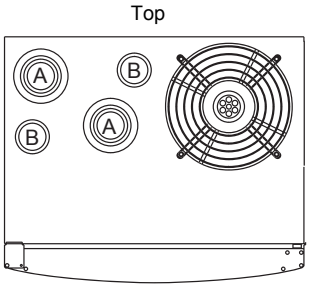


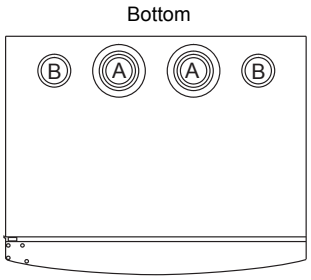
Figure 9: Screws to remove to connect two racks

3. Place a rack splice plate over the empty screw holes and replace the screws you removed in Step 2 as shown above.
4. Repeat Steps 1, 2 and 3 until you've secured all of the racks.

Connecting power wiring

ETC recommends routing line (or feeder) cables first, load neutral and load ground wires next, and load phase wires last.





Knockout sizes		
Type	Conduit (in inches)	Hole size (in inches)
A	1, 1¼, 1½, 2	$1^3/_8$, 1¾, 2, 2½
B	1, 1¼	$1^3/_8$, 1¾

Figure 10: SR6, SR12 and SR24 conduit knockouts

Note: *Dress wires neatly and avoid leaving extra wire inside the rack. Too much clutter can restrict air circulation and reduce cooling efficiency.*

Note: *Line and load wires used with Sensor CEM dimming systems must be copper. Do not use wire containing aluminum or other metals.*

Attaching line cable and power wire conduit

Line cable and power wire conduits should enter the rack through the designated top and bottom access points.

SR6, SR12 and SR24 conduit access

These racks have removable conduit knockouts at the top and bottom. See *Figure 10: SR6, SR12 and SR24 conduit knockouts* on this page.

1. Remove the desired top or bottom wire knockouts.
2. Install the appropriate conduit in the holes.

SR48 wire and conduit access

SR48 racks have removable top and bottom access panels. See *Figure 11: SR48 access panels* on this page.

1. Remove the desired access panel from the rack.
2. Cut access holes in the top and bottom access panels.
3. Install your conduit fittings into the holes.
4. Re-install the access panel so that there are minimal air gaps. See *Sealing rack air leaks* on page 25 for more information.

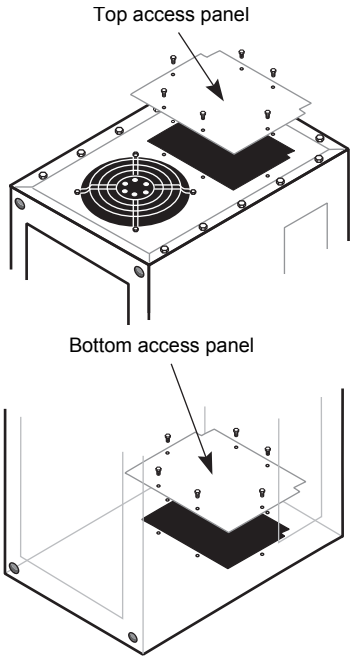


Figure 11: SR48 access panels

Using a wire trough for line cable and power wire access

1. Remove the desired wire knockouts (SR6, SR12 or SR24) or access panel (SR48).
2. (SR6, SR12 or SR24) Install conduit fittings or grommets in the openings.
3. (SR48) Cut the necessary opening in the access panel and reinstall it.
4. (SR48) Install a fiche paper lining or grommeting material in the access panel opening.

Note: *Wire openings must have fittings or linings to protect wire and cable insulation from damage by sharp metal edges.*

5. Position the wire trough above the prepared opening.

Connecting line feed cables

Line feed cables are terminated on the rack's line phase, neutral and ground lugs. Phase and neutral lugs are located on bus bars.

Table 2: Rack Line Lug Sizes

Rack Type	Hot and Neutral Lugs	Ground Lugs
SR6	2 x 2/0	2 AWG
SR12	2 x 250 MCM	2 AWG
SR24	2 x 350 MCM	2 AWG
SR48	2 x 600 MCM	250 MCM

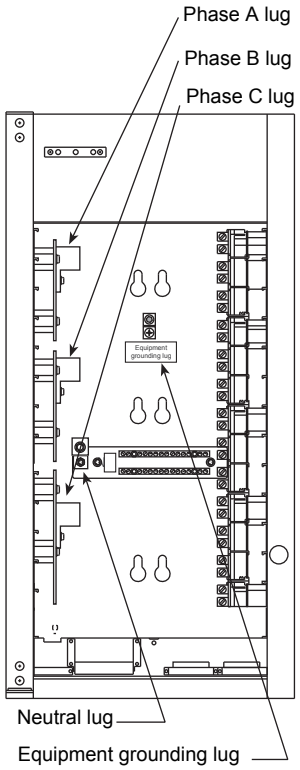


Figure 12: Line cable lug locations

Note: *The Neutral Disconnect bussing used by Ground Fault Interrupt racks have different line connection orientations. See Connecting Ground Fault Current Interrupt (GFCI) racks on page 20 for line connection points.*

1. Pull the line phase, neutral and ground cables to the rack through the openings you prepared previously. (See *Attaching line cable and power wire conduit* on page 15.)

Note: *Phase, neutral and ground lug orientation are reversible to make top or bottom line cable easier. Lugs are shipped in top entry orientation.*

2. Strip 1 inch of insulation from the end of the line phase, neutral and ground cables and attach them to the correct lugs. *Line connections are labeled **A**, **B**, **C**, **N**, and **Equipment Grounding Lug**.*

Note: *The example in Figure 12 shows a three phase rack. Single phase racks are shipped with two phase bus bars labeled **A** and **B**. SR48 racks are only available as three phase racks.*

Warning! ***Do not try to modify any Sensor rack to use a single line feed by jumpering between phase bars. Single feed operations will result in overcurrents on the Neutral bus, and may cause fire or equipment failure.***

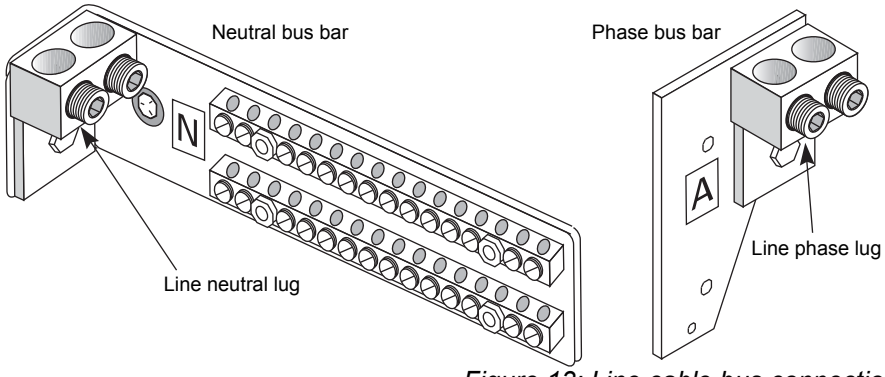


Figure 13: Line cable bus connections

3. Tighten the lugs to the correct torque based on cable size.

Table 3: Line lug torque

Cable size	Torque (inch lbs)	Torque (foot pounds)
4 – 6 AWG	110 inch/lbs	9.2 foot/lbs
1 – 2 AWG	150 inch/lbs	12.5 foot/lbs
1/0 – 2/0 AWG	180 inch/lbs	15 foot/lbs
3/0 – 4/0 AWG	250 inch/lbs	20.8 foot/lbs
250 – 450 MCM	325 inch/lbs	27.1 foot/lbs
500 – 750 MCM	375 inch/lbs	31.3 foot/lbs
800 – 1000 MCM	500 inch/lbs	41.7 foot/lbs

Attaching wires for the loads

Load lugs are on the right side of the rack. Lugs can be single 15/20 amp, paired 15/20 amp fluorescent, double-height 50 amp, or dual-slot 100 amp.

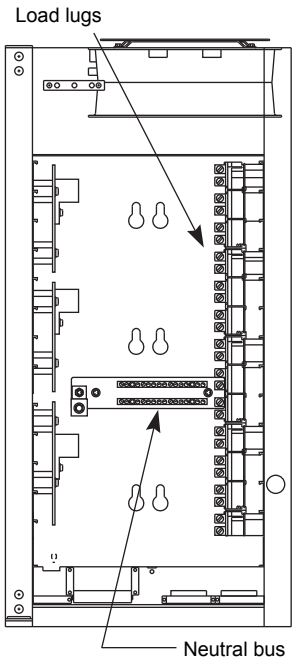


Figure 14: Load lug position

Note: *When using D20F modules connected to dimmable fluorescent 3-wire ballasts, wire the top lug in each slot to the ballast's non-dimmed power lead and the bottom lug to the dimmed ballast control lead.*

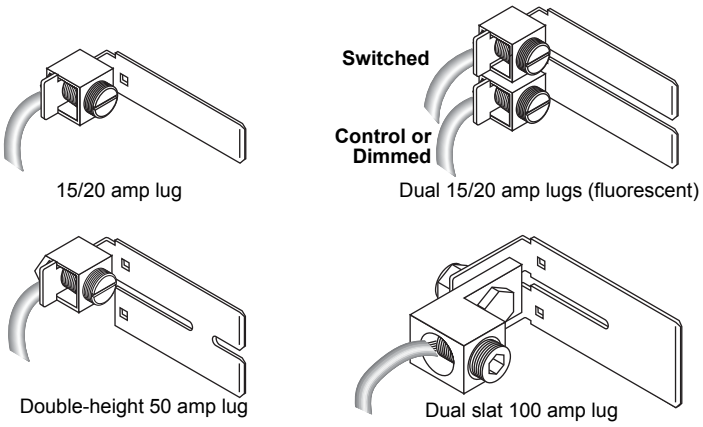


Figure 15: Load lug types

Note: *Dress and terminate load wires neatly. Do not leave excess wire in the rack to interfere with ventilation airflow.*

1. Route the load wires to the rack or racks.

Note: *The Discrete Neutral bussing used by Ground Fault Interrupt racks have different load wire connection requirements. See* *Connecting Ground Fault Current Interrupt (GFCI) racks on page 20.*

2. Separate the neutral load wires from the other cables, route them to the neutral bus in each rack, and terminate them.

Caution: ***A two-wire circuit with separate hot and neutral conductors is required for every branch circuit that will be connected to the dimmer rack. Shared neutral (multiwire) branch circuit arrangements are not recommended for phase-control dimming systems due to harmonics and potentially elevated neutral currents in a shared neutral arrangement.***

For retrofit installations where shared neutral circuits are already installed, or track lighting installations where the track has a shared neutral, consult ETC Technical Services for rack installation guidelines.Separate the hot load wires into separate bundles for each rack.

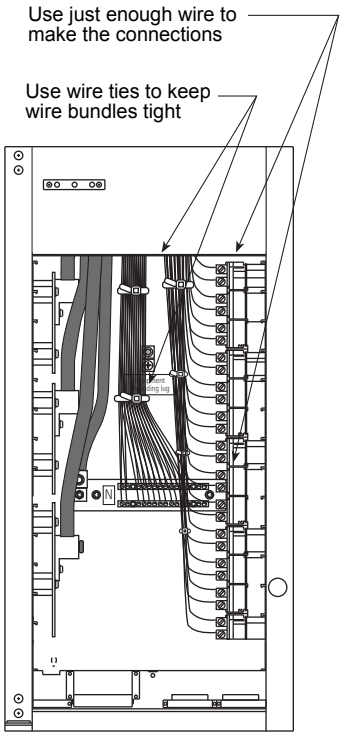


Figure 16: Line and load wiring example

3. Route each hot load wire to its individual load output connection.

Note: *To prevent interference with cooling airflow, do not run load wires from one rack through a different rack. See Sealing rack air leaks on page 25 for more information.*

- 15 – 50 amp load lugs
  Insert the wire under the pressure plate and tighten it onto the wire with the screw. Do not clamp the wire directly under the screw.

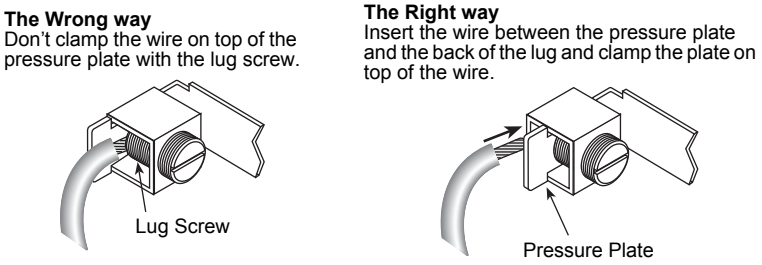


Figure 17: Connecting 15 – 50 amp load lug wires

- 100 amp load lugs tighten the screw lug directly on the cable (see *Figure 15*).

4. Tighten all load connections to the torque specified in the table below.

Table 4: Line lug torque

Connection	Cable size	Torque	Torque
20 – 50 amp and fluorescent Load lugs	14 – 10 AWG 8 AWG 4 – 6 AWG	35 inch/lbs 40 inch/lbs 45 inch/lbs	2.9 foot/lbs 3.3 foot/lbs 3.8 foot/lbs
100 amp Load lugs	14 – 8 AWG 6 – 4 AWG 2 – 1 AWG 1/0 – 2/0	75 inch/lbs 110 inch/lbs 150 inch/lbs 180 inch/lbs	6.3 foot/lbs 9.2 foot/lbs 12.5 foot/lbs 15 foot/lbs
Neutral bus	14 – 6 AWG	25 inch/lbs	2 foot/lbs
Equipment grounding	14 – 8 AWG 4 – 6 AWG 2 – 3 AWG	75 inch/lbs 110 inch/lbs 150 inch/lbs	6.3 foot/lbs 9.2 foot/lbs 12.5 foot/lbs

5. Combine load ground wires into the Equipment grounding lug and torque to the recommended value from *Table 4*, above.

Note: *Use the combined diameter of the line and load wires to determine the torque needed. If there are too many load ground wires to fit into the equipment grounding lug, replace it with a larger lug or bus and torque to manufacturer's specification.*

Connecting Ground Fault Current Interrupt (GFCI) racks

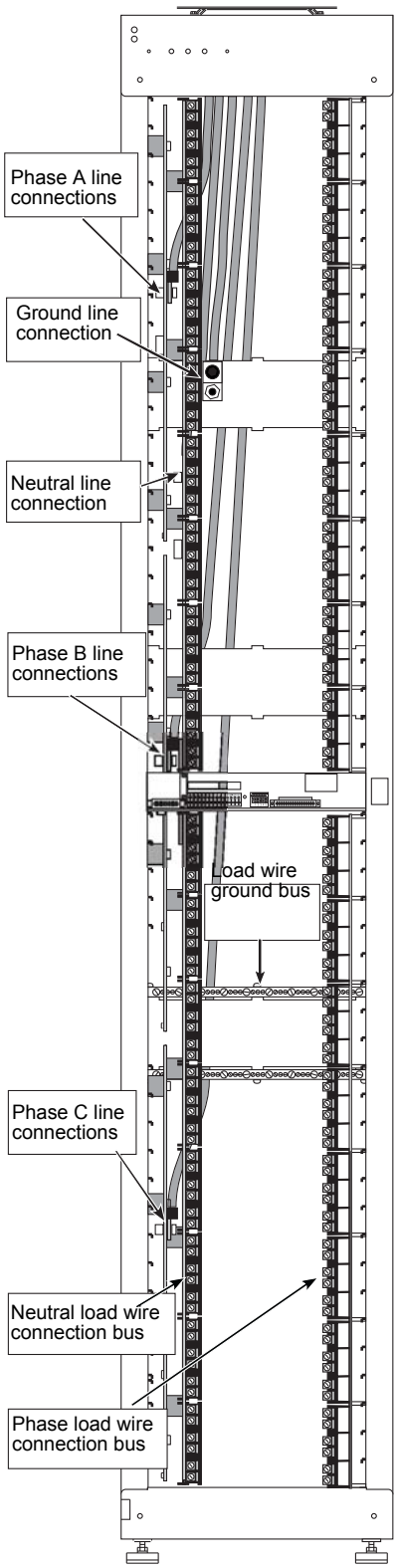


Figure 18: Ground Fault Interrupt line and load connections

Sensor GFCI racks have discrete Neutral bussing for using GFCI dimmer modules, which provide extra safeguards in hazardous environments.

Warning! ***GFCI protection does not increase sensitivity to overcurrent conditions caused by shorts between a circuit's neutral and load wires. Overcurrent protection, provided by the dimmer module circuit breaker, is identical to equally rated standard Sensor dimmer modules.***

Making Discrete Neutral load connections

GFCI racks have a larger line Neutral bus, with individual Load Neutral lugs for each dimmer circuit. Neutral and Hot wires from GFCI circuits must be matched to the same GFCI dimmer to work correctly.

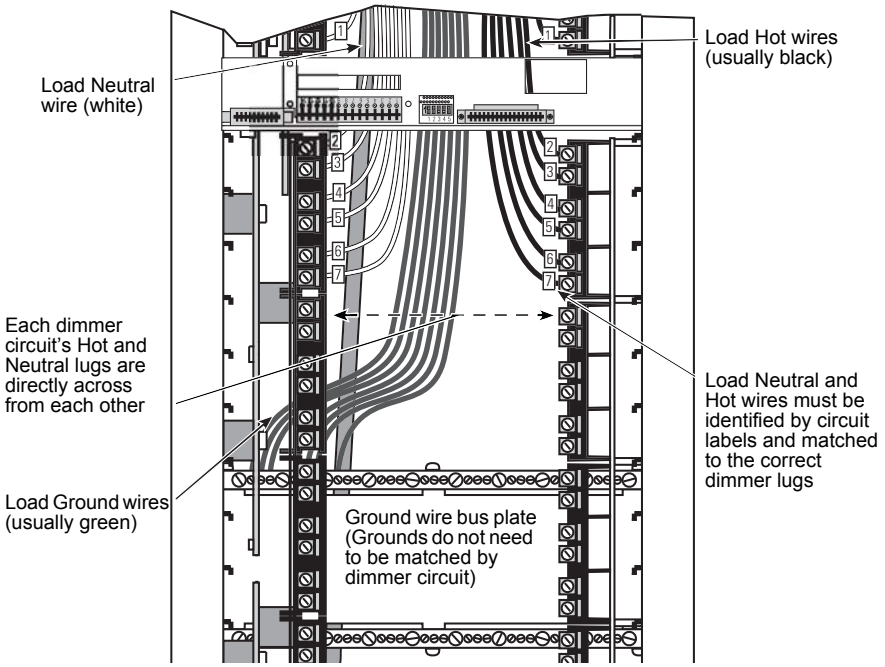


Figure 19: Neutral Disconnect Hot and Neutral lugs

1. Follow the instructions in *Connecting line feed cables* on page 16 to prepare line cables for connection.
2. Follow the instructions in *Connecting line feed cables* on page 16 to connect line cables to the rack. Use *Figure 18* to locate line connections.

Caution: ***A Ground Fault Current Interrupt load circuit will not function unless its Hot and Neutral wires are connected to the same dimmer.***

3. Follow the instructions in *Attaching wires for the loads* on page 18 to connect load wires to the rack. Refer to *Figure 19* to locate Ground Fault Current Interrupt load wire connections.

Note: *GFCI rack slots can be modified to use standard Sensor dimmer modules. For information on converting module slots from GFCI to standard, see Appendix D: on page 45. Converted slots have the same discrete Load Neutral wire connections as GFCI slots.*

DMX512 and ETCLink data connections

This section contains instructions for connecting Sensor racks to existing DMX512 or ETCLink data cables. For information about installing DMX512 or ETCLink data cables in your facility, refer to *Appendix B: Installing a simple DMX512 or ETCLink system* on page 39.

Preparing data cables for network connection

After pulling the data cables to the racks, you must cut them to length and prepare them to connect to the CEM backplane. Use these instructions to prepare DMX512 and ETCLink data cables you will be connecting.

Note: *You should pull the cables and cut them to length before preparing the ends for connecting. Depending on your installation type (single or multiple racks), follow the instructions in Routing a single data cable on page 22 or Connecting DMX512 and ETCLink to multiple racks on page 23 before preparing the cable ends.*

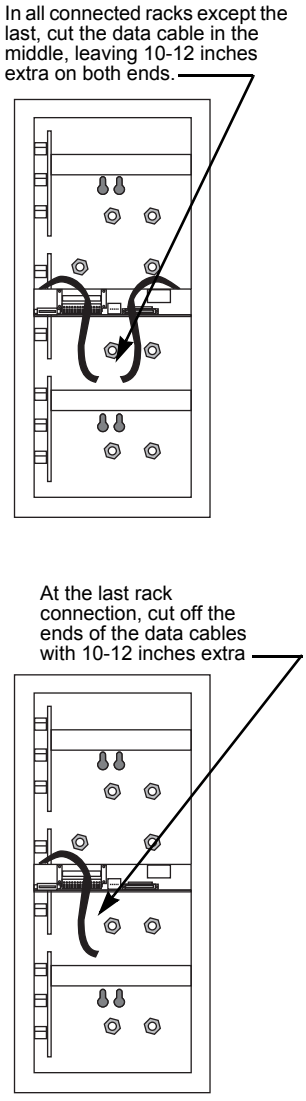


Figure 20: Cutting data cable

1. Cut the cables at each CEM backplane so there is 10-12 inches of extra cable.
2. Strip 6 inches of cable jacket from the control cable.
3. Remove the exposed foil shielding from all the wire pairs in the cable. Do not untwist the wires.
4. Cover all bare shield wires with 1/16 inch heat shrink (each twisted pair of wires in the cable should have a separate shield wire).
5. Slide a 2½ inch length of 1/8 inch heat shrink over base of each set of twisted pair and shield wires (including extra wire sets).

Note: *Normal practice uses the red and black twisted pair as the network wires, with red as Data + or Data 1 and black as Data – or Data 2.*

6. Cover the last inch of any unused wire pairs, including their shield wires, with a piece of heat shrink that extends 1/2 inch beyond their end.

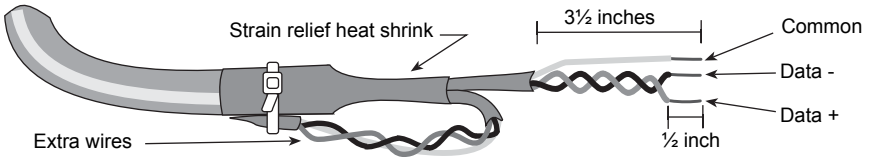


Figure 21: Preparing the DMX512 facility control cable

7. Center a 2½ inch length of 3/8 inch heat shrink over the end of the cable jacket and the bases of all the wires in the cable for strain relief.
8. Bend back each unused wire set and secure it to the cable with a short piece of 3/8 inch heat shrink or a wire tie.
9. Strip 1/4 inch of insulation or heat shrink from the ends of the Data +, Data –, and Common wires. The Data + and Data – wires should remain twisted together.

Side knockouts for DMX512 or ETCLink cables are located next to the CEM backplane (Bottom or centered location depends on rack size)

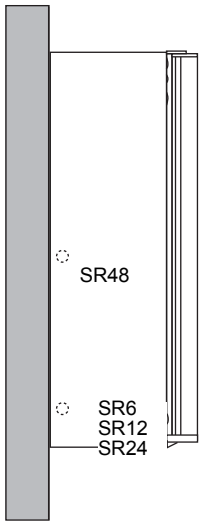


Figure 22: Side knockouts

Data cables can enter from the top, bottom or side as desired

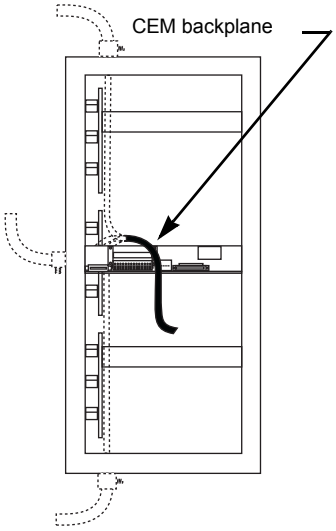


Figure 23: Pulling data wires into the rack

Connecting DMX512 and ETCLink to a single rack

Use the same basic procedure to connect either an ETCLink or DMX512 data cable to the CEM backplane. The only difference between the cable types is their connection points on J2 and which DIP switches you must set.

Routing a single data cable

1. Remove the desired bottom or side conduit knockout where the data cables will enter the rack. See Figure 10*: SR6, SR12 and SR24 conduit knockouts* on page 15 for top and bottom knockout information.

Note: *Control cables must be run in separate conduit from power wires.*

2. Attach the control cable conduit.
3. Pull DMX512 control and ETCLink network cables through the conduit to the CEM backplane. Leave 10-12 inches of extra cable at the backplane.

Note: *When installing ETCLink, you should also pull two 16 AWG wires to provide operating power for ETCLink peripherals (see page 39).*

Connecting DMX512 and ETCLink wires to the CEM backplane

1. Prepare the ends of the data cables. See *Preparing data cables for network connection* on page 21 for instructions.
2. Connect the cables to their terminals on CEM backplane connector J2.

Note: *If you are installing only one DMX512 cable, connect it to DMX Port A.*

Note: *For accessory power, ETCLink connects two 16 AWG wires in addition to the data cable.*

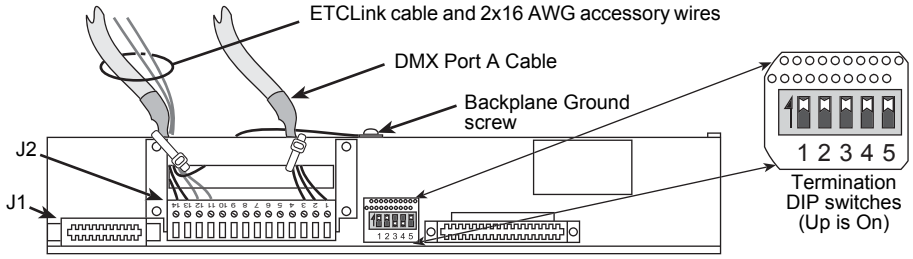


Figure 24: Connecting a Data cables to the CEM backplane

Table 5: J2 connections and termination DIP Switch settings

DMX Port A J2		**DMX Port B J2**		**ETCLink J2**	
Black –	J2, 1	**Black –**	J2, 9	**Data –**	J2, 13
Red +	J2, 2	**Red +**	J2, 10	**Data +**	J2, 14
Shield	J2, 3	**Shield**	J2, 3	**Ground**	Backplane ground screw
				16 AWG wires	J2, 11 – red (12Vdc) J2, 12 – black (Common)
Port A DIP settings		**Port B DIP settings**		**ETCLink DIP settings**	
Termination	1 and 2 On	**Termination**	3 and 4 On	**Termination**	5 On

3. Use a wire tie to bind each signal wire bundle to the CEM backplane 1inch back from J2.
4. Set each connections' termination DIP switches to **On** (up position). Use *Table 5* to determine the correct switch numbers.

Connecting DMX512 and ETCLink to multiple racks

Unlike single racks, multiple rack connections have network termination turned **Off**, except for the last rack in the series. Also, the 16 AWG ETCLink auxiliary power wires are only connected to the first rack in the series.

Routing DMX512 and Data Cables between multiple racks

1. Remove the desired top, bottom or side conduit knockout from the first rack on the left or right of the group of racks. See *Connecting DMX512 and ETCLink to a single rack* on page 22 for conduit knockout locations.

Note: *DMX512 and ETCLink cable connections must be made in a series. Do not start connecting a group of racks from the middle.*

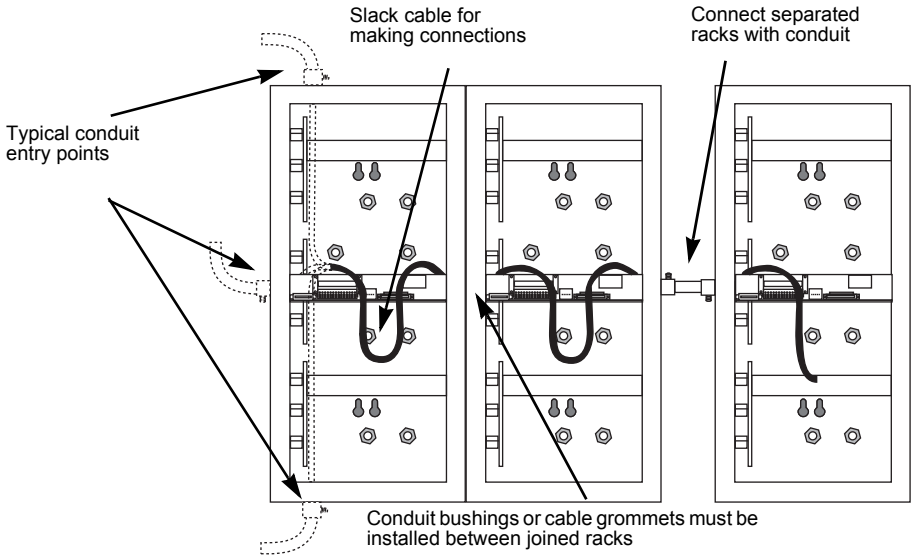


Figure 25: Routing data cable through multiple racks

2. Remove the side conduit knockouts between the first rack and the other racks in the group.

Note: *Using side knockouts for data cable conduit between racks is recommended because it provides the most direct route between CEM backplanes. You can use top or bottom knockouts if desired.*

3. Attach control cable conduit in the first knockout hole, and in the knockouts between the remaining racks.

Note: *If you are installing control cable in racks that are joined together, install conduit bushings or cable grommets into the knockout holes between the racks.*

4. Pull DMX512 and ETCLink cables through the conduit connection on the first rack through the connections between the racks until the cable reaches the last rack in the group.

Note: *Leave 10-12 inches of slack in the cable at each rack's CEM backplane.*

DMX512 and ETCLink terminations in multiple racks

When you connect data cables to multiple racks (series connections), you must connect an input and pass-through cable to each data port and turn off termination for all racks except the last in the series.

1. Prepare the ends of all the data cables. See *Preparing data cables for network connection* on page 21 for instructions.
2. On all racks except the last, connect the input and pass-through wires of each cable to the proper terminals on CEM backplane connector J2. See *Table 6*, below, for connection details by port.

Note: *If you are installing only one DMX512 cable, connect it to DMX Port A.*

Note: *ETCLink connects two additional 16 AWG wires for accessory power to the first rack only.*

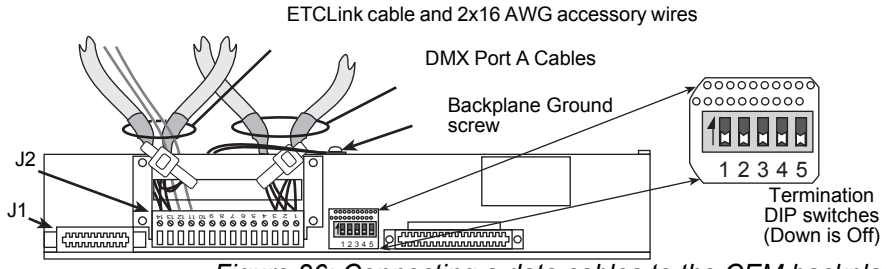


Figure 26: Connecting a data cables to the CEM backplane

Table 6: J2 connections and termination DIP Switch settings

DMX Port A J2		**DMX Port B J2**		**ETCLink J2**	
Black –	J2, 1	**Black –**	J2, 9	**Data –**	J2, 13
Red +	J2, 2	**Red +**	J2, 10	**Data +**	J2, 14
Shield	J2, 3	**Shield**	J2, 3	**Ground**	Backplane ground screw
				16 AWG wires	J2, 11 – red (12Vdc) J2, 12 – black (Common)
Port A DIP settings		**Port B DIP settings**		**ETCLink DIP settings**	
Last rack	1 and 2 **On**	Last rack	3 and 4 **On**	Last rack	5 **On**
Other racks	1 and 2 **Off**	Other racks	3 and 4 **Off**	Other racks	5 **Off**

3. Set each connections' termination DIP switches to **Off** (down position). Use *Table 6* to determine the correct switch numbers.
4. On the last rack, connect each cable to its pins on CEM backplane connector J2 and set its termination DIP switches to **On**.

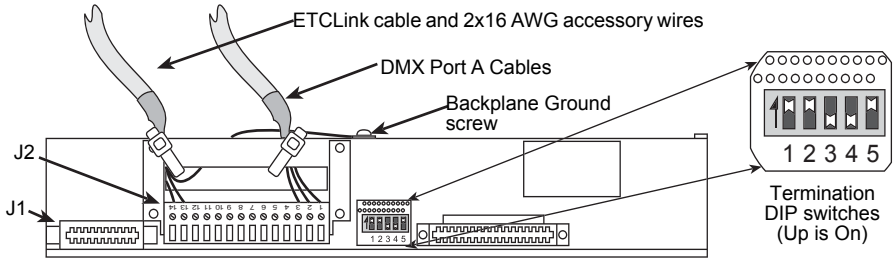


Figure 27: Connecting a data cable to the last CEM backplane

5. Bind each signal wire bundle to the backplane 1 inch back from J2 with a wire tie.

Termination DIP switch functions

This is an explanation of what each DIP switch on the backplane does.

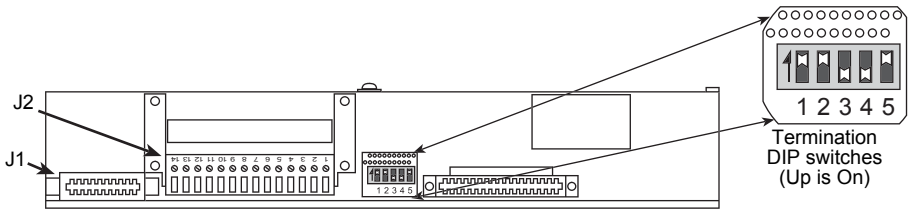


Figure 28: Backplane termination DIP switch functions

Table 7: Termination DIP switch functions

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
Port A Data + termination	Port A Data – termination	Port B Data + termination	Port B Data – termination	ETCLink termination

Sealing rack air leaks

After you have attached all the conduit to the rack and connected all wiring, you must seal any air leaks in the rack cabinet created during the installation process. Use urethane aerosol foam to fill air gaps in conduit.

1. Seal all conduit access holes.
2. Re-install access panels removed during installation, or completely cover their openings with fiche paper and urethane aerosol foam.
3. Seal any air gaps caused by bent access panels.
4. Fill in any gaps inside partially filled wiring conduit.
5. Fill in other gaps or holes in the cabinet created during installation.
6. Any racks that are installed side-by-side (bolted together) should only have minimal airflow between them.
   - Bussed racks shipped from ETC should have the proper baffling in place. Check to make sure it hasn't moved in shipping.
   - Racks that are bussed in the field need to have the airflow between the racks restricted to a minimum.

Caution ***Air leaks can cause dimmer racks to overheat during operation and shut down. Air leaks can also cause a rack to shut down via an "Airflow Error" meaning that too little air is going through the front of the rack where it is needed to cool the dimmers.***

Finishing installation

Attaching the door

All Sensor racks (except the SR6) are delivered with the doors separated. This improves access to the rack interior for wiring and other installation work. Some loose door installation parts are bundled with the doors as detailed below in Table 8.

When interior wiring is completed, attach the rack door. Do not operate your dimmer rack without a door installed.

Table 8: Loose parts shipped with Sensor rack doors

SR12 Qty	SR24 Qty	SR48 Qty	ETC Part Number	Descriptions
1	1	1	7051A4001	Beacon door .5” acrylic
2	2	1	7051A3006	Bracket, Rack door hinge
-	-	1	7051A2009	SR48 Bottom hinge weldment
4	4	2	HW486	Screw 10-32x½ PhTHMS
2	2	2	HW253	Screw 6-32x3/8 truss SS
3	3	3	HW757	Pin, Taper 5/32x1.0
6	6	6	HW327	Washer, Flat #8 .188x.375x.049 SS
1	1	1	HW8146	Keylatch with Keeper 93-10-202-50

Note: *SR6 racks ship with their doors assembled and attached.*

Caution ***Dimmer rack doors filter and regulate ventilation airflow. Operating without the door can contaminate the rack interior with dust and cause rack modules to overheat.***

1. Insert the top hinge into the slot on the top of the rack and attach it to the frame with two 10-32 x 1/2" Phillips head screws (included).

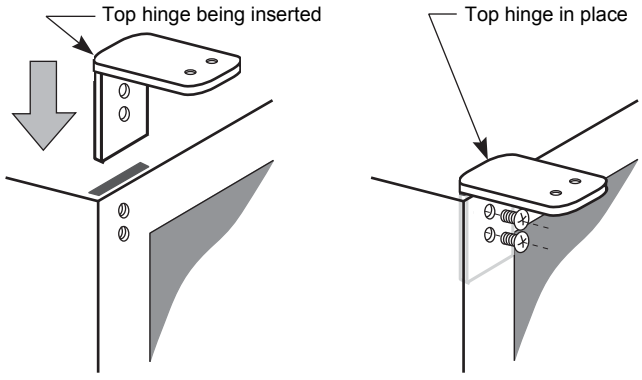


Figure 29: Attaching the top door hinge

2. The bottom hinge on the SR48 is a different design from the one used on the SR12 and SR24 to compensate for the heavier SR48 door.
   - SR12 and SR24 – Insert the bottom hinge into the slot on the bottom of the rack and attach it to the frame with two 10-32 x 1/2" Phillips head screws (included).

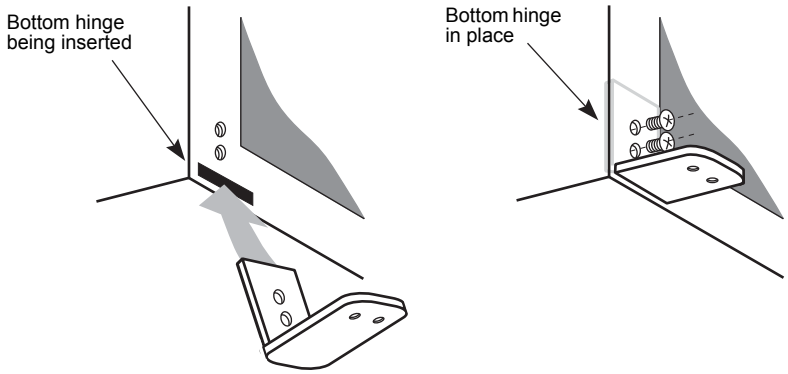


Figure 30: Attaching the SR12 and SR24 bottom hinge

   - SR48 – Remove the 10-32 x 1/2" Phillips head screw, insert the hinge into the slot and secure it by replacing the screw.

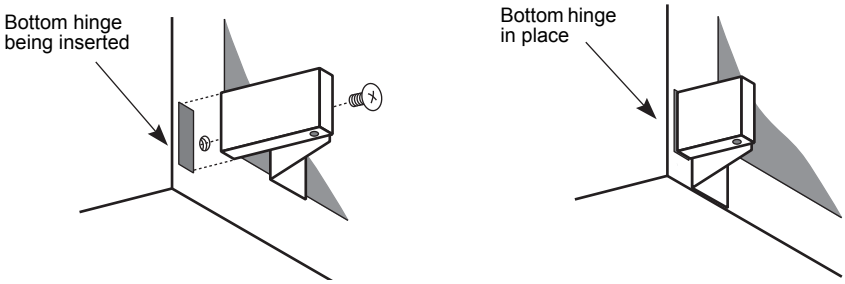


Figure 31: Attaching the SR48 bottom hinge

3. Drive the narrow end of one taper pin into the bottom of the door. Set the taper pin into the hole on the lower hinge.

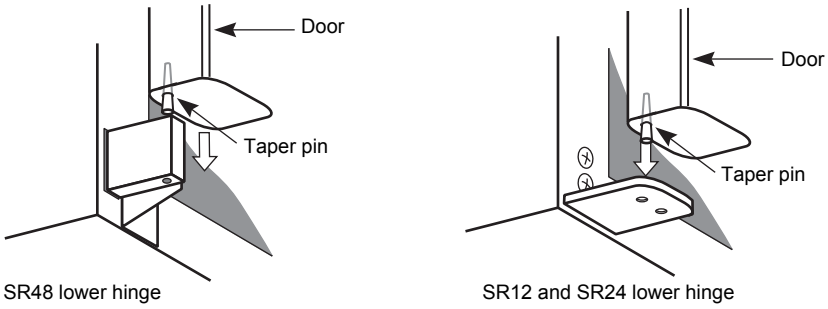


Figure 32: Installing the bottom taper pin

4. Hold the door in place and insert the other taper pin, narrow end down, through the top hinge and washer.

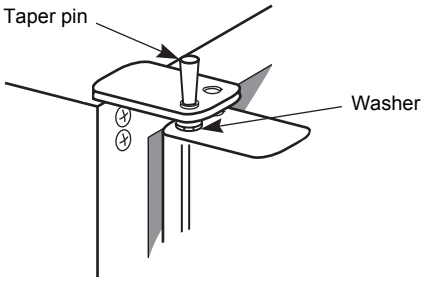


Figure 33: Installing the top taper pin

5. Take the Sensor beacon block, insert it through the slot on the upper left corner of the door so the word “SENSOR” is visible on the outside of the rack and secure it with two 10-32 x 1/2" Phillips head screws (included).

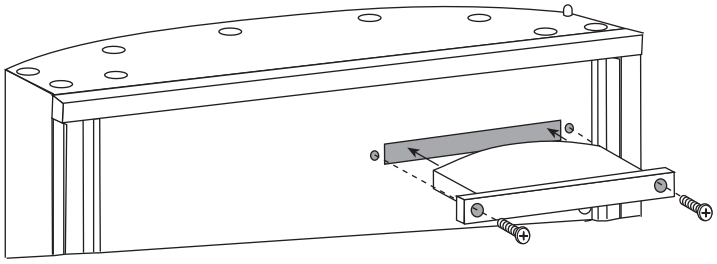


Figure 34: Installing the Sensor beacon block

Checking rack installation before installing dimmer modules

It is a good idea to go over the installation before applying power to the rack.

Before removing dimmer or control modules, de-energize the 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 short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

Warning! ***Power must be turned OFF when you perform this procedure.***

1. Clean out dust, metal scraps or other debris from the rack interior.

Note: *ETC recommends vacuuming the rack interior before installing modules.*

2. Check for loose connections, bare wires or damaged insulation.
3. Spin the top cooling fan to be sure it is not obstructed. Correct air leaks caused by conduit openings, empty screw holes or misaligned panels.

Checking main power wiring

1. Check resistance between phases, neutral and ground busses with a digital voltmeter (DVM):
   - **Phase to phase**; resistance should be 10MΩ or higher
   - **Phases to ground**; resistance should be 10MΩ or higher
   - **Neutral to ground**; resistance should be 0Ω
   - **Phase to neutral**; resistance should be 10MΩ or higher

Checking load wiring

1. Check resistance between the load terminals and the neutral buss:
   - Above 1MΩ – Normal when no load is connected
   - Between 1 – 1000Ω – Normal when loads are connected
   - Below 1Ω – Indicates a dead short in the load wiring

Checking control wiring with the CEM removed

You should check your control wiring at the wallplate XLR connector station farthest from your dimmer rack(s).

Warning! ***Power must be turned OFF when you perform this procedure.***

1. Remove all Control Electronics Modules (CEMs) from your dimmer racks.

Checking the DMX512 wiring

1. Measure resistance between the following pins on the XLR plug:
   - Pin 3 (Data+) and Pin 2 (Data–): Above 10MΩ
   - Pin 3 (Data+) and Pin 1 (Common): Above 10MΩ
   - Pin 3 (Data+) and ground: Above 10MΩ
   - Pin 2 (Data–) and Pin 1 (Common): Above 10MΩ
   - Pin 2 (Data–) and ground: Above 10MΩ

Checking the ETCLink wiring

1. Measure resistance between the following pins on the XLR plug:
   - Pin 1 (Data+) and Pin 2 (Data–): Between 475 – 525Ω
   - Pin 1 (Data+) and Pin 7 (Common): Above 10MΩ
   - Pin 1 (Data+) and ground: Above 10MΩ
   - Pin 2 (Data–) and Pin 7 (Common): Above 10MΩ
   - Pin 2 (Data–) and ground: Above 10MΩ
   - Pin 7 (Common) and ground: Above 10MΩ
   - Pins 5 and 6 (Aux power): Above 10MΩ
   - Pin 5 (Aux power) and ground: Above 10MΩ
   - Pin 6 (Aux power) and ground: Above 10MΩ

Checking DMX512 wiring with the CEM installed

You should check your DMX512 wiring at the wallplate XLR connector station farthest from your dimmer rack(s).

1. Install all CEMs into your dimmer racks
2. Measure resistance between Pin 3 (Data+) and Pin 2 (Data–). It should be between 90 – 130Ω. The following readings indicate a problem:
   - Below 50Ω – network is double terminated
   - Above 1MΩ – network is not terminated
   - Below 1Ω – data wires are shorted together

Optional – Checking line voltages on the phase bus bars

You can check the voltages on your phase bus bars with a Digital Voltmeter (DVM) before installing your modules.

Warning! ***Line voltages are present on the phase bus bars during this procedure. You must be a qualified electrician familiar with the hazards of working with electricity and use extreme caution to check line voltages on the phase bus bars.***

Warning! ***Risk of electric shock***

- **HIGH LEAKAGE CURRENT**
- **Ground connection essential before connecting supply**
- **Disconnect power before removing modules**
- **Service by authorized persons only**

1. Close the dimmer rack door.
2. Apply phase power at the main circuit breaker for 90 seconds. Observe the rack for evidence of shorting, like arcing sounds or a burning smell. If you detect evidence of shorting, shut off power and fix the wiring.
3. Open the rack door and check voltage between phases, neutral and ground:
   - **Phase to phase**; voltage should be between 190 and 225VAC on three phase racks and between 220 and 260VAC for single phase
   - **Phases to neutral**; voltage should be 110 to 130VAC
   - **Neutral to ground**; voltage should be less than 0.5VAC
4. Turn off phase power at the main circuit breaker.

Installing rack modules

Sensor dimmer and control modules are easily slid into place by hand.

Installing dimmer modules

1. Inspect each dimmer module for loosened components or other shipping damage.
2. Slide dimmer modules into the rack. If you are installing a mix of module types, consult the included job drawings for the correct module order.
3. Push each module into its slot until it is flush with the front of the rack.

Installing the CEM Module

1. Inspect the CEM module for loosened components or other shipping damage.
2. Slide the CEM module into the rack.
3. Push the module into the rack until it seats into the CEM backplane.

Testing Ground Fault Interrupt dimmer modules (GFCI racks only)

GFCI dimmer modules must be tested monthly for proper GFCI operation in order to comply with UL943. Test results should be recorded on a test sticker that is easily accessible from the dimmer rack.

Note: *GFCI tests must be performed with rack power on.*

1. Open the dimmer rack door and locate the GFCI modules you want to test.
2. Push the Test switch just right of the circuit breaker handles:
   - If the GFCI breaker is working, the breaker switches will trip to the right
   - If the switches do not trip, the GFCI circuit may need repair

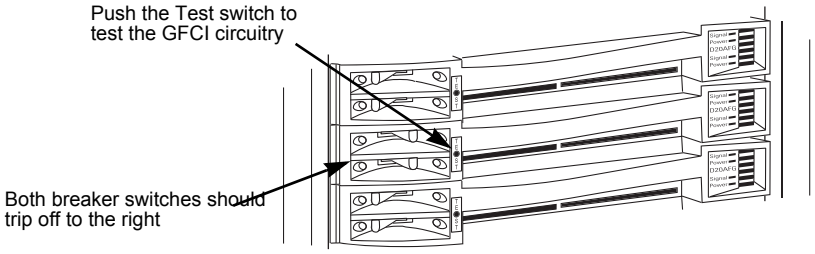


Figure 35: GFCI Dimmer module circuit breakers

3. Reset the breaker switches and document the test on the test sticker.
4. Close the dimmer rack door.

Sensor rack installation checklist

Please go over this checklist to confirm that you have correctly installed the Sensor Installation Rack.

- ❑ Is the rack securely mounted with all mounting bolts tight?
- ❑ Is there sufficient clearance on the left side (6 inches minimum) and in front (17 inches minimum) to allow the rack door to open completely?
- ❑ Is there sufficient clearance (10 inches minimum) above the rack?
- ❑ Are all distribution cables landed and properly terminated? (Any circuits not landed must be clear or capped off.)
- ❑ Do all control cables meet spec? (See ETC installation drawings or Table 10*: Data cable requirements* on page 40.)
- ❑ Are DMX512 and ETCLink data cables routed as specified in the drawings?
- ❑ Are all air leaks into the dimmer cabinet sealed?

If you have any questions about the installation of your Sensor Installation Rack, please contact:

ETC Technical Service
3030 Laura Lane
Middleton, WI. 53562
Phone: 608/831-4116
Fax: 608/836-1736

Testing an installed rack

After finishing installation, use this procedure to perform a functional check.

Before removing dimmer or control modules, de-energize the 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 short circuit currents on the feeders of the equipment. Any work on energized equipment must comply with OSHA Electrical Safe Working Practices.

Note: *Go over the Sensor rack installation checklist on page 34 before energizing the rack.*

1. Make sure power is disconnected at the main circuit breaker.
2. Open the door and set all the dimmer module circuit breakers to **Off**.

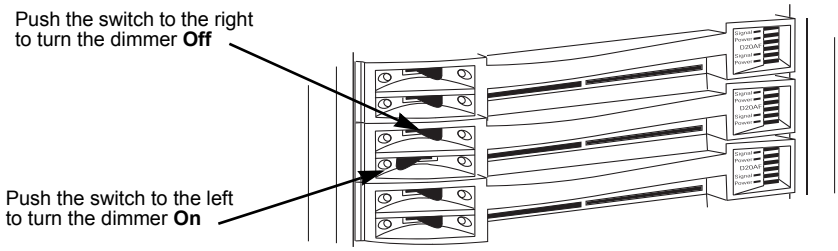


Figure 36: Dimmer module circuit breakers

3. Remove the CEM and set the test switch to **TEST** (See *Figure 37*).

Caution: ***With the test switch on TEST, all dimmers drive to full output. Your power supply may not have enough capacity to operate the rack at full output. To avoid tripping your main circuit breakers, make sure you have set all dimmer module circuit breakers to Off before applying power. (Step 2)***

4. Replace the CEM and close the door.
5. Apply power at the main circuit breaker

Warning! ***High voltage is present inside the rack during this procedure. Do not remove rack modules after applying power.***

6. Observe the rack for obvious faults:
   - The Sensor beacon lit or flashing (The beacon will be off unless there is a fault.)
   - Any indication of shorting or burning from rack components

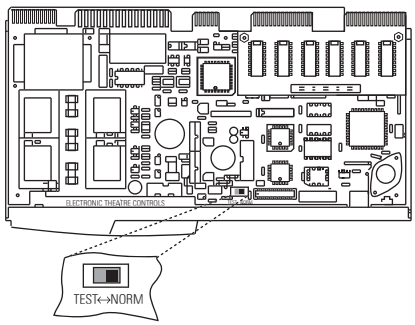


Figure 37: Test switch location

Checking individual dimmer operation

1. Open the dimmer rack door. All dimmer module signal LEDs should be on.
2. Set one dimmer module circuit breaker to **On** and check these functional indications:
   - The dimmer's lighting loads are on (if visible)
   - The rack cooling fan is running
   - Dimmer hum increases slightly
   - **Power** LED lights (AF modules only)
3. Set the circuit breaker to **Off**, and repeat Step 2 with the next dimmer module.
4. If all indications are normal after testing the dimmer modules, the rack is functional.
5. Remove power at the main circuit breaker.
6. Open the rack door, remove the CEM and set the Test switch to Off (See *Figure 37*).
7. Replace the CEM and close the rack door.
8. Turn all the dimmer circuit breakers **On.**
9. If possible, apply power and test your system with the facility control system
10. Deliver all ETC documentation to the system operator.

Appendix A:

Sensor Rack specifications

Dimensions

SR6 – 16.4 inches high x 14.8 inches wide x 13.3 inches deep
SR12 – 25.8 inches high x 14.8 inches wide x 13.3 inches deep
SR24 – 48.0 inches high x 14.8 inches wide x 17.2 inches deep
SR48 – 86.2 inches high x 14.8 inches wide x 20.1 inches deep

Weight without dimmer modules

SR6 – 36 pounds
SR12 – 50 pounds
SR24 – 132 pounds
SR48 – 249 pounds

Rack module weights

Control Electronics Module (CEM) – 4.3 pounds
D15 and D20 module – 5.0 pounds
D50AF module – 5.5 pounds
D100AF module – 7.6 pounds
Airflow (AFM) module – 1.5 pounds

Electrical compliance

SR6 – 100 amps per phase (3 phase maximum)
SR12 – 200 amps per phase (3 phase maximum)
SR24 – 400 amps per phase (3 phase maximum)
SR48 – 800 amps per phase (3 phase maximum)

(These are maximum current ratings. Your rack may use less depending on your loads.)

Operational Voltage (Ue): 120V ±10% (3p + N + ⏚)
120V ±10% (2p + N + ⏚)
Frequency: 50/60Hz
Short-circuit current: 10,000 AIC (100,000 AIC available)

Environment

Ambient temperature between 32°F and 104°F (0 – 40°C)
Humidity between 30 – 95% (non-condensing)
Altitude below 6500 feet (2000 meters)

Dimmer Module Efficiency

The following table provides information on the thermal efficiency of ETC Sensor dimmer modules. All dimmer efficiencies are measured at maximum current (full load). Note that the watt and BTU figures shown below apply to single dimmers, not dimmer modules and a module often contains more than one dimmer.

Table 9: Dimmer Module Efficiency

Module Type	Dimmers per Module	Full Load in Watts	Watts Dissipated	BTU's Dissipated	Dimmer Efficiency
D15	2	1,800	56	190	96.9%
D15AF, D15E	2	1,800	70	237	96.1%
D20	2	2,400	77	261	96.8%
D20AF, D20E	2	2,400	119	405	95.1%
D20HR	1	2,400	259	883	89.2%
D50AF	1	6,000	237	808	96.1%
D50HR	1	6,000	543	1,853	90.9%
D100AF	1	12,000	446	1,521	96.3%

Although Sensor dimmers are designed to operate safely in environments with ambient temperatures of up to 104°F (40°C), as with all electronic equipment, keeping the operating environment at cooler temperatures will help improve the service life of the equipment. In order to maximize the efficiency of your dimming system, dimmer room air conditioning should maintain an ambient dimmer room temperature of 68°F (20°C) or less.

Note: *When calculating air conditioning requirements, keep in mind that the BTU outputs cited in the table above are maximums. The heat actually dissipated may be less. Factors that influence actual heat dissipation include service ampacity, as well as how the dimmers are used and typical loads.*

Appendix B:

Installing a simple DMX512 or ETCLink system

If you do not have an existing DMX512 or ETCLink wiring in your facility, you can use these instructions to install basic system. Adding to an existing system, or installing a complex system requires technical assistance from an authorized ETC representative and is not covered by these instructions.

Note: *Use this appendix for guidance only. Your system must be designed and installed by qualified personnel and comply with your state and local electrical codes.*

Defining a simple system

A simple system connects signal sources (lighting control consoles or architectural lighting controllers) at one end with dimmer racks at the other.

ETC recommends installing DMX512 and ETCLink wiring in grounded metal conduit. DMX512 and ETCLink can run in the same conduit.

Note: *ETCLink needs two 16 AWG wires for accessory power.*

Maximum total data wire length in a simple system is 1000 feet.

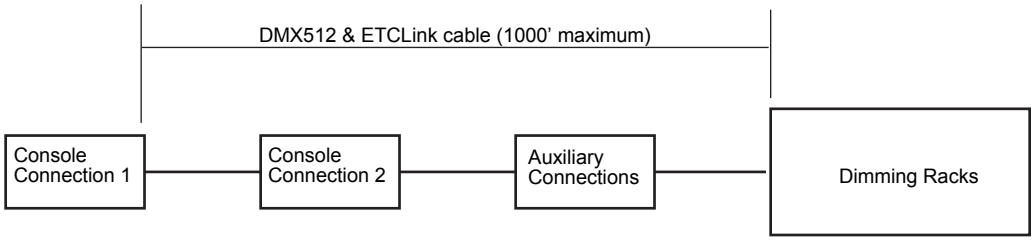


Figure 38: Correct layout for a simple network

Simple systems run directly from the signal source to the dimmer racks, without branching off to other devices. Up to 31 connections for auxiliary devices can be installed on simple DMX512 or ETCLink systems as long as the data wiring does not branch out or form any loops.

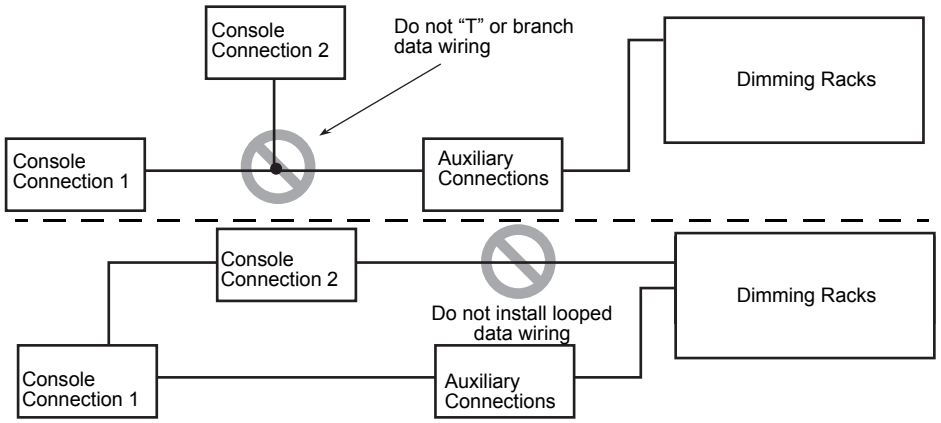


Figure 39: Diagram of incorrect network layouts

Installing conduit and cables

After planning your system, pull your data cables and accessory wires.

Note: *ETC recommends installing data cabling in grounded metal conduit.*

1. Install data conduit and backboxes according to local electrical codes.

Note: *Do not pull DMX512 or ETCLink data cabling in the same conduit as load or line power wiring.*

2. Pull your data cables and ETCLink accessory wires. Leave a 20 inch loop of extra cable at each backbox where you plan to make a network connection.

Note: *DMX512 and ETCLink use the same type of cable for data). Make sure all wire runs are labeled to avoid cross-connecting your cabling.*

Table 10: Data cable requirements

Communication type	Recommended wiring
DMX512	Belden 9729
ETCLink	Belden 9729 plus two 16 AWG wires

Table 11: Belden 9729 cable alternatives

Cable manufacturer	Part number
Carol	C0910
General	E8990
Olfex	9729

Any red and black stranded 16 AWG wires can be used for ETCLink auxiliary power runs of under 1000 feet. Runs over 1000 feet require 14 AWG wire.

Installing data connection terminals

At one end the DMX512 and ETCLink networks connect directly to the CEM backplane of your dimmer racks. For instructions on making those connections, see *DMX512 and ETCLink data connections* on page 21.

Other connections to the cabling are made through wallplate connectors installed throughout the system.

Wallplate connectors from ETC install in standard industry backboxes. A single wallplate connector uses a one-gang backbox. Each additional connection increases backbox size by one gang.

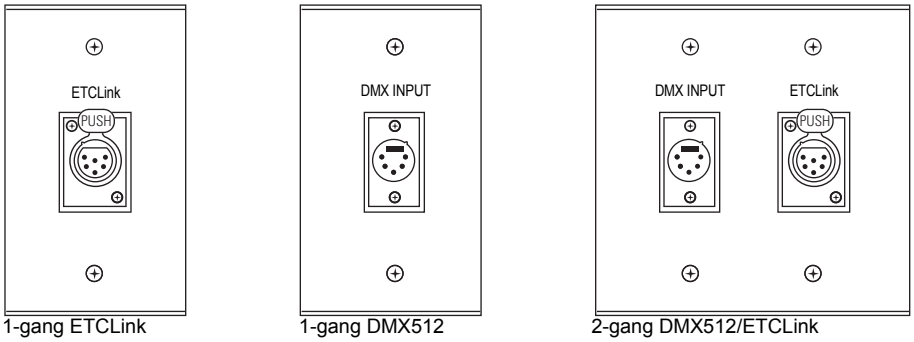


Figure 40: DMX512 and ETCLink wallplate connectors

DMX512 and ETCLink wallplate connectors may be installed alone, together or in combination with other connector types in the same backbox, depending on other data types used in the lighting system. Wire connections from DMX512 and ETCLink cables are not affected by different combinations on the wallplate.

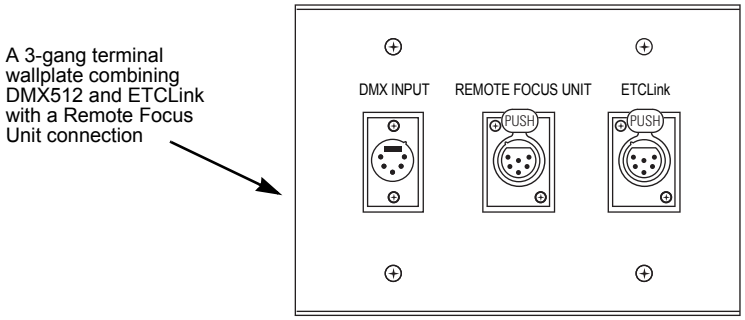


Figure 41: 3-gang DMX512/RFU/ETCLink wallplate

Note: *For actual wire termination on wallplates, please see the documentation that ships with the individual wire preparation kits for those wallplates.*

Appendix C:

GFCI circuit troubleshooting

Ground Fault Current Interrupt (GFCI) circuits provide extra protection for people and equipment by comparing current on the Hot (supply) and Neutral (return) wires of each dimmer circuit. In a properly functioning circuit, the current on these wires will be equal, because all the current carried to the loads by the hot wire returns on the Neutral wire to complete the circuit.

In the event of a Ground fault, some or all of the current “leaks” from the circuit to Ground. This leakage reduces the amount of current that returns on the Neutral wire. The GFCI electronics detect this difference and trip the circuit breaker.

Requirements for GFCI circuits

- GFCI circuit wires cannot be longer than 125 feet (measured from dimmer lugs)
- The neutral and hot wires for each GFCI protected circuit must run in the same dedicated conduit.
- No splitting of load and neutral wires between conduits
- No ganging of neutral (return) wires at any point in circuit
- No including non-GFCI/RCD load or neutrals in GFCI conduits
- Low voltage loads need special transformer or GFCI won't trip on fault
- Possible incompatible fluorescent ballasts/wiring

Typical causes of GFCI circuit faults

Circuit immediately trips when powered up

- Load and neutral wires from different circuits are connected to GFCI dimmer
- Neutral wires are ganged with other dissimilar loads
- There is a real GFCI circuit fault

Circuit intermittently trips when powered up

- Load and neutral wires from different (but associated) circuits are connected to GFCI dimmer
- Neutral wires are ganged with associated dimmer circuits
- There is an intermittent GFCI circuit fault

Circuit does not trip during a GFCI fault

- GFCI dimmer is connected to the wrong (fault-free) dimmer circuit
- GFCI circuit load is an incompatible low-voltage transformer or fluorescent ballast type
- GFCI dimmer module is faulty

Warning! ***GFCI dimmer modules cannot be repaired on site. Defective modules must be replaced and returned to ETC for evaluation or repair. Do not allow anyone to attempt to repair a GFCI in the field. A GFCI module that has been tampered with does not provide UL 943-compliant GFCI circuit protection.***

Appendix D:

Converting Discrete Neutral dimmer lugs

If you need to place a non-GFCI protected circuit and use a non-GFCI dimmer module (such as a standard D20) in a GFCI rack, you need to perform this conversion. This conversion needs to be done in pairs to accommodate an entire module. ETC does not make a module that is half GFCI and half standard.

1. Shut off rack power at the main circuit breaker.

Warning! ***Servicing a dimmer rack with power on may result in death or injury from electrical shock***

2. Determine which dimmer slots you will be converting. You can convert either individual slots or three-slot strip.

Converting GFCI dimmer slots

1. Gently bend the lug tab out with a small standard screwdriver until the lug releases and you are able to pull it out. Repeat steps 1 and 2 for the other dimmer slot lug.

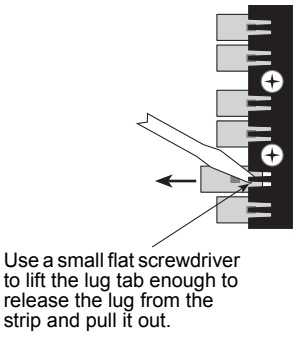


Figure 42: Removing a lug

Caution ***Lug catches will break if bent too far. Only bend the catch until the lug releases.***

2. Use a #2 flat screwdriver to loosen the threaded inserts until the contact plates can slide out of both lugs.
3. Install a Neutral lug jumper into the lugs and tighten the threaded insert.
4. Slide the jumpers into the plastic lug strip until the lug tab clicks into place.
5. Secure the jumper to the PEM insert on the main Neutral bus using the provided 4-40 screw.
6. Repeat Steps 1 through 6 for any other lugs you want to convert.

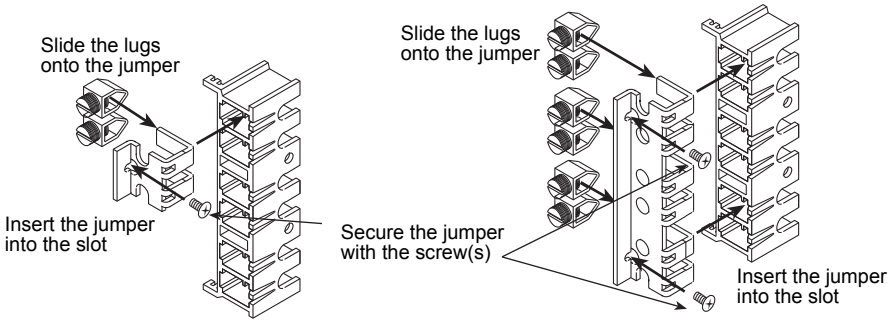


Figure 43: Converting Neutral Disconnect lugs to use standard dimmers

Installing three-slot dimmer lug strips

1. Use a #2 Phillips screwdriver to remove the two 4-40 screws securing the lug strip to the left side of the rack. See Figure 5, left.
2. Remove the lug strip and replace it with one containing a three-slot Neutral jumper.
3. Secure the strip to the rack with the screws you removed in Step 1.
4. Secure the jumper to the main Neutral bus PEM inserts using the two 4-40 screws provided with the jumper strip.

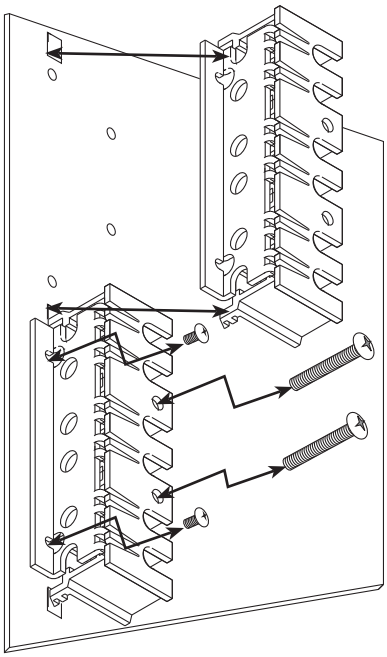


Figure 44: Removing or installing a Neutral lug strip

Glossary

Auxiliary power: 12Vdc operating power supplied to peripheral devices on a control data network.

CEM: The Control Electronic Module for a Sensor CEM dimming system. CEM systems enable multiple DMX512 inputs and addressing modes and support ETCLink.

Data network: Light gauge wires, usually shielded, that carry digital information instead of operating power.

Dimmer channel: An individual circuit used to set lighting levels.

Dimmer circuit: The load wiring and fixtures connected to a single dimmer.

Dimmer module: A slide-in cartridge containing one or two dimmer channels.

Dimmer rack: The cabinet, cooling and power distribution system for dimmer modules.

Dimmer slot: The rails and circuit connections in a dimmer rack that individual dimmer modules slide into during installation. Larger dimmer modules (100 amp) use two dimmer slots per module.

DMX512:The established data protocol for digital control of dimming systems. A DMX512 signal carriers up to 512 dimmer channels – each with an intensity level from 0-255.

ETCLink: A digital Echelon® LonTalk® network that carries system status information, including console-specific and dimmer-specific data, between components of a Sensor system. ETCLink components include CEMs and ETClink consoles, PCs or peripheral devices.

Line voltage (power): Phase voltage delivered to a dimming system from the installation main supply, usually municipal power.

Line wiring: Main power cables installed into the phase and neutral busses of the dimmer rack delivering line voltage.

Load voltage (power): Voltage controlled by a dimmer, delivered to fixtures on a dimmer circuit.

Load wiring: Power wiring installed between a dimmer and its loads, forming the dimmer circuit.

Network termination: A resister or resistive network installed on a data wires to reduce data interference by attenuating spurious signals.

Port: DMX512 input ports. Each CEM in the rack has two DMX input ports labeled port A and port B.

SR6: A six slot Sensor dimmer rack.

SR12: A twelve slot Sensor dimmer rack.

SR24: A twenty-four slot Sensor dimmer rack.

SR48: A forty-eight slot Sensor dimmer rack.

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