



NetSure™ 7100 Series -48 VDC Power System

Installation Manual

Specification Number: 582127000

Model Number: 7100

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

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Admonishments Used in this Document



DANGER! Warns of a hazard the reader *will* be exposed to that will *likely* result in death or serious injury if not avoided. (ANSI, OSHA)



WARNING! Warns of a potential hazard the reader *may* be exposed to that *could* result in death or serious injury if not avoided. This admonition is not used for situations that pose a risk only to equipment, software, data, or service. (ANSI)



CAUTION! Warns of a potential hazard the reader *may* be exposed to that *could* result in minor or moderate injury if not avoided. (ANSI, OSHA) This admonition is not used for situations that pose a risk only to equipment, data, or service, even if such use appears to be permitted in some of the applicable standards. (OSHA)



ALERT! Alerts the reader to an action that *must be avoided* in order to protect equipment, software, data, or service. (ISO)



ALERT! Alerts the reader to an action that *must be performed* in order to prevent equipment damage, software corruption, data loss, or service interruption. (ISO)



FIRE SAFETY! Informs the reader of fire safety information, reminders, precautions, or policies, or of the locations of fire-fighting and fire-safety equipment. (ISO)



SAFETY! Informs the reader of general safety information, reminders, precautions, or policies not related to a particular source of hazard or to fire safety. (ISO, ANSI, OSHA)

Important Safety Instructions

Safety Admonishments Definitions

Definitions of the safety admonishments used in this document are listed under “Admonishments Used in this Document” on page vi.

Safety and Regulatory Statements

Refer to Section 4154 (provided with your customer documentation) for Safety and Regulatory Statements.

Déclarations de Sécurité et de Réglementation

Reportez-vous à la Section 4154 (fourni avec les documents de votre client) pour les déclarations de sécurité et de réglementation.

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1 Customer Documentation Package

This document (IM582127000) provides *Installation Instructions* for Vertiv™ NetSure™ -48 VDC Power System Model 7100, Spec. No. 582127000.



NOTE! 582127000 List 100, 101, 102, 203, 500, 501, 502, 503, 600, 601, 900 and 901 are specific configurations of 582127000. Separate User Instructions and Installation Instructions are provided with these power systems. For 582127000 List 100, 101, 102, 203, 500, 501, 502, and 503; do not use these instructions. Refer to IM582127000100 and UM582127000100 for instructions. For 582127000 List 600, 601, 900 and 901; do not use these instructions. Refer to IM582127000900 and UM582127000900 for instructions.

The complete Customer Documentation Package consists of...

-48 VDC Power System Installation Manual

- Power System Installation Instructions: IM582127000

NCU Controller User Manual

- NCU Controller User Instructions: UM1M830BNA

USB Drive with All Customer Documentation

- Power System Quick Start Guide: QS582127000
- Power System Installation Instructions: IM582127000
- Power System Installation Instructions: IM582127000100 (instructions for List 100, 101, 102, 203, 500, 501, 502, and 503)
- Power System User Instructions: UM582127000
- Power System User Instructions: UM582127000100 (instructions for List 100, 101, 102, 203, 500, 501, 502, and 503)
- NCU Controller User Instructions: UM1M830BNA
- Rectifier Instructions: UM1R483500e
- Rectifier Instructions: UM1R483500e3
- Rectifier Instructions: UM1R482000e3
- -48 VDC to +24 VDC Converter Instructions: UM1C48241500
- -48 VDC to -58 VDC Converter Instructions: UM1C48582000P3
- Inverter Instructions: UM1I1201000
- Power System "System Application Guide": SAG582127000
- NCU Controller 2nd Ethernet Port Add-On Kit Instructions: IM559252
- NCU Controller 2nd Ethernet Port Retrofit Kit Instructions: IM559251
- Engineering Drawings
- Also provided on the USB drive is a controller configuration drawing and the controller configuration files loaded into the controller as shipped.

2 Installation Acceptance Checklist

Provided in this section is an Installation Acceptance Checklist. This checklist helps ensure proper installation and initial operation of the system. As the procedures presented in this document are completed, check the appropriate box on this list. If the procedure is not required to be performed for your installation site, also check the box in this list to indicate that the procedure was read. When installation is done, ensure that each block in this list has been checked. Some of these procedures may have been factory performed for you.



NOTE! The system is not powered up until the end of this checklist.



NOTE! Some of these procedures may have been performed at the factory for you.

Installing the System

- Relay Rack Secured to Floor (if applicable)
- Enclosures Placed, Bolted Together, and Secured to Floor (if applicable)
- System Components Mounted in Relay Rack (if required)
- Optional Lug Adapter Busbar Kits Installed
- Circuit Breakers Installed
- Fuses Installed

Setting Jumper and Switch Options

- Jumpers on System Interface Circuit Card Set
- Factory Switch Setting on IB2 Interface Board Verified
- Factory Switch Setting on Optional EIB Interface Board Verified
- Factory Switch Setting on SM-DU Verified
- Factory Switch Setting on Optional SM-DU+ Verified

Making Electrical Connections

- Relay Rack or Enclosure Grounding Connection (Frame Ground) Made
- Central Office Ground Connection Made
- AC Input and AC Input Equipment Grounding Connections Made
- AC Output Connections Made (if equipped with Optional Inverter System)
- External Alarm, Reference, Monitoring, and Control Connections Made
- Ethernet Connection Made (if required)
- Bay-to-Bay Cable Connections Made (as required)
- Bay-to-Bay Busbars Installed (as required)
- Bay-to-Bay Busbar Covers Installed (as required)

- Converter Output Cables (if furnished) Connections to +24VDC or -58VDC Distribution Made (as required)
- Load Connections Made
- Battery Connections Made
 - a) Batteries Installed and Connected in an optional Battery Tray (if furnished)
 - b) Optional Battery Tray Front Battery Covers Installed (if furnished)
 - c) Optional Battery Tray Circuit Breaker Guards Installed (if furnished)

Installing the Modules and Initially Starting the System

- Rectifier and Converter Modules Installed
- Inverter Modules Installed (if equipped with Optional Inverter System)
- System Started, Configured, and Checked

3 Installing the System

3.1 General Requirements

- This product is intended only for installation in a restricted access location on or above a non-combustible surface.
- This product must be located in a controlled environment with access to Crafts persons only.
- This product is intended for installation in network telecommunication facilities (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- This product is intended for connection to the common bonding network in a network telecommunication facility (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- The DC return connection to this system can remain isolated from system frame and chassis (DC-I).
- This system is suitable for installation as part of the Common Bonding Network (CBN).
- The installer should be familiar with the installation requirements and techniques to be used in securing the relay rack to the floor.
- Rectifier, converter, and mounting assembly ventilating openings must not be blocked and temperature of air entering rectifiers and converters must not exceed rated operating ambient temperature range found in SAG582127000.
- Clearance requirements are:
 - a) Recommended minimum aisle space clearance for the front of each bay is 2' 6".
 - b) Recommended minimum aisle space clearance for the rear of each bay is 2' 0" for any of the following conditions:
 1. Multiple bay arrangements that incorporate rear inter-bay busbars (List 2 and List 3 or List 7 and List 8 bays).
 2. Addition of a module mounting assembly in the field.
 3. Making input connections to a field installed module mounting assembly.
 4. Adding battery tray(s) in the field.

For all other conditions, required minimum spacing from the rear of the bay to a wall or other solid surface is that which is specified for proper module mounting assembly ventilation. Refer to System Application Guide SAG582127000 for ventilation spacing requirements.



NOTE! Minimum spacing specified for ventilation may not permit replacement of certain components such as busbars or module mounting assemblies.

3.2 Procedures when the System is Installed in an Enclosure

3.2.1 Removing the Enclosure Rear Panels

Procedure

1. Loosen the fasteners on the rear panel, then remove the panel. Refer to Figure 3.1.
2. For reassembly, note the location of the large holes in two corners of the panels. Orient the panels as shown in Figure 3.1

3.2.2 Removing the Enclosure Side Panels

Procedure

1. Loosen the fasteners on the side panel including panel frame grounding wire hardware, then remove the panel. Refer to Figure 3.1.

3.2.3 AC Input Conduit Options

Procedure

1. Two types of conduit plates are available. Select and install the conduit plate appropriate for your application. Refer to Figure 3.2.

Figure 3.1 Removing System Enclosure Side and Rear Panels

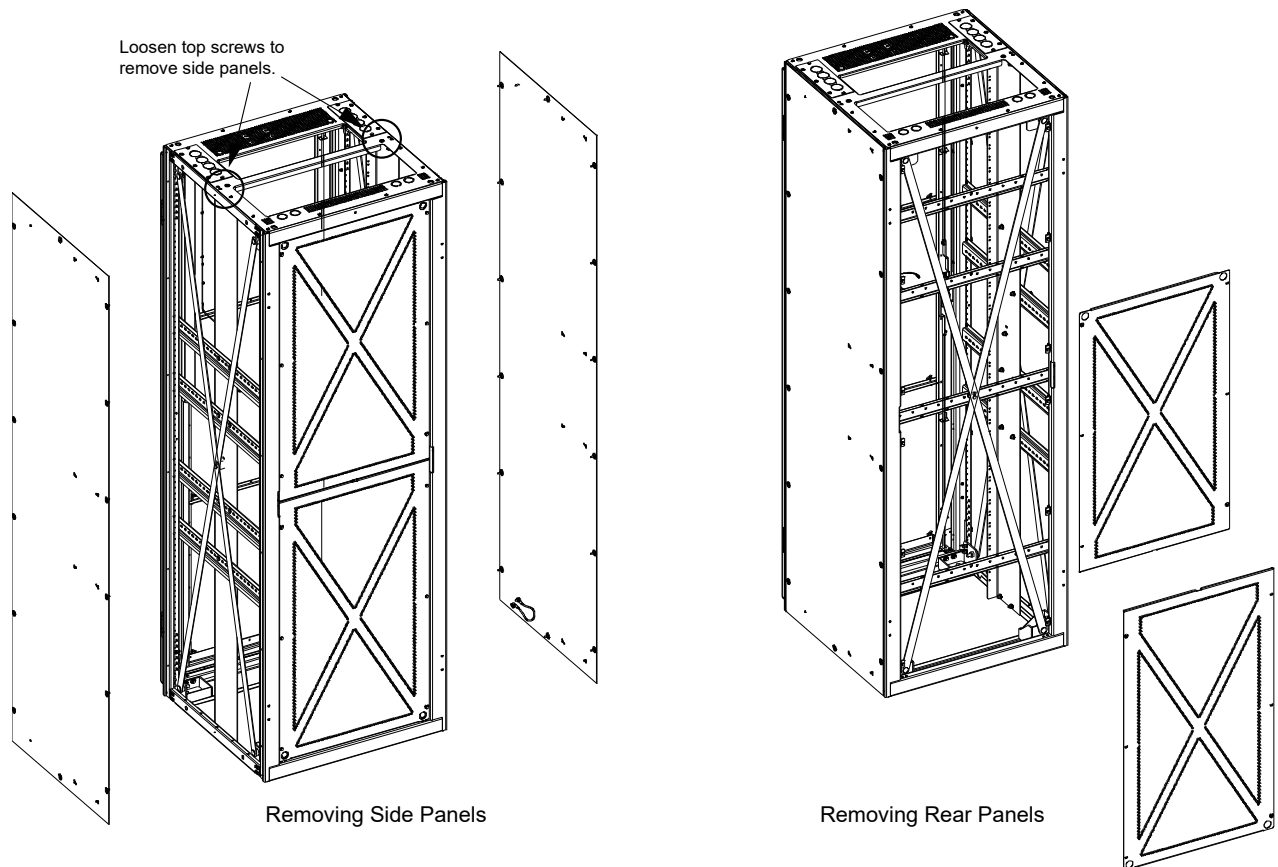
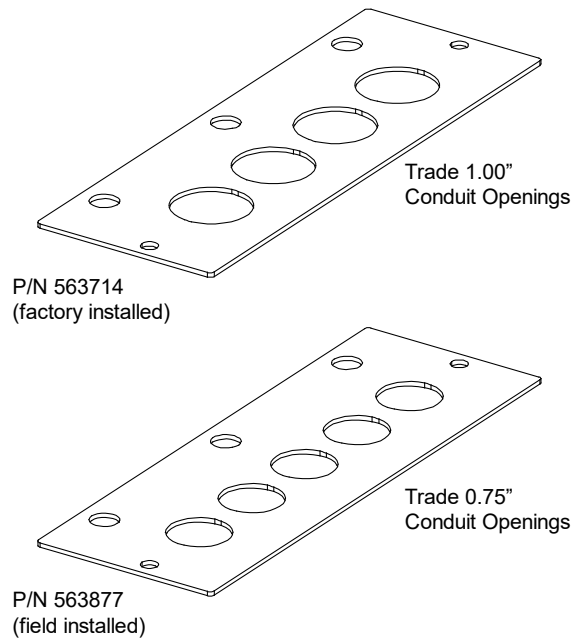


Figure 3.2 AC Input Conduit Plates



3.2.4 Reversing the Enclosure Front Door

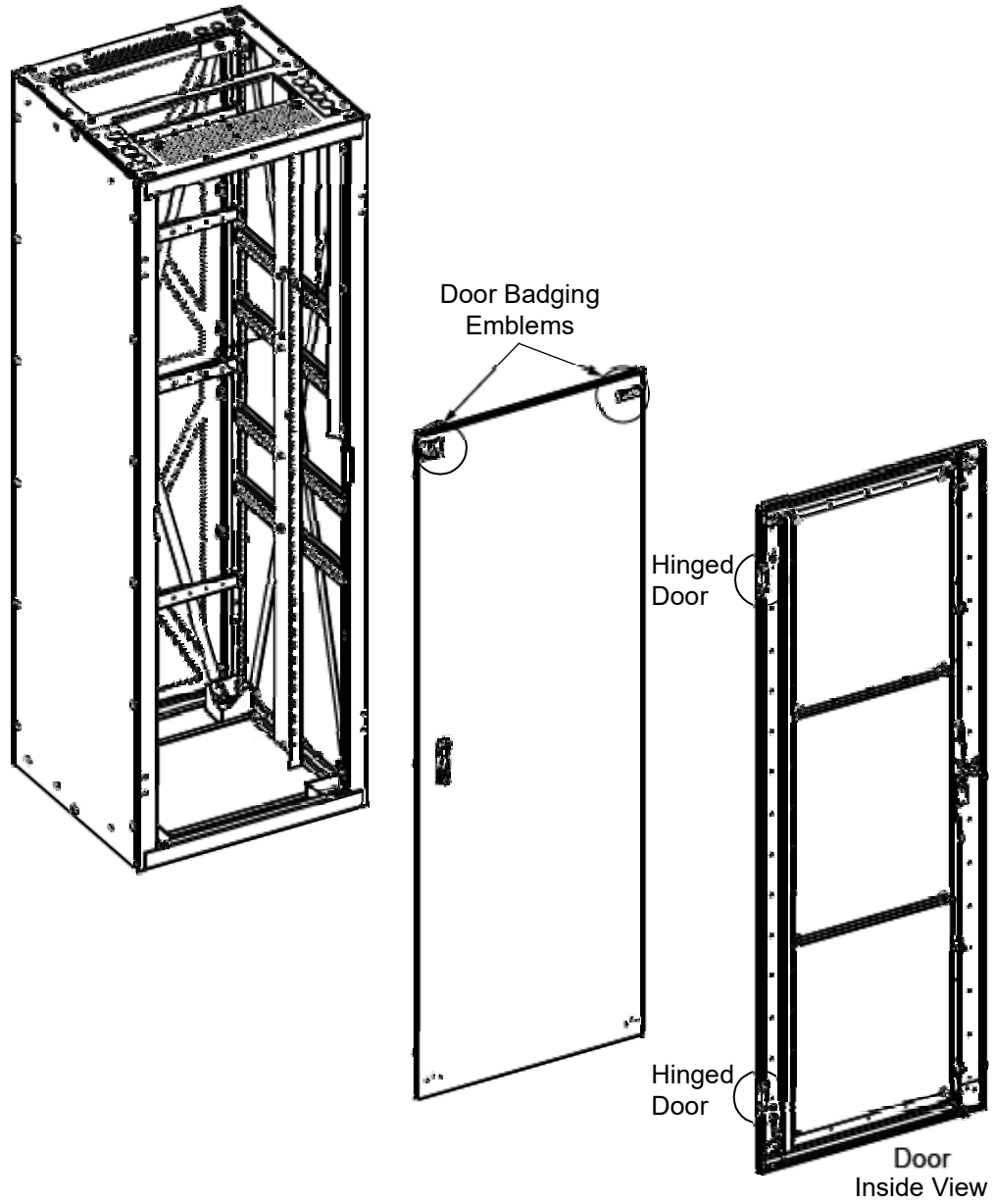


NOTE! Refer to Figure 3.3 as this procedure is performed.

Procedure

1. Open the front door.
2. Remove the ground strap from the front door, saving the hardware.
3. Unbolt the front door hinges from the enclosure.
4. Remove the front door.
5. Reverse the front door.
6. Re-bolt the front door hinges to the other side of the enclosure.
7. Re-attach the ground strap to the front door, using the saved hardware.
8. Carefully remove the clips from inside the door securing the door badging emblems.
9. Remove the door badging emblems and relocate them to the opposite corners at the top of the door. Secure with the clips removed above.

Figure 3.3 Reversing the Enclosure Front Door



3.3 Placing and Securing the Relay Rack(s) to the Floor (if applicable)

System components are factory mounted in a relay rack, on shipping rails, or in an enclosure as specified when ordered.

Systems Installed in a Relay Rack

The system consists of one to six bays. For busbar-connected systems (List 1 with List 2/List 3), locate relay racks in a line adjacent to each other, with no space between them. Place the List 1 Main Bay at the right or left side end, then the List 2 Supplemental Bay, then the List 3 Supplemental Bay (if furnished), etc.

Secure the relay rack to the floor per site requirements. Refer to “General Requirements” on page 4.

Ventilation Requirements

Refer to the “General Requirements” on page 4.

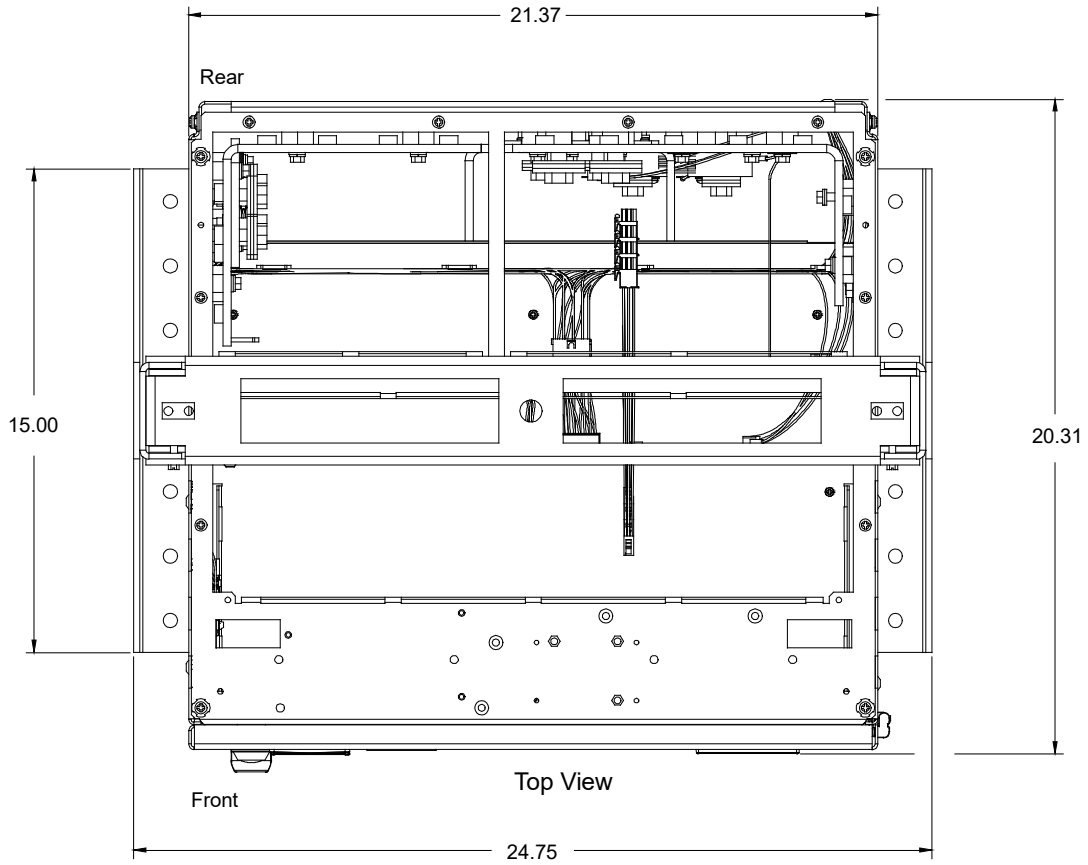
Relay Rack Floor Mounting Dimensions

Refer to Figure 3.4 for relay rack floor mounting dimensions.

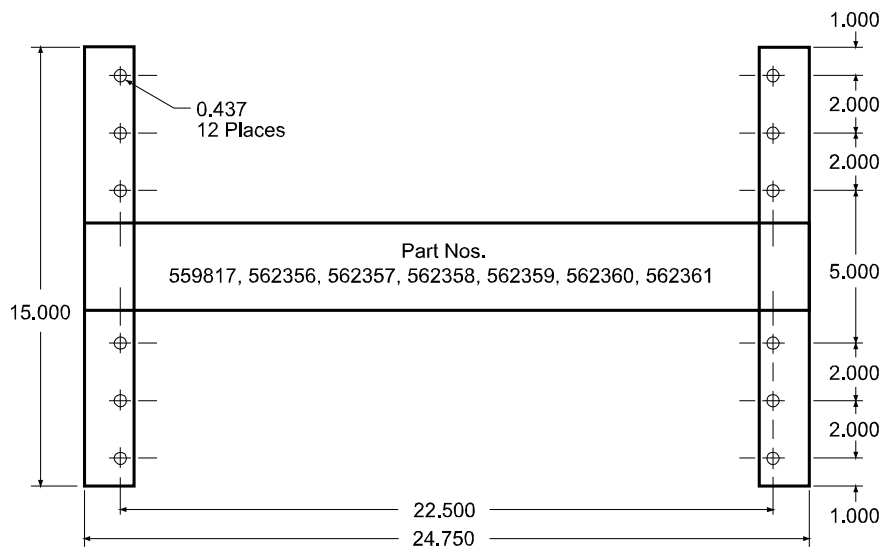
Optional Relay Rack Isolation Kit

Refer to Figure 3.5 when using the Optional Relay Rack Isolation Kit.

Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd on next page)

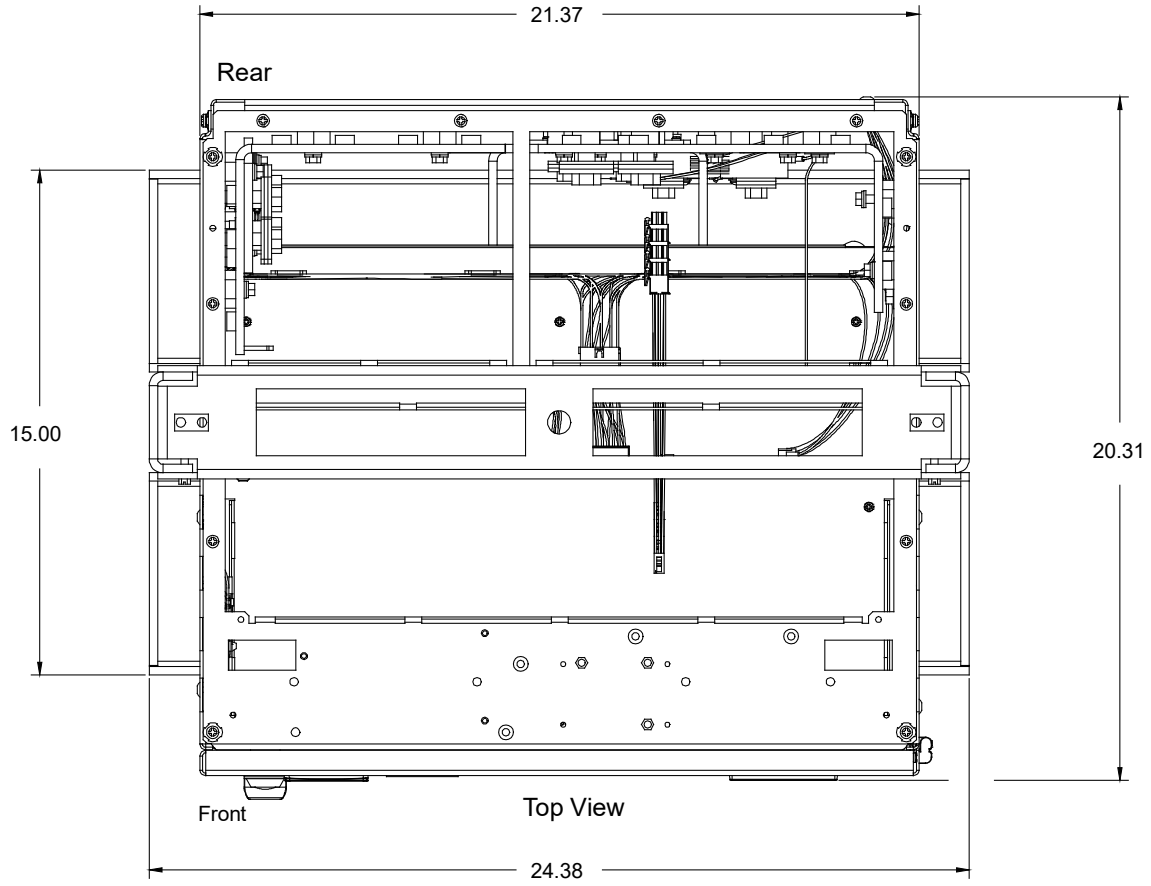


559817, 562356, 562357, 562358, 562359, 562360, 562361 with Power System

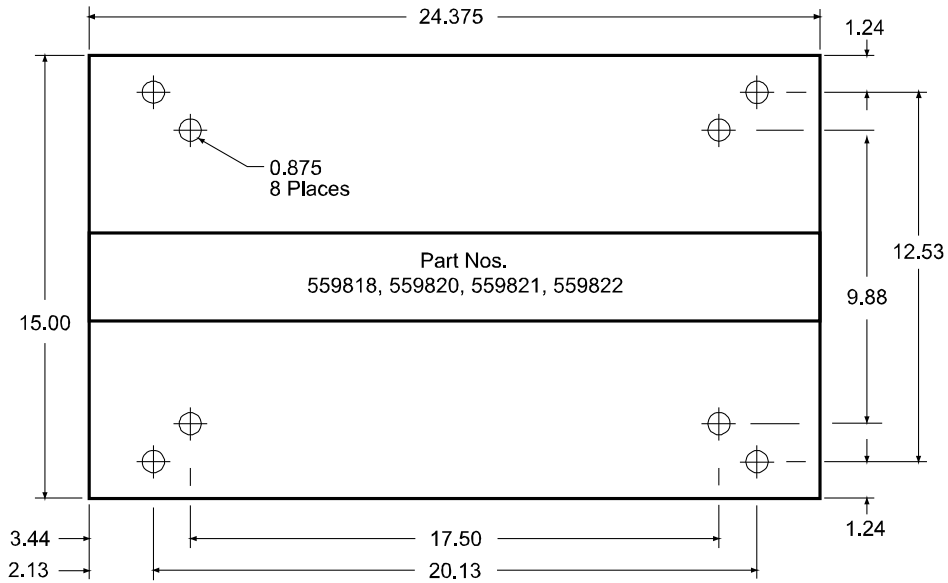


Notes:
1. All dimensions are in inches.

Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page, cont'd on next page)

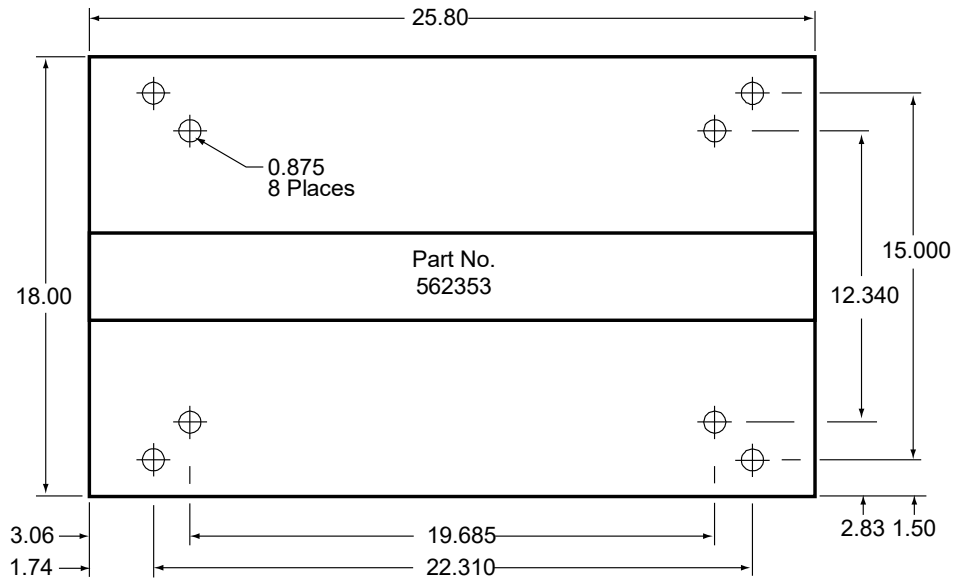


559818, 559820, 559821, 559822 with Power System



- Notes:
 1. All dimensions are in inches.

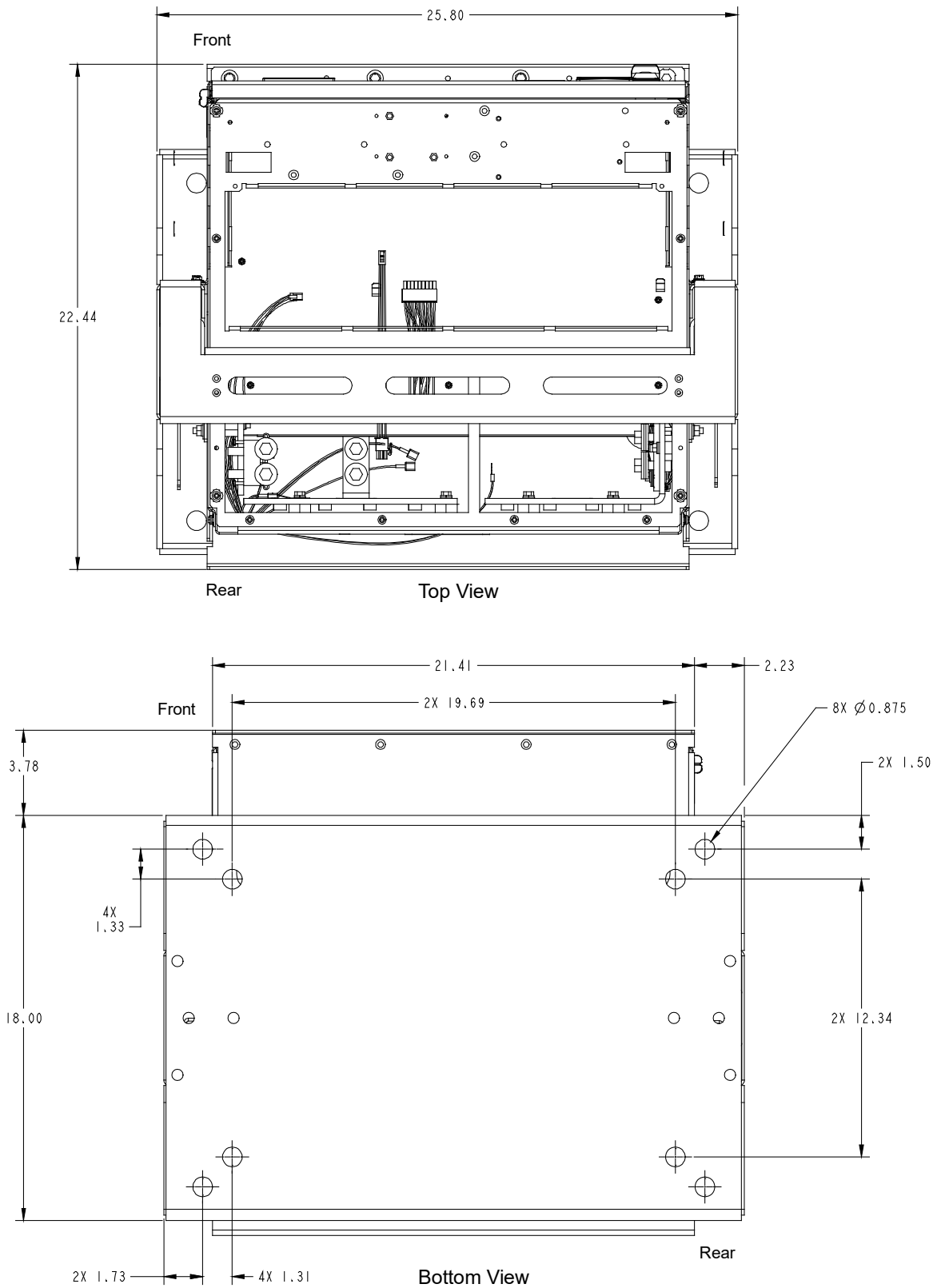
Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page)



Notes:

1. All dimensions are in inches.

Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page)

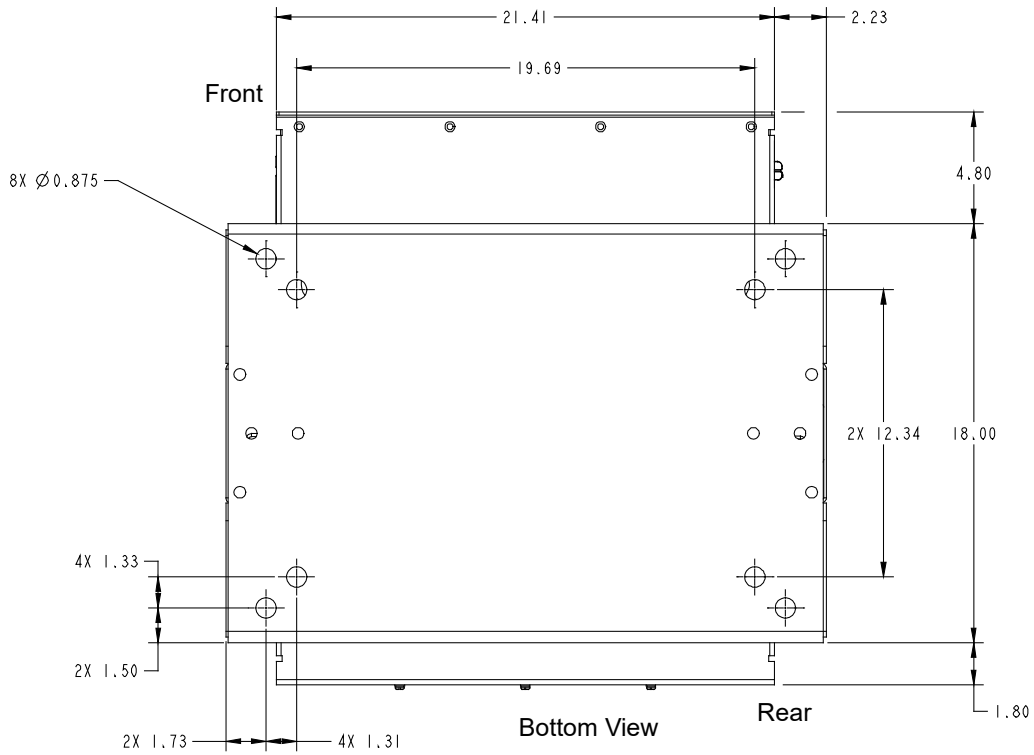
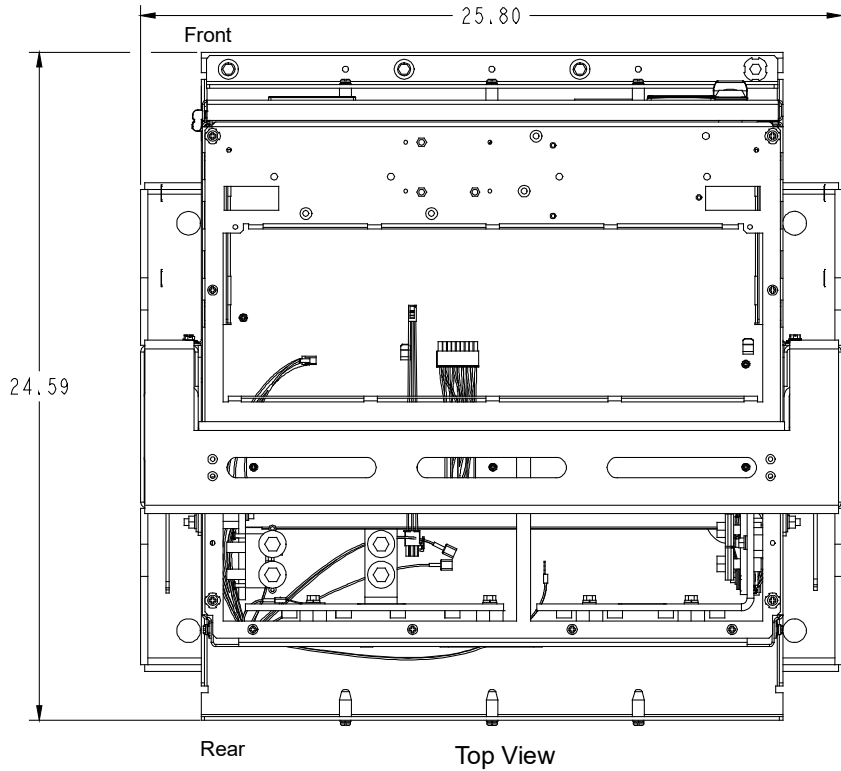


Notes:

1. All dimensions are in inches.

562353 with List 21 and List 93

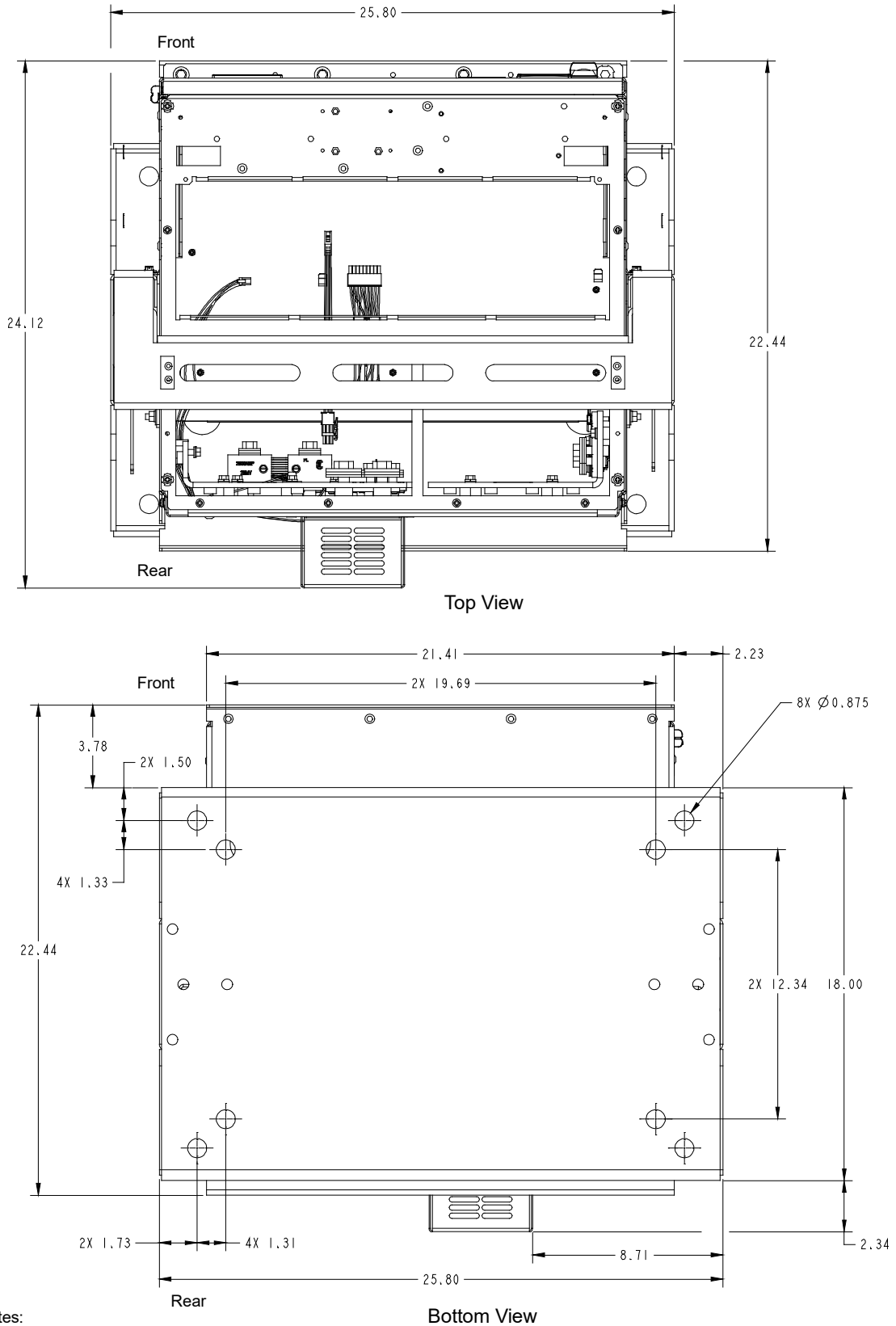
Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page)



Notes:
1. All dimensions are in inches.

562353 with List 21 and List 95

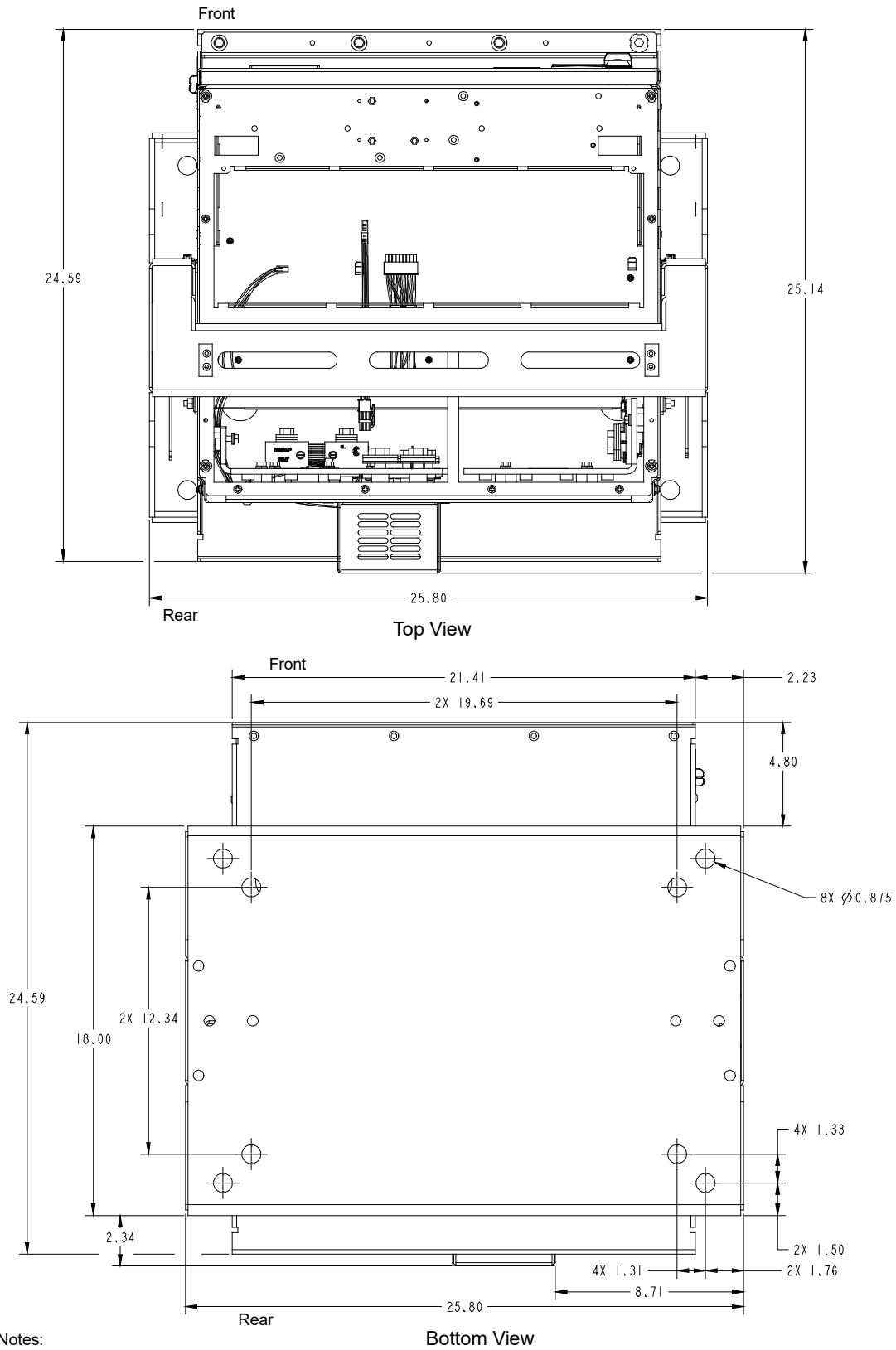
Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page)



Notes:
1. All dimensions are in inches.

562353 with List 22 or List 23 or List 24 and List 93

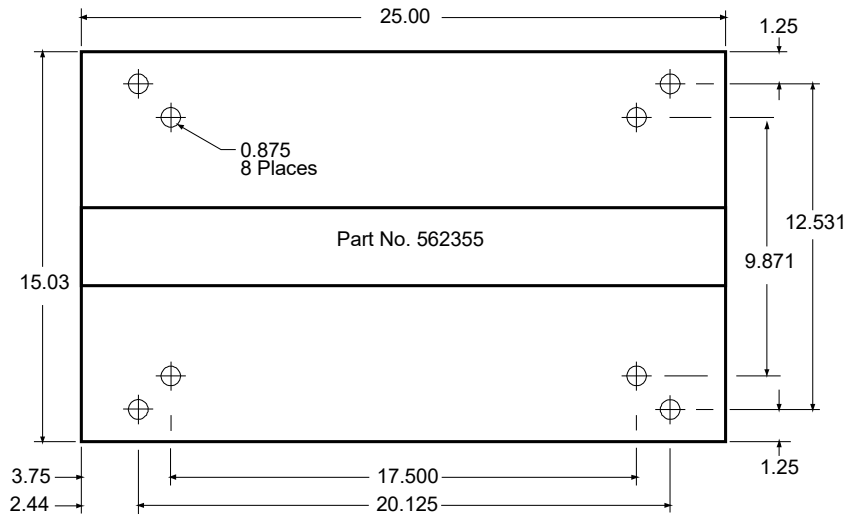
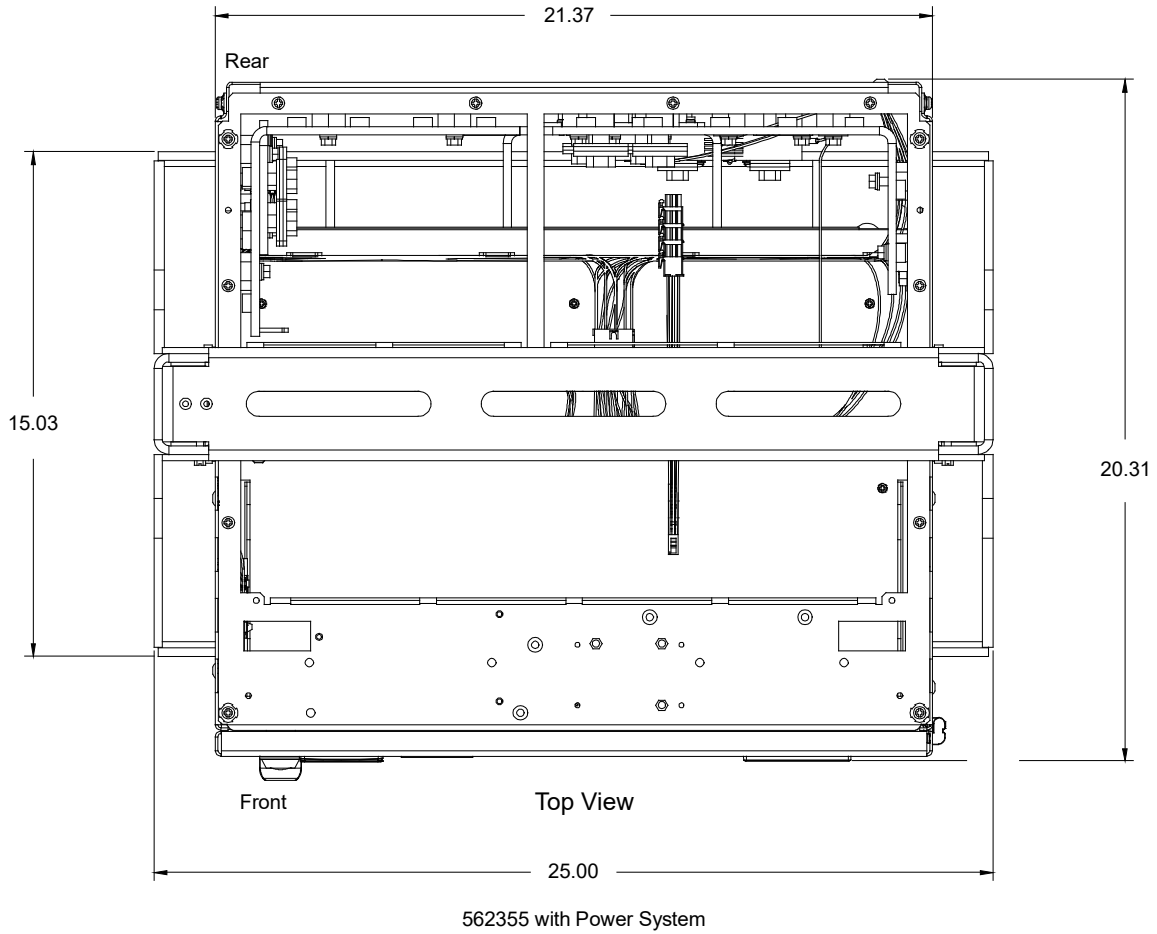
Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page)



Notes:
1. All dimensions are in inches.

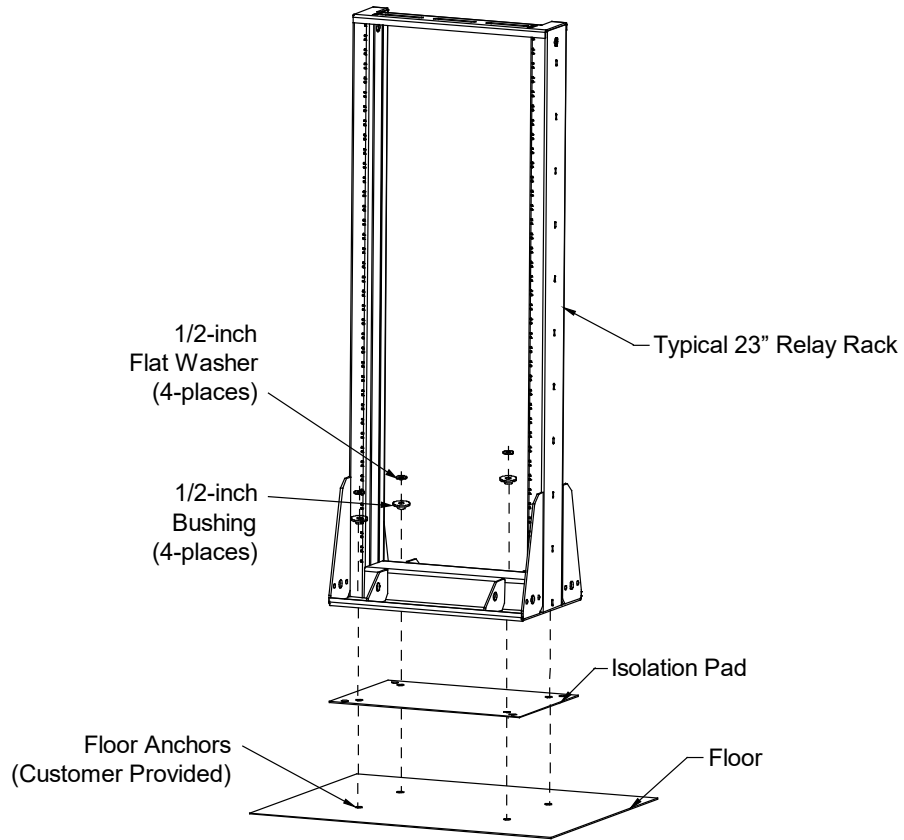
562353 with List 22 or List 23 or List 24, and List 95

Figure 3.4 Relay Rack Floor Mounting Dimensions (cont'd from previous page)



Notes:
1. All dimensions are in inches.

Figure 3.5 Optional Relay Rack Isolation Kit Mounting



3.4 Placing the Enclosures, Bolting Enclosures Together, and Securing the Enclosure(s) to the Floor (if applicable)

System components are factory mounted in a relay rack, on shipping rails, or in an enclosure as specified when ordered.

Systems Installed in an Enclosure

The system consists of one to six bays. Locate enclosures in a line adjacent to each other, with no space between them. Place the List 1 Main Bay at the right or left side end, then the List 7 Supplemental Bay, then the List 8 Supplemental Bay (if furnished), etc. Refer to the following procedures.

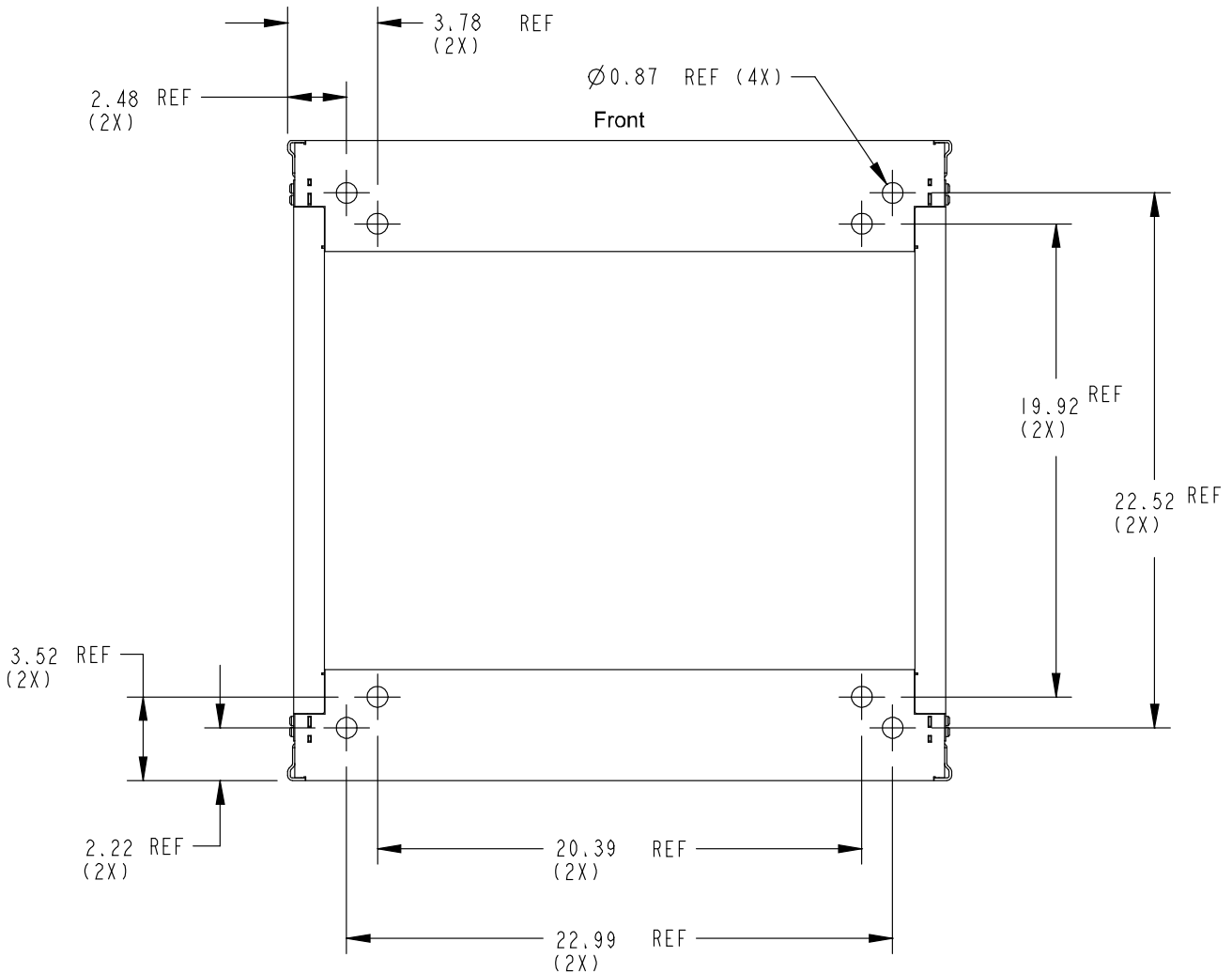
Ventilation Requirements

Refer to the “General Requirements” on page 4.

Enclosure Floor Mounting Dimensions

Refer to Figure 3.6 for enclosure floor mounting dimensions.

Figure 3.6 Enclosure Floor Mounting Dimensions



Notes:

1. All dimensions are in inches.

Procedure



NOTE! Refer to Figure 3.6, Figure 3.7, and Figure 3.8 as this procedure is performed.

1. If present, remove the side panels from the adjacent sides of each enclosure.
2. Locate where the enclosure(s) are to be placed. Refer to “General Requirements” on page 4.
3. Drill mounting holes in the floor for the main enclosure. Refer to Figure 3.6 for enclosure floor drilling dimensions.
4. Place the main enclosure in position.
5. Open the enclosure’s front door.
6. For seismic Zone 4 applications, ensure the four (4) loose 1/4" thick seismic, 1-hole washers are installed in each corner of the enclosure. See Figure 3.8.
7. Install mounting hardware per site requirements. See Figure 3.9.



NOTE! Do not tighten. Leave extremely loose.

8. Locate a bag of parts, labeled 563677, shipped with the expansion enclosure.
9. Install one (1) bolt, (3) flat washers, (1) ground washer, and (1) nut in the front enclosure joining hole at the top of the main enclosure as shown in Figure 3.7. Torque to value indicated in Figure 3.7.
10. Repeat the previous step for the front enclosure joining hole at the bottom of the main enclosure.
11. Repeat the above steps for the rear enclosure joining holes at the top and bottom of the main enclosure.
12. Drill mounting holes in the floor for the 1st expansion enclosure. Refer to Figure 3.6 for enclosure floor drilling dimensions.
13. Place the 1st expansion enclosure in position so that the bolts installed on the main enclosure enter enclosure joining holes on the 1st expansion enclosure.
14. Open the enclosure’s front door.
15. For seismic Zone 4 applications, ensure the four (4) loose 1/4" thick seismic, 1-hole washers are installed in each corner of the enclosure. See Figure 3.8.
16. Install mounting hardware per site requirements. See Figure 3.9.



NOTE! Do not tighten. Leave extremely loose.

17. Fasten the expansion enclosure to the main enclosure by installing (1) flat washer and (1) nut at the top front of the enclosure as shown in Figure 3.7. Torque to value indicated in Figure 3.7.
18. Repeat the previous step for the bottom front of the enclosures.
19. Repeat the above steps for the rear enclosure joining holes at the top and bottom of the enclosures.
20. Repeat the above steps if a 2nd expansion enclosure is furnished.
21. Level enclosures as required. Level the enclosures so that all enclosures are even at top. Install shims between bottom of each enclosure and the floor as required to distribute floor loading and to align outside of enclosures.

- 22. Tighten the floor mounting hardware per hardware manufacturer specifications.

Figure 3.7 Bolting Enclosures Together

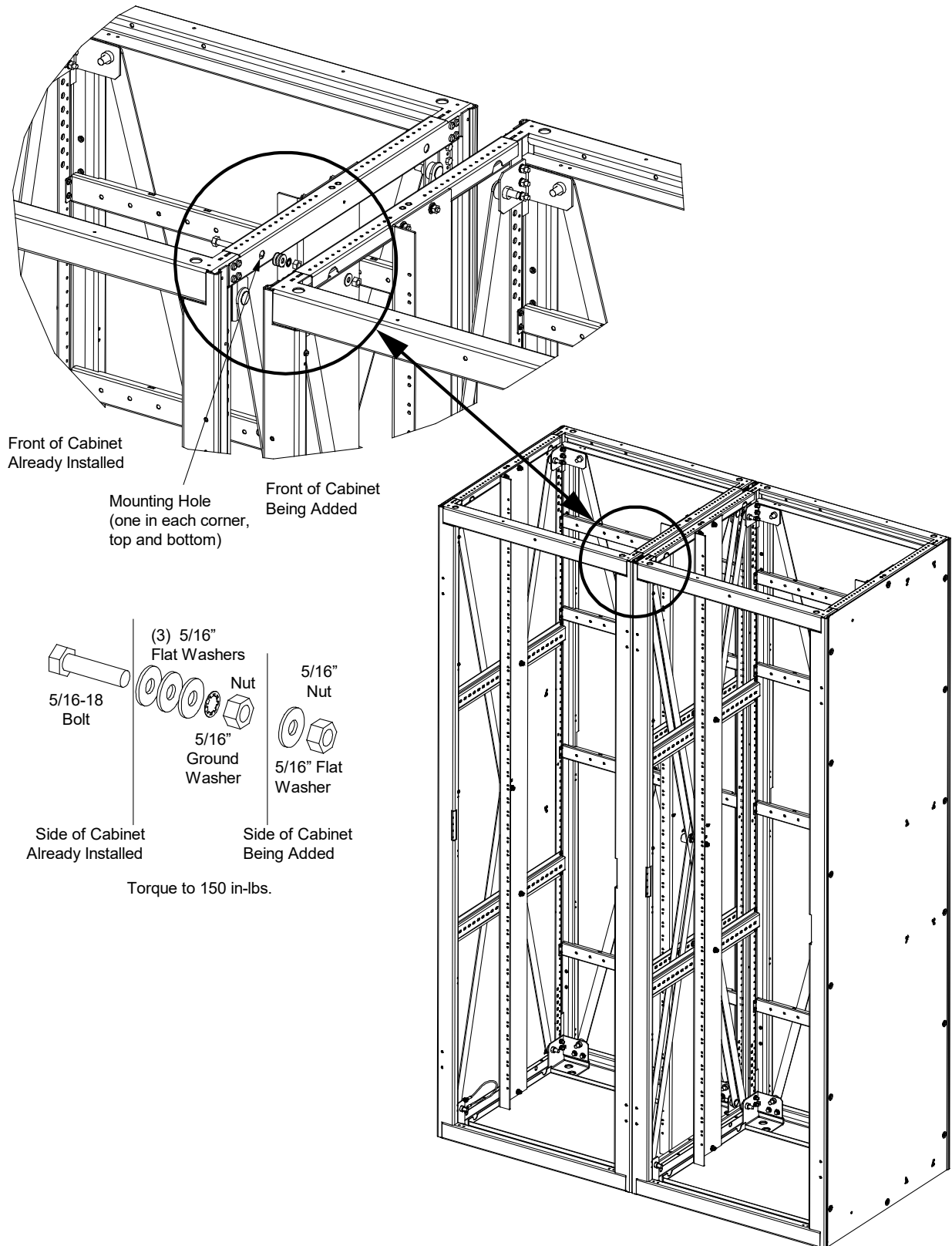


Figure 3.8 Installing Four (4) 1/4" Thick Seismic, 1-Hole Washer for Seismic Zone 4 Applications

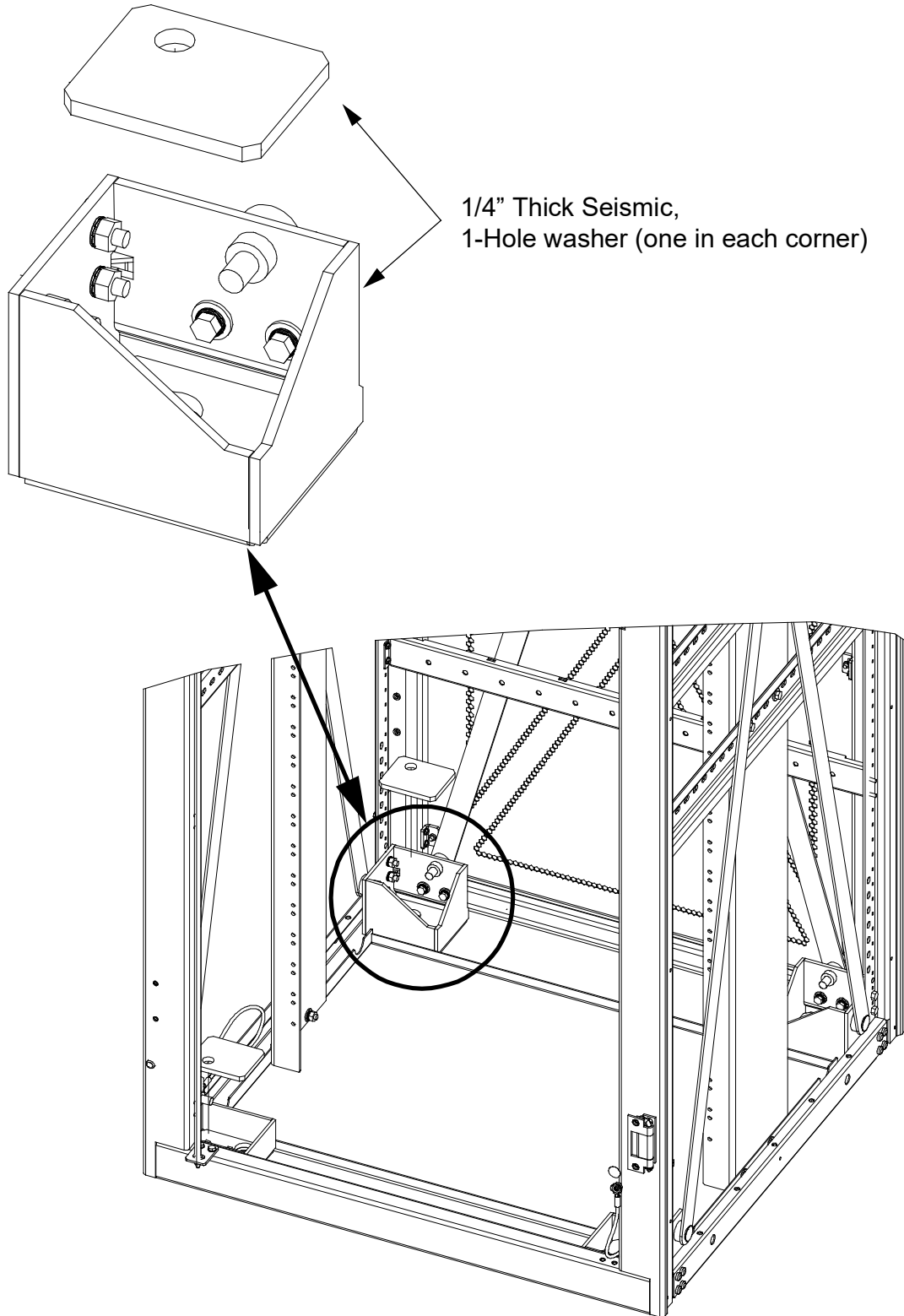
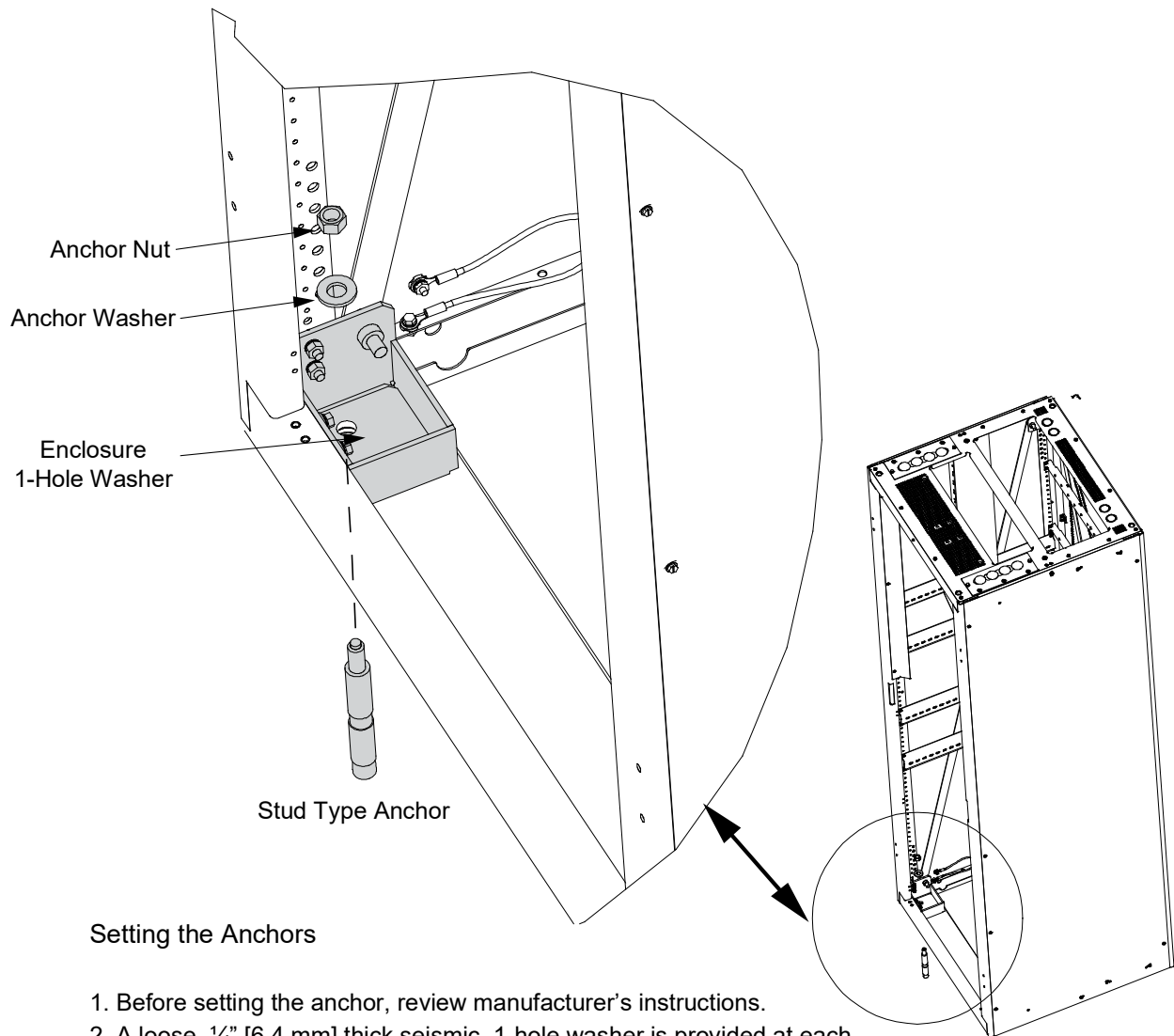


Figure 3.9 Setting the Anchors and Securing the Enclosure to the Floor



Setting the Anchors

1. Before setting the anchor, review manufacturer's instructions.
2. A loose, ¼" [6.4 mm] thick seismic, 1-hole washer is provided at each corner. Since the 1-hole washer's hole diameter is 0.563" [14.3 mm], a stud type anchor is recommended.
3. The total height of the enclosure metal surrounding each mounting hole, including 1-hole washer, is 0.74" [18.8 mm].
4. Remove the nut and washer from the anchor.
5. For each anchor, drop the anchor into the drilled hole. Insert the anchor setting tool and hit it with a hammer to expand the anchor.

Placing and Securing the Enclosure to the Floor

1. Place the enclosure into position over the anchoring holes.
2. Install the anchor washer and anchor nut FINGER TIGHT for each anchor.
3. Check the enclosure is level front-to-back and side-to-side. Install shims if necessary.
4. When the enclosure is level, tighten all nuts to the appropriate torque.

3.5 Mounting the Distribution Cabinet with Module Mounting Assembly(s)



NOTE! If the power system was ordered in a relay rack, these procedures have been performed at the factory. Note also the power system can be ordered, installed in an enclosure. These procedures are only for field installing the power system in a relay rack.

This power system is designed to mount in a standard 23" relay rack having 1" or 1-3/4" multiple drillings. Refer to System Application Guide SAG582127000 for overall dimensions and a list of available relay racks.



NOTE! The distribution cabinet is factory connected to the module mounting assembly(s). The distribution cabinet with module mounting assembly(s) is mounted as a complete assembly.

The distribution cabinet with module mounting assembly(s) must be the top-most component in the relay rack. Perform the following steps to mount the distribution cabinet with module mounting assembly(s).



DANGER! The relay rack must be securely anchored to the floor before the distribution cabinet with module mounting assembly(s) is installed.



DANGER! The distribution cabinet with module mounting assembly(s) is heavy. Use a hoist, battery lift, or other appropriate lifting device to raise and support the assembly during the installation. Take appropriate precautions to avoid injury.

Procedure

1. Remove the distribution cabinet with module mounting assembly(s) from its shipping brackets. Position the assembly in the equipment rack. Note that part of the Input Termination Assembly will have to be temporarily removed from the distribution cabinet to access the mounting hardware.



NOTE! Install the ground washers so the teeth dig into the paint on the mounting angles. Torque all screws to 65 in-lbs.

2. Mount the distribution cabinet to the relay rack using the following hardware. Refer to Figure 3.10.
 - a) **1-Row Cabinet:** Install (8) 12-24 x 3/4" hex head thread-forming screws (P/N 218710600) and (8) No. 12 ground washers (P/N 215640600).
 - b) **2-Row Cabinet:** Install (10) 12-24 x 3/4" hex head thread-forming screws (P/N 218710600) and (10) No. 12 ground washers (P/N 215640600).
 - c) **3-Row Cabinet:** Install (12) 12-24 x 3/4" hex head thread-forming screws (P/N 218710600) and (12) No. 12 ground washers (P/N 215640600).
 - d) **4-Row Cabinet:** Install (16) 12-24 x 3/4" hex head thread-forming screws (P/N 218710600) and (16) No. 12 ground washers (P/N 215640600).
3. Mount the module mounting assembly to the relay rack using hardware as shown Figure 3.11 or Figure 3.12.

Figure 3.10 Distribution Cabinet Mounting Hardware

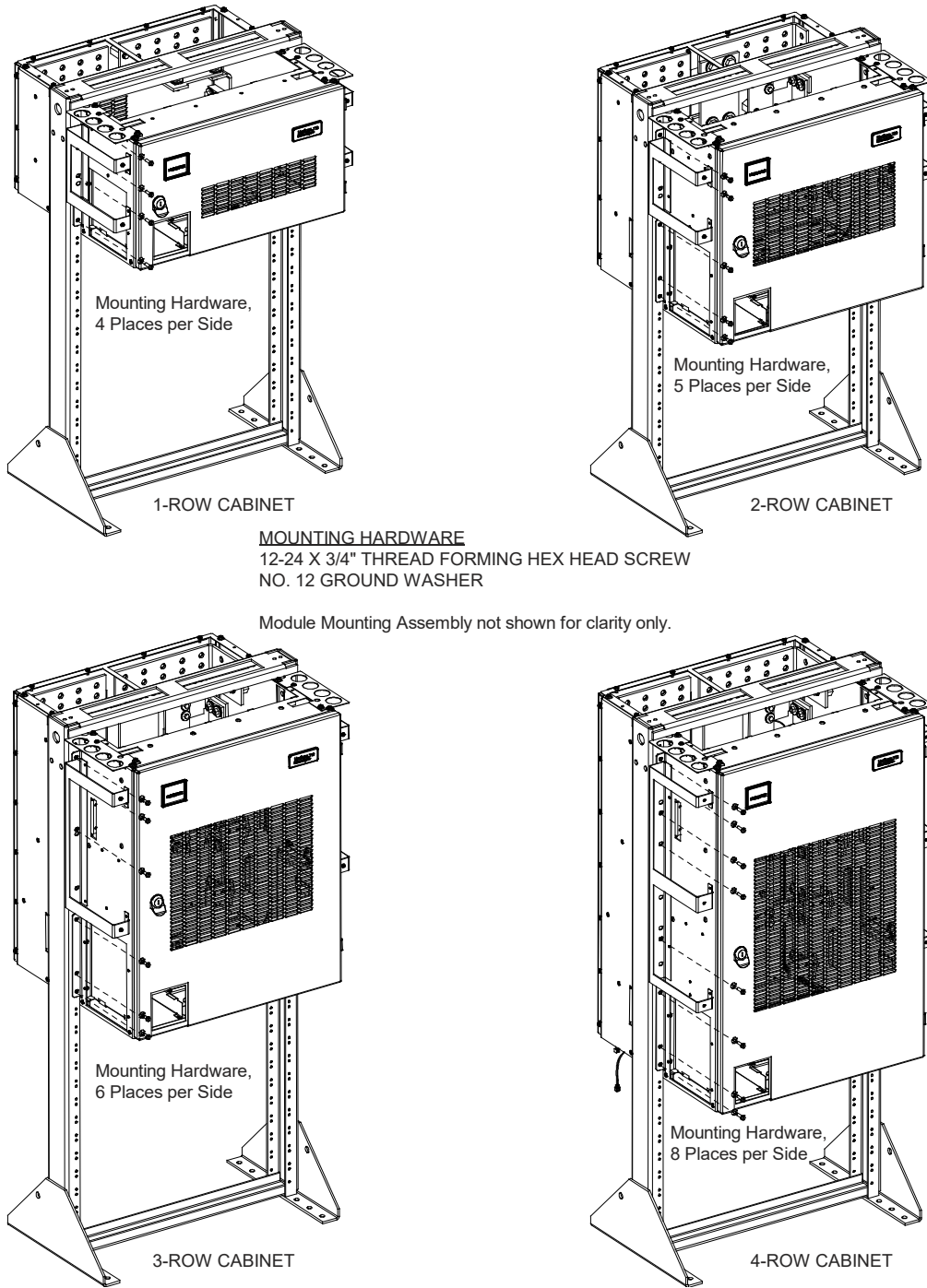
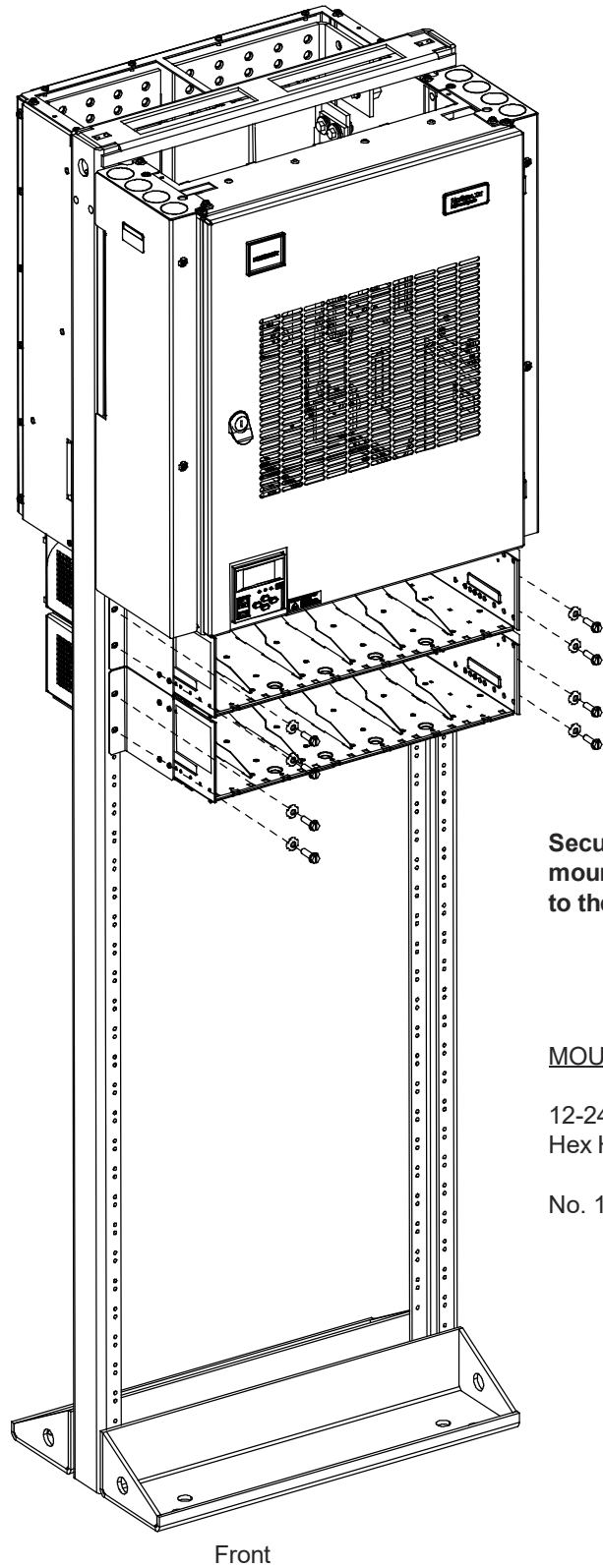


Figure 3.11 Module Mounting Assembly Spec. No. 588705000 and 588705500 Mounting Hardware



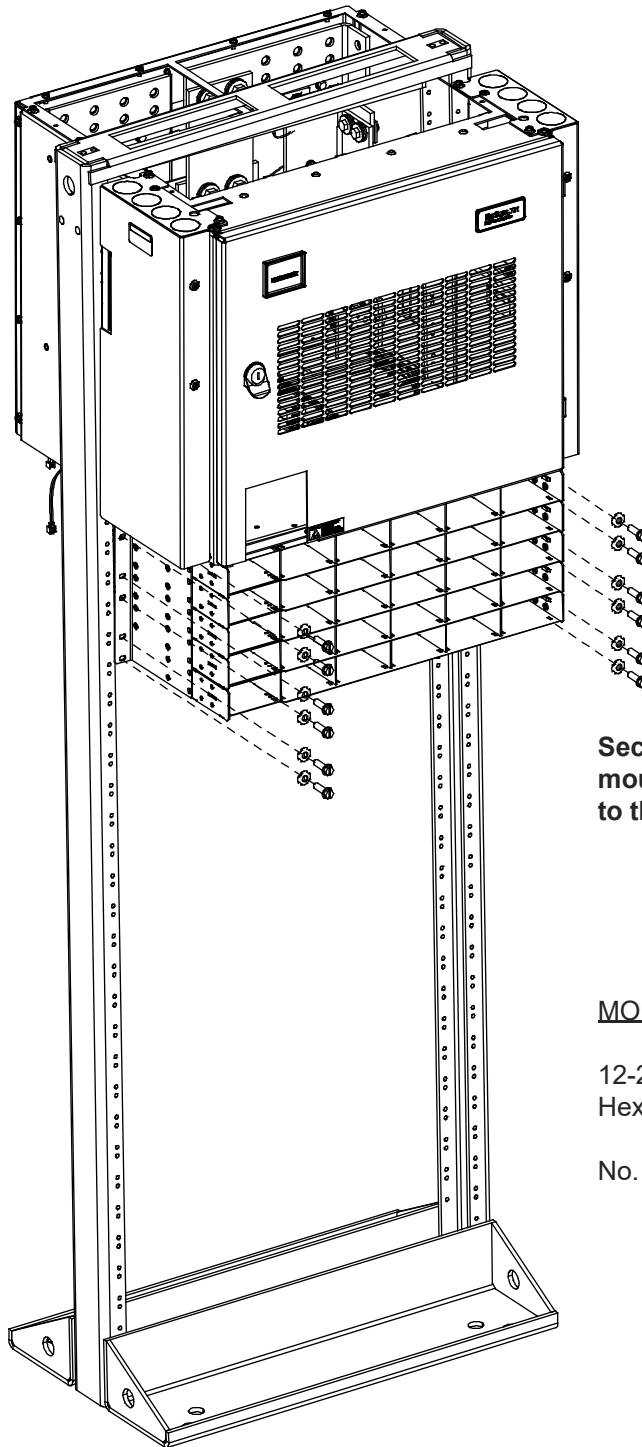
Secure the module mounting assembly(s) to the relay rack.

MOUNTING HARDWARE

12-24 x 3/4" Thread Forming Hex Head Screw

No. 10/12 Ground Washer

Figure 3.12 Module Mounting Assembly Spec. No. 588705300 and 588705400 Mounting Hardware



Secure the module mounting assembly(s) to the relay rack.

MOUNTING HARDWARE

12-24 x 3/4" Thread Forming Hex Head Screw

No. 10/12 Ground Washer

Front

3.6 Installing a 582127000 List 93 or List 95 Battery Tray (Relay Rack Installation Only)

Perform the following procedure to install a 582127000 List 93 or List 95 Battery Tray into a relay rack.



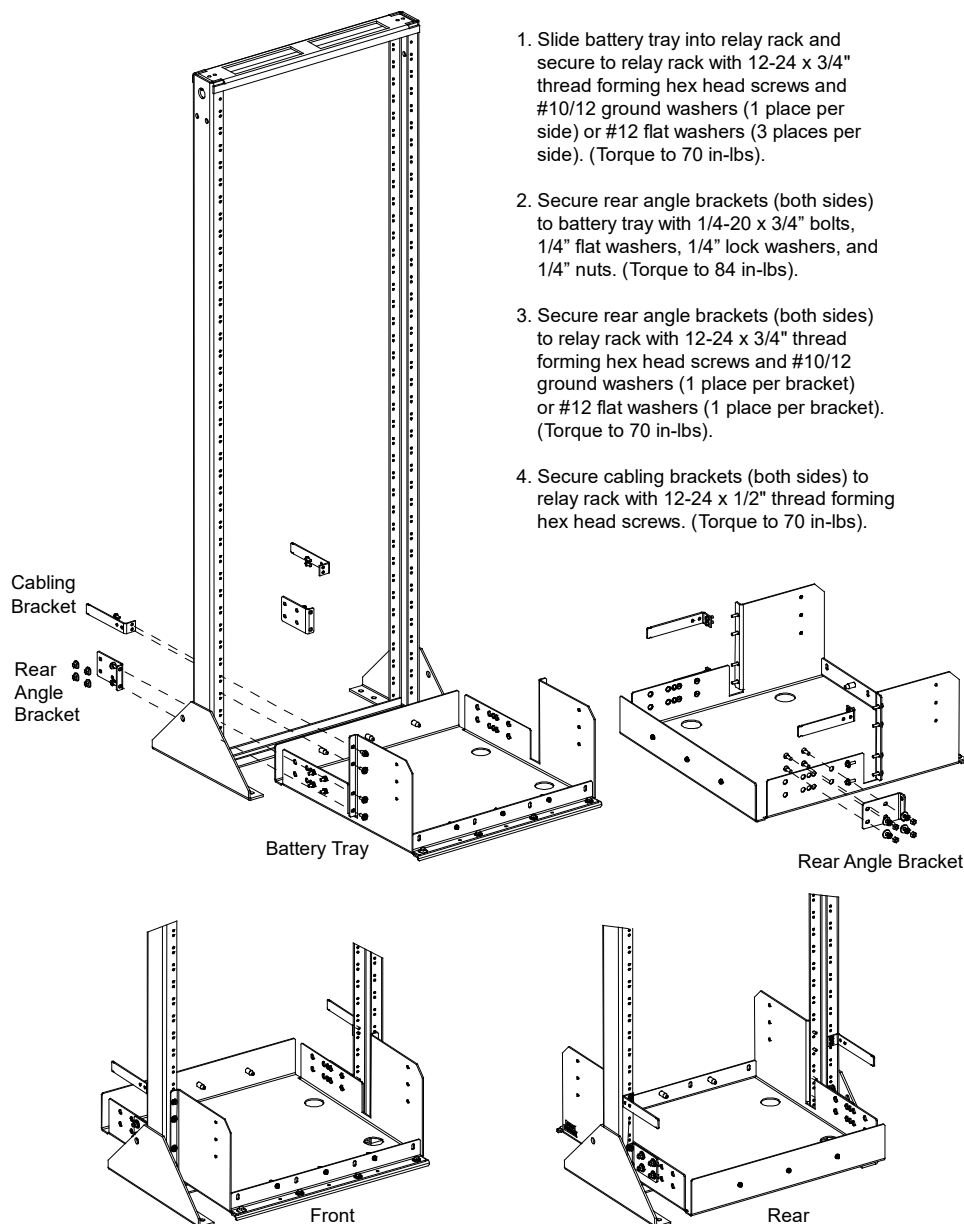
DANGER! The relay rack must be securely anchored to the floor before a battery tray is installed.

3.6.1 Installing a Battery Tray

Procedure

- To install a 582127000 List 93 or List 95 Battery Tray, perform the procedure in Figure 3.13.

Figure 3.13 Installing a 582127000 List 93 or List 95 Battery Tray

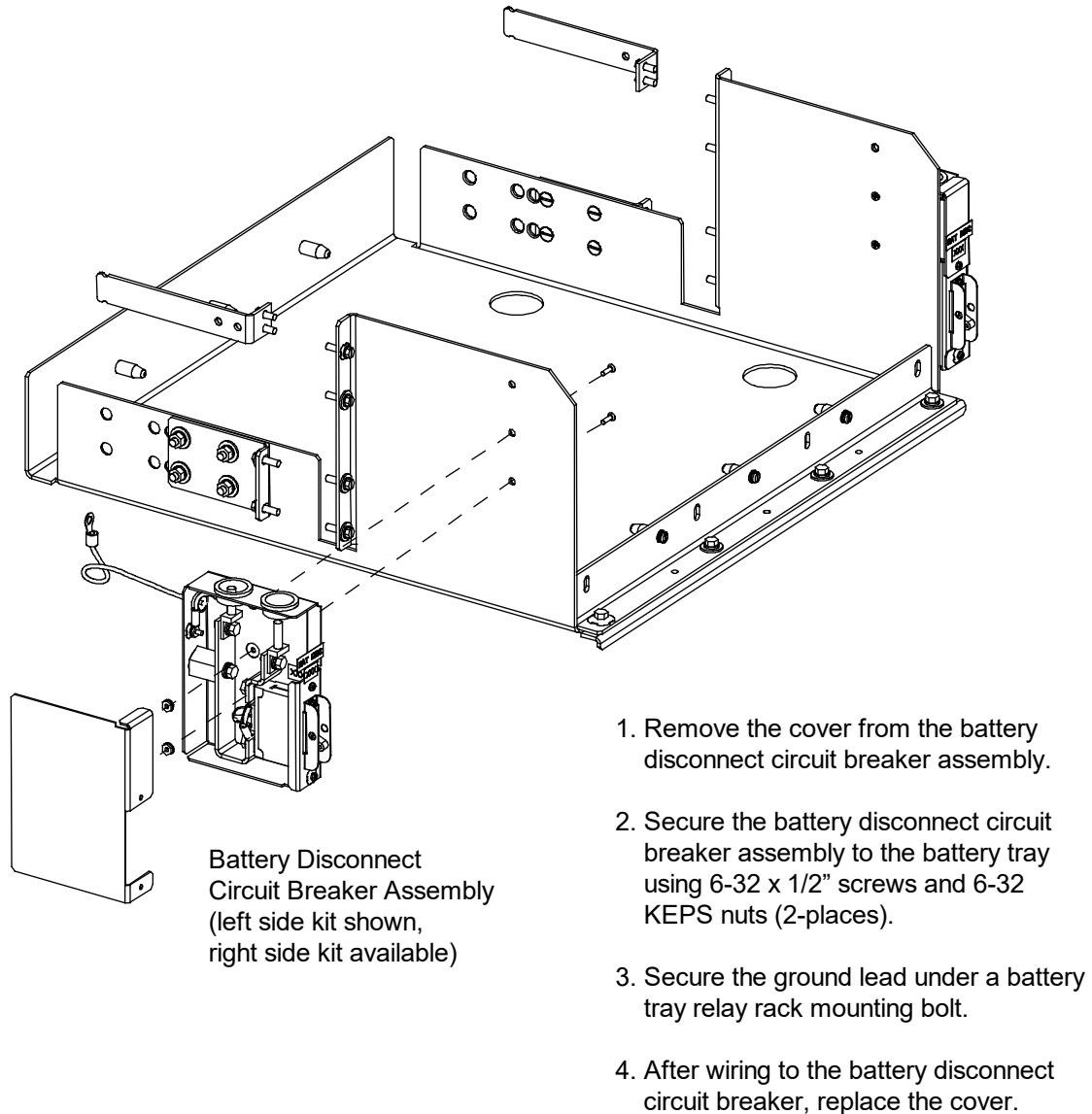


3.6.2 Installing Optional Battery Disconnect Circuit Breakers

Procedure

1. To install an optional battery disconnect circuit breaker onto the List 93 or List 95 Battery Tray, perform the procedure in Figure 3.14.
2. Battery tray wiring is shown in “Installing and Connecting Batteries in List 93 or List 95 Battery Tray (if furnished)” on page 178.

Figure 3.14 Installing Optional Battery Disconnect Circuit Breakers onto a List 93 or List 95 Battery Tray

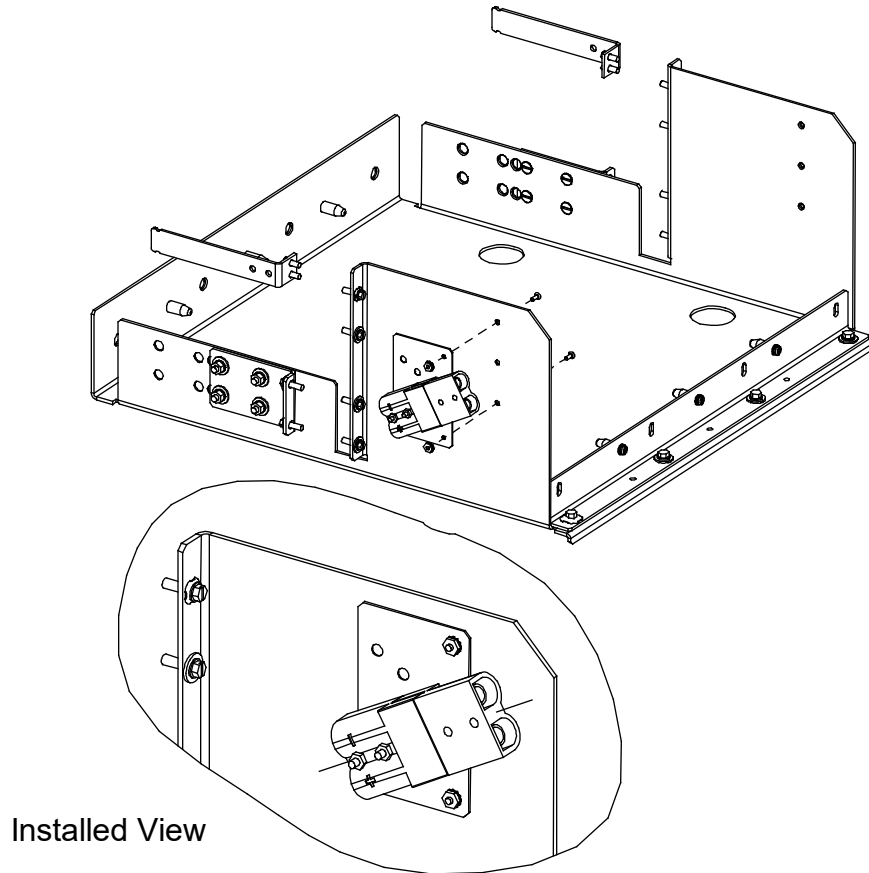


3.6.3 Installing Optional Anderson Battery Connector Kit

Procedure

1. To install an optional Anderson battery connector kit onto the List 93 or List 95 Battery Tray, perform the procedure in Figure 3.15.

Figure 3.15 Installing Optional Anderson Battery Connector Kit onto a List 93 or List 95 Battery Tray

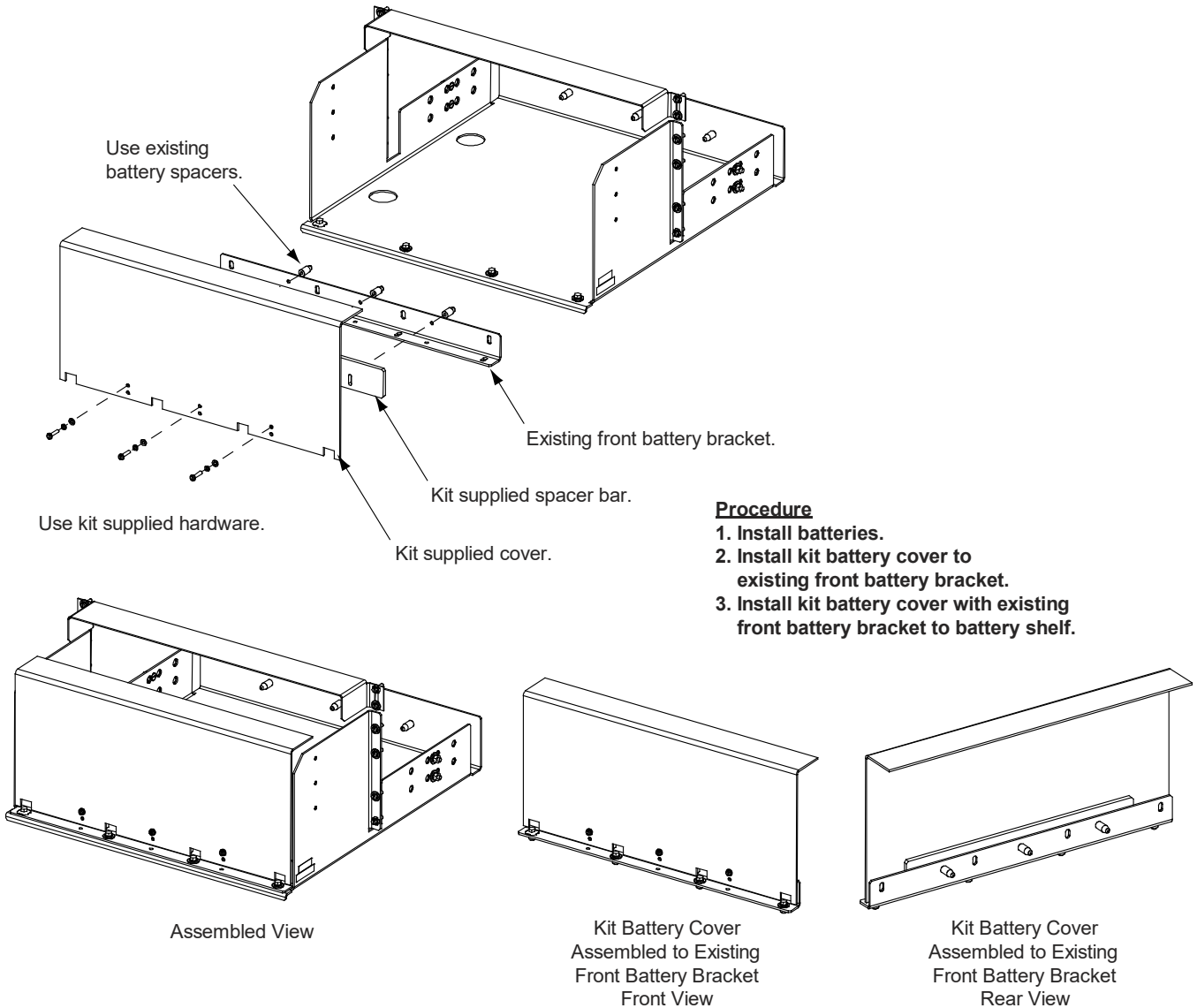


3.6.4 Installing Optional Front Battery Cover

Procedure

1. To install an optional front battery cover onto a List 93 or List 95 Battery Tray, perform the procedure in Figure 3.16. Note that batteries must be installed first, as described in “Installing and Connecting Batteries in List 93 or List 95 Battery Tray (if furnished)” on page 178.

Figure 3.16 Installing Optional Front Battery Cover onto a List 93 or List 95 Battery Tray

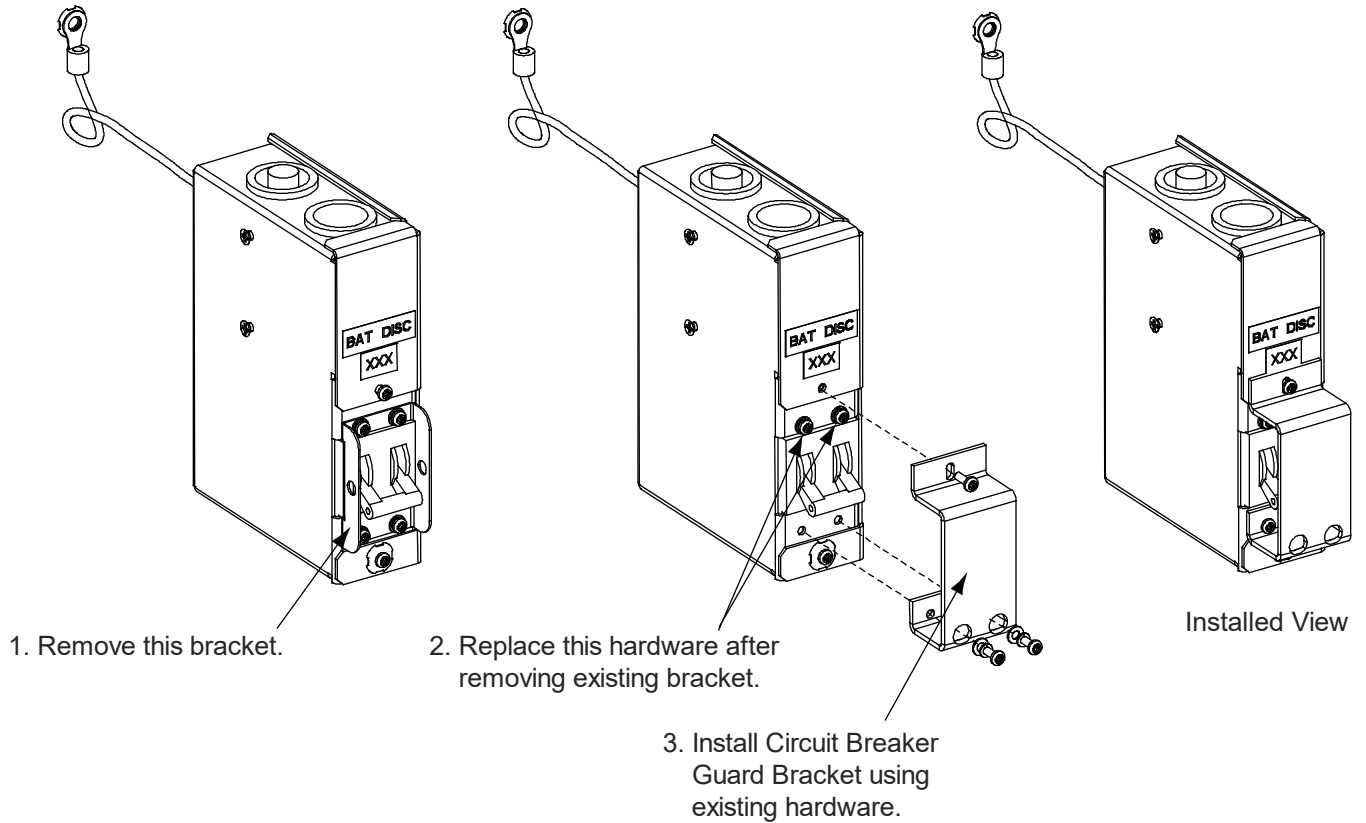


3.6.5 Installing Optional Circuit Breaker Guard

Procedure

1. To install an optional circuit breaker guard onto a battery disconnect circuit breaker, perform the procedure in Figure 3.17.

Figure 3.17 Installing Optional Circuit Breaker Guard



3.7 Installing a Battery Tray Mounting Kit, P/N 565004 (Enclosure Installation Only)

Perform the following procedure to install a 582127000 List 93 or List 95 Battery Tray into an enclosure.



DANGER! The enclosure must be securing anchored to the floor before the battery tray is installed.

3.7.1 Removing the Enclosure Rear and Side Panels

Procedure

1. Refer to Removing the Enclosure Rear Panels and Removing the Enclosure Side Panels starting on Page 5.

3.7.2 Installing a Battery Tray Mounting Kit P/N 565004

Procedure

1. To install a Battery Tray Mounting Kit, perform the procedure in Figure 3.18.

Figure 3.18 Installing a Battery Tray Mounting Kit P/N 565004 (cont'd on next page)

1. Remove the twelve (12) 1/4-20 x 3/4" screws, locations shown. Save washers and nuts for reassembly.
2. Remove the two (2) 1/4-20 x 1.75" screw, locations shown. Save washers, spacers, and nuts for reassembly.
3. Assemble battery tray mounting kit rails in location shown.

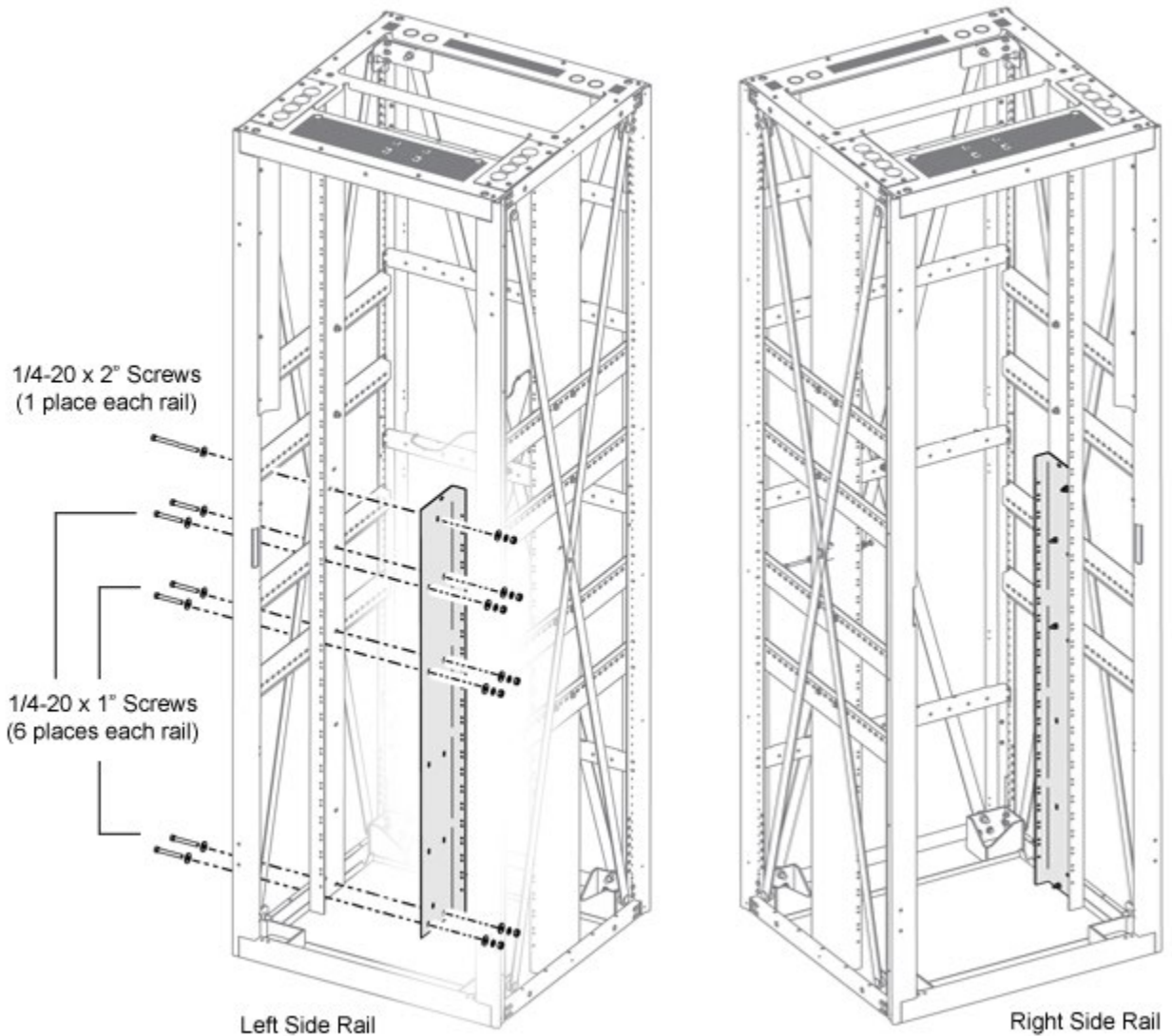
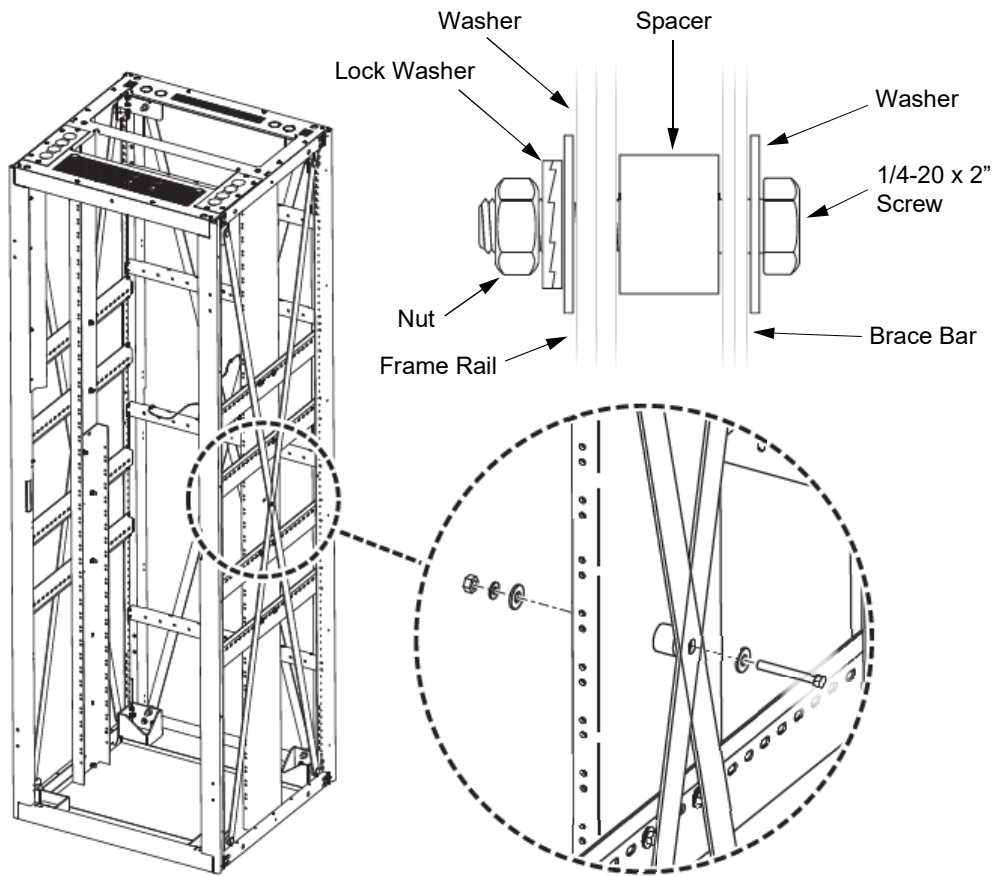


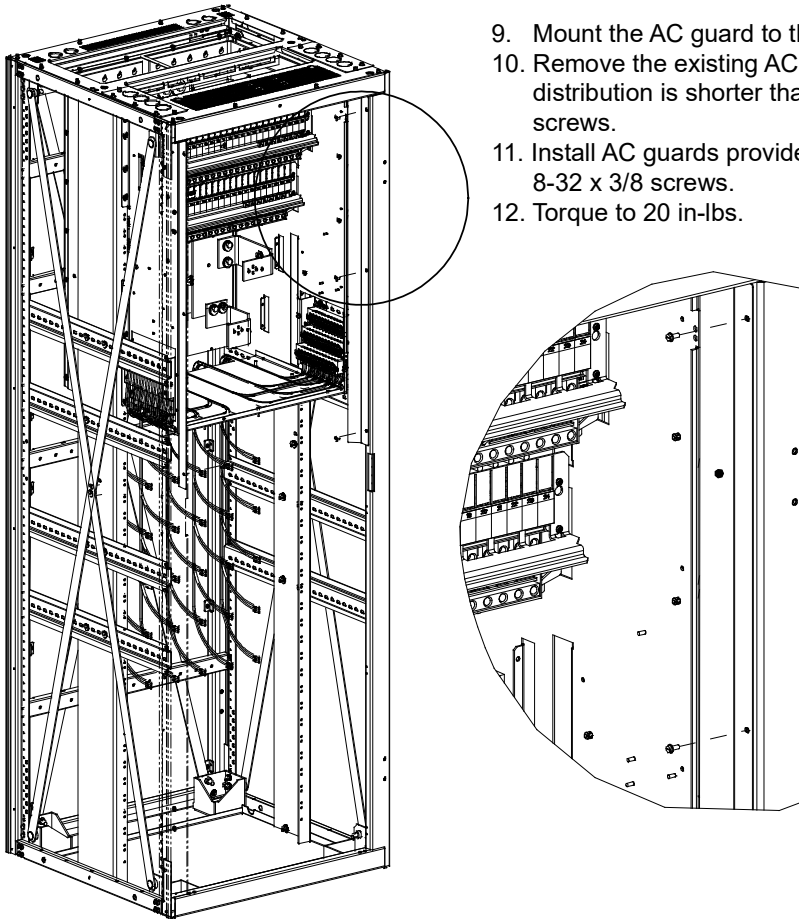
Figure 3.18 Installing a Battery Tray Mounting Kit P/N 565004 (cont'd from previous page, cont'd on next page)

4. Mount hardware to the left and right side rails.
5. Assemble the twelve (12) 1/4-20 x 1" screws provided with kit and saved washers and nuts, locations shown. Leave nuts loose at this time.
6. Assemble the two (2) 1/4-20 x 2" screws provided with kit; and saved washers, spacers, and nuts, locations shown. Leave nuts loose.
7. Ensure mounting rails are vertically leveled and the front-to-rear flange spacings are 6.0".
8. Torque to 75 in-lbs.



Mount hardware to the left and right side rails.

Figure 3.18 Installing a Battery Tray Mounting Kit P/N 565004 (cont'd from previous page)



9. Mount the AC guard to the cabinet.
10. Remove the existing AC guard if the power system distribution is shorter than 4-row. Save 8-32 x 3/8 screws.
11. Install AC guards provided with kit and saved 8-32 x 3/8 screws.
12. Torque to 20 in-lbs.

3.7.3 Installing the List 93 or List 95 Battery Tray

Refer to Installing a 582127000 List 93 or List 95 Battery Tray (Relay Rack Installation Only) on page 27.

Procedure

1. To install a Battery Tray Mounting Kit, perform the procedure in Figure 3.13.



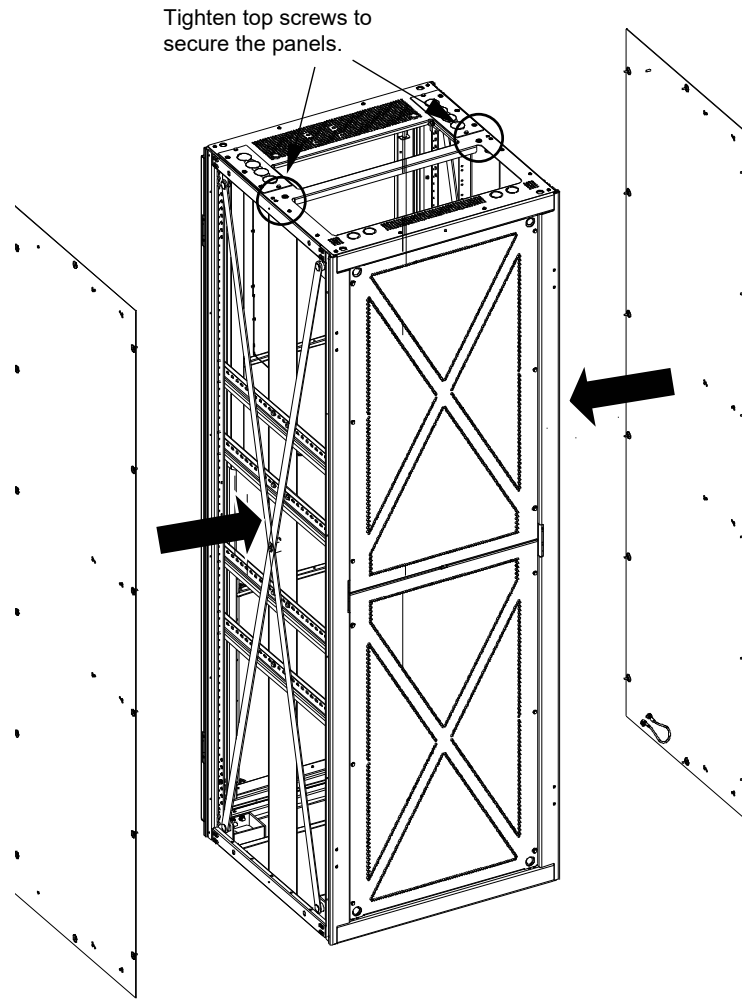
NOTE! Do not install battery tray circuit breaker covers (if provided).

3.7.4 Installing the Enclosure Rear and Side Panels

Procedure

1. Fix in position the rear and side panels that were removed before installing the battery tray mounting kit. Tighten the fasteners on the side panel including panel frame grounding wire hardware. Refer to Figure 3.19.

Figure 3.19 Installing the Enclosure Rear and Side Panels



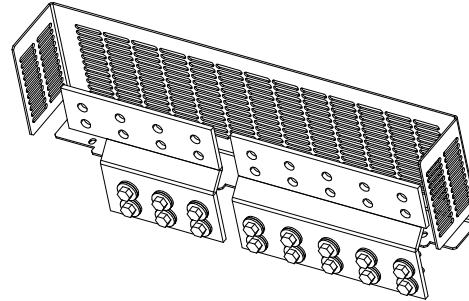
3.8 Installing Optional Battery Busbar Extension Kit, Part No. 562364

This kit provides plates that extend the system busbars above the top of a List 23 and List 24 distribution cabinet and increases the number of lug landings available for battery cables. This kit provides back-to-back landings for up to ten lugs for the hot side and eight lugs for the return side.

Installing Part No. 562364 Busbar Extension Kit

This kit consists of the following:

Qty.	Part No.	Description
1	562362	Return Side Extension Busbar
1	562363	Power Side Extension Busbar
1	562354	Cover Kit
16	214204100	3/8" Flat Washer
16	214825000	3/8" Belleville Washer
16	227646800	3/8-16 x 1-1/4" Bolt



Perform the following steps to install the battery busbar extension plates.

Procedure



NOTE! Refer to Figure 3.20 as the procedure is performed. A system installed in a relay rack is shown in the illustration. The procedure for a system installed in an enclosure is the same except as noted in the following procedure steps.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Install busbar extension plates as shown in Figure 3.20. Apply anti-oxidizing compound to busbar mating surfaces before assembling. Tighten bolts to the recommended torque value shown in Figure 3.20.



NOTE! Install the Belleville lock washers so the concave side is towards the busbar.

3. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Perform the following steps to mount the Lexan cover.

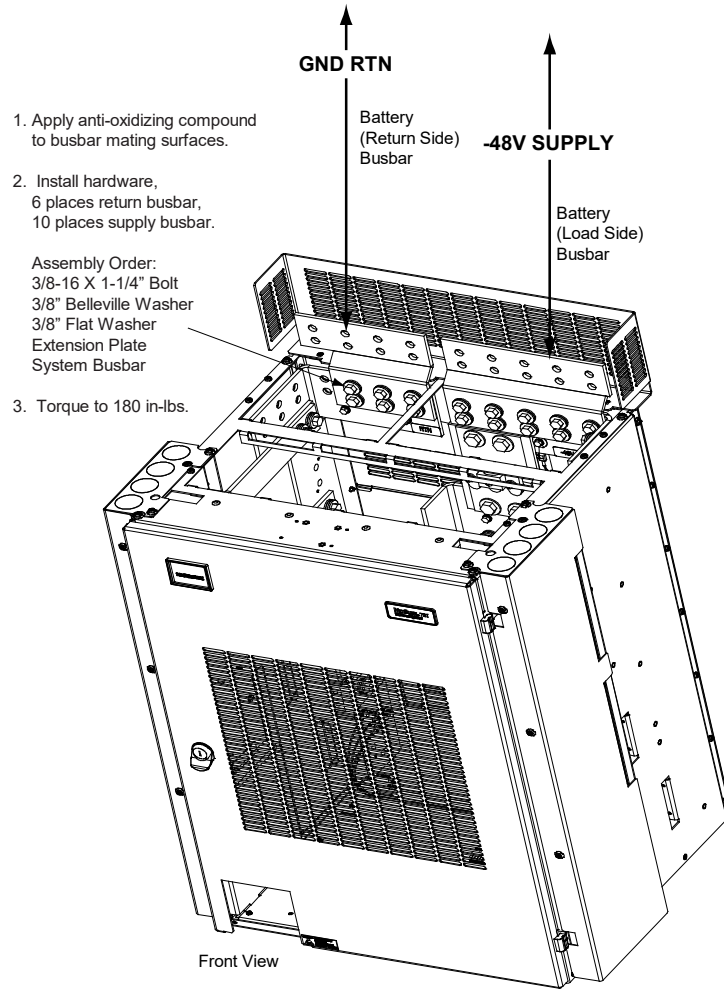
Procedure



NOTE! Refer to Figure 3.21 as the procedure is performed. A system installed in a relay rack is shown in the illustration. The procedure for a system installed in an enclosure is the same except as noted in the following procedure steps.

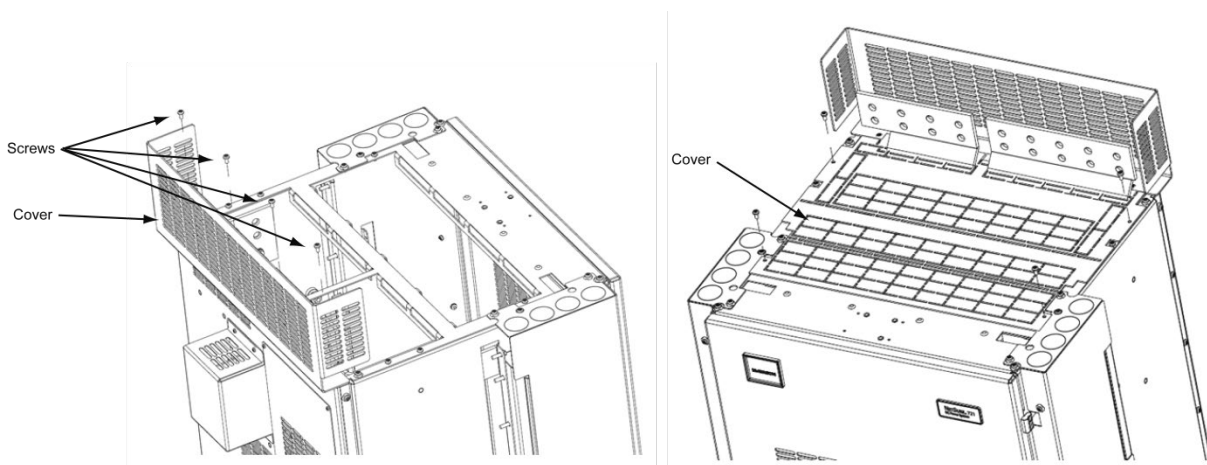
1. Loosen the four (4) screws at the back of the busbars.
2. Place the Lexan cover at the back of the busbars and use the four (4) screws to secure it.
3. Remove the four (4) screws at the top of the enclosure and place the cover.
4. Re-use the screws to secure the top cover.

Figure 3.20 Installing Battery Busbar Extension Kit, Part No. 562364



List 24 Distribution Cabinet
(List 23 similar)

Figure 3.21 Mounting the Lexan Cover



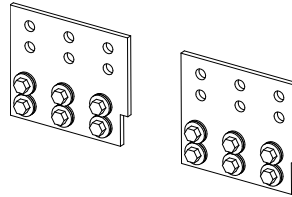
3.9 Installing Optional Battery Busbar Extension Kit, Part No. 554541

This kit provides plates that extend the system busbars above the top of the distribution cabinet and increases the number of lug landings available for battery cables. This kit provides back-to-back landings for up to six lugs per polarity.

This kit consists of the following:

Installing Part No. 554541 Busbar Extension Kit

Qty.	Part No.	Description
2	554540	Busbar extension plates, flat
12	214204100	Flat washer, 3/8" x 1" O.D.
12	214825000	Belleville washer, 3/8"
12	227646800	Hex head bolt, 3/8-16 x 1-1/4"



Perform the following steps to install the battery busbar extension plates.

Procedure

Refer to Figure 3.22 as the procedure is performed.

1. Open the distribution cabinet front door.
2. Install busbar extension plates as shown in Figure 3.22. Apply anti-oxidizing compound to busbar mating surfaces before assembling. Tighten bolts to the recommended torque value shown in Figure 3.22.



NOTE! Note that the busbars are notched. Some installations require the busbar to be rotate so the notch portion clears any protrusion present.



NOTE! Install the Belleville lock washers so the concave side is towards the busbar.

3. Close the distribution cabinet access door.

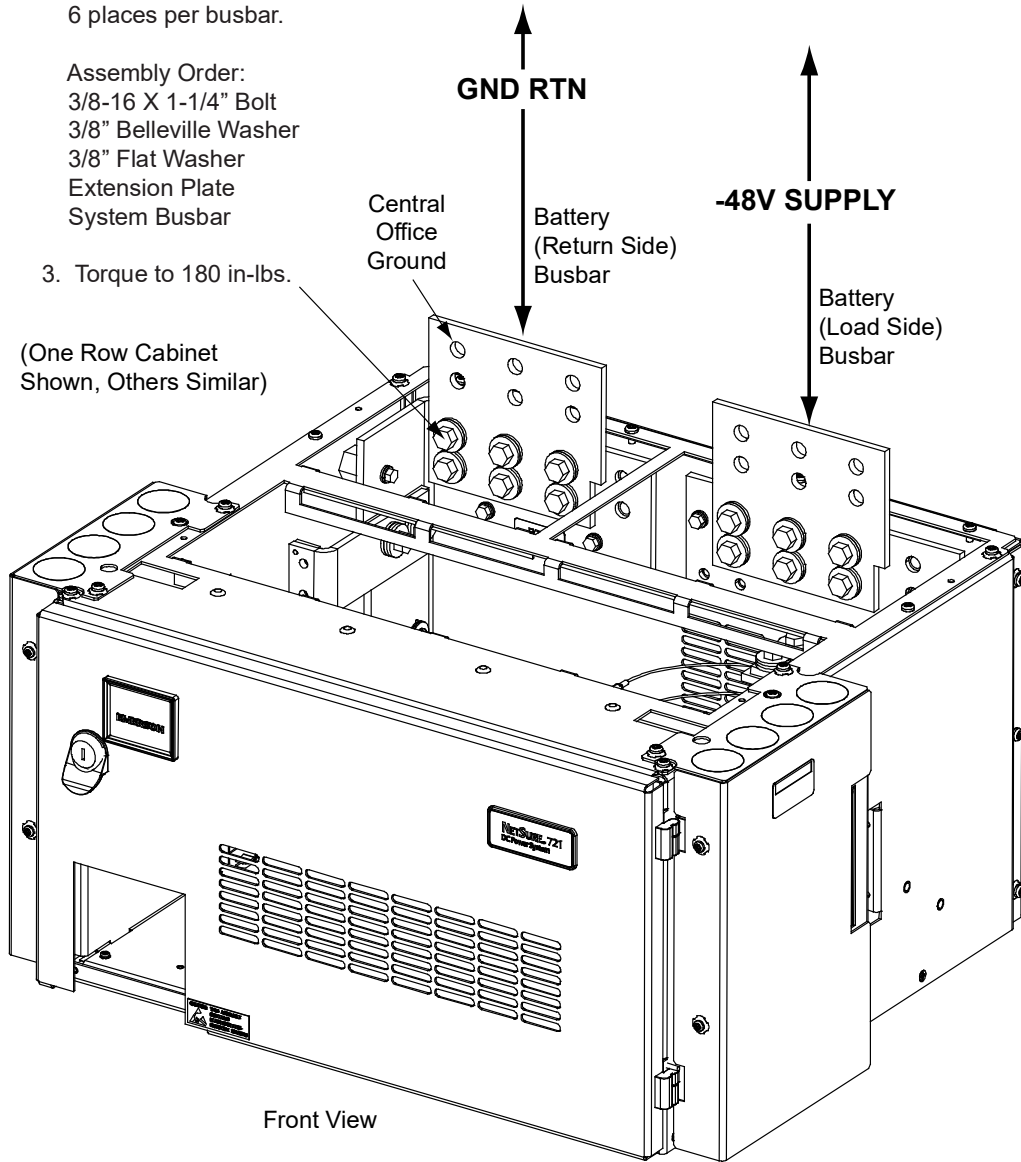
Figure 3.22 Installing Battery Busbar Extension Kit, Part No. 554541

1. Apply anti-oxidizing compound to busbar mating surfaces.
2. Install hardware, 6 places per busbar.

Assembly Order:
3/8-16 X 1-1/4" Bolt
3/8" Belleville Washer
3/8" Flat Washer
Extension Plate
System Busbar

3. Torque to 180 in-lbs.

(One Row Cabinet Shown, Others Similar)

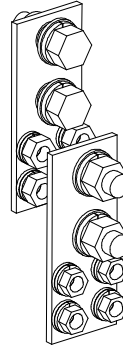


3.10 Installing Optional Lug Adapter Busbar Kits, Part Nos. 534449 and 514714

These kits provide lug adapter busbars plus hardware for use with 2-pole and 3-pole bullet circuit breakers.

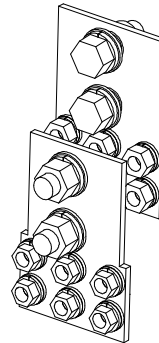
Contents of Kit P/N 534449 (for 2-pole circuit breakers)

Qty.	Part No.	Description
1	534447	Busbar
1	534448	Busbar
8	214110100	Flat Washer, 1/4"
4	214112100	Flat Washer, 3/8"
8	215111100	Lock Washer, 1/4"
4	215111300	Lock Washer, 3/8"
4	227640400	Hex Head Bolt, 1/4-20 x 3/4" (not used)
2	227646600	Hex Head Bolt, 3/8-16 x 1"
8	228557100	Nut, 1/4-20
2	228567100	Nut, 3/8-16



Contents of Kit P/N 514714 (for 3-pole circuit breakers)

Qty.	Part No.	Description
1	514676	Busbar
1	514678	Busbar
12	214110100	Flat Washer, 1/4"
4	214112100	Flat Washer, 3/8"
12	215111100	Lock Washer, 1/4"
4	215111300	Lock Washer, 3/8"
6	227640400	Hex Head Bolt, 1/4-20 x 3/4" (not used)
2	227646600	Hex Head Bolt, 3/8-16 x 1"
12	228557100	Nut, 1/4-20
2	228567100	Nut, 3/8-16



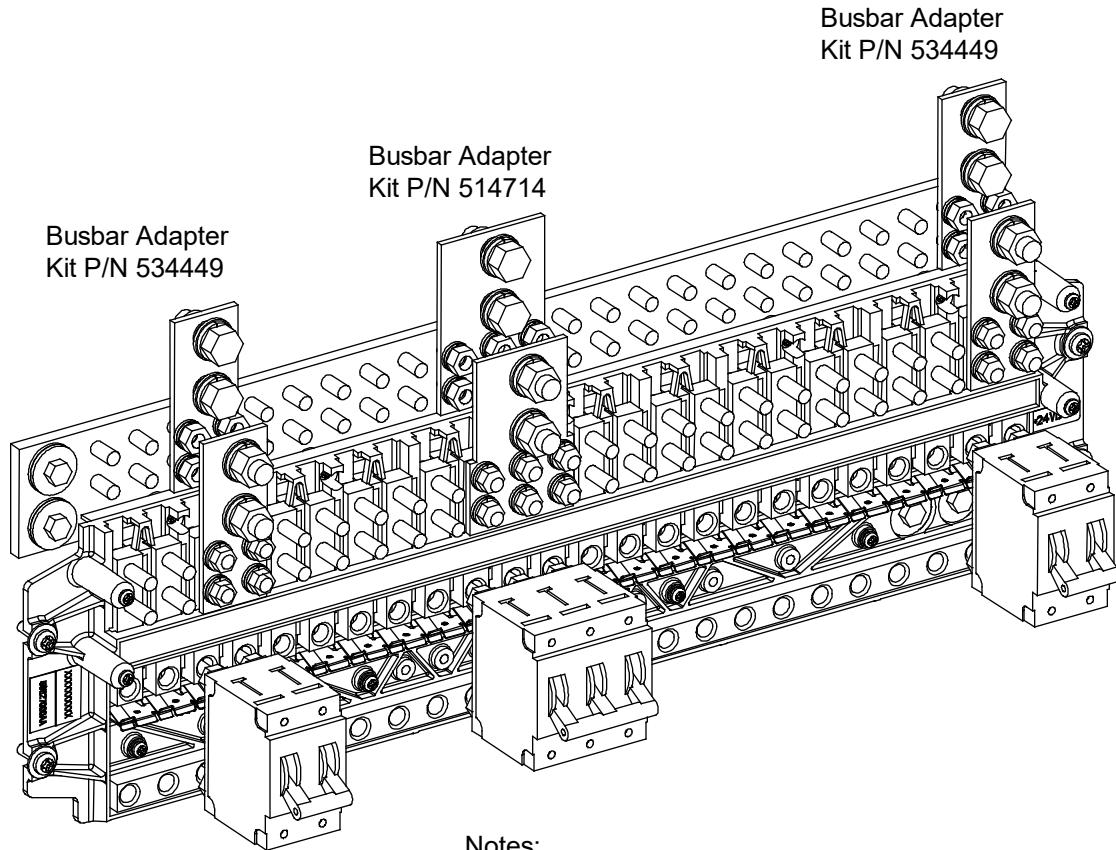
Perform the following steps to install the lug adapter busbars.

Procedure

Refer to Figure 3.23 as the procedure is performed. Note also the restrictions on location in Figure 3.23.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Install the lug adapter busbars as shown in Figure 3.23. Apply anti-oxidizing compound to busbar mating surfaces before assembling. Recommended torque is 72 in-lbs using the supplied 1/4" bolts and hardware.
3. Orient the load lug hardware as shown in Figure 3.23. Recommended torque is 300 in-lbs using the supplied 3/8" bolts and hardware.
4. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.23 Installing Lug Adapter Busbar Kits



Notes:

Orient busbars as shown.

Shield not shown. Remove breakaway areas from shield as required. Breakaways are only provided for positions 1-8, 9-12, and 23-24. This restricts 2 and 3-pole breaker adapter kits to be located in these positions only.

Circuit breaker locations for reference only.

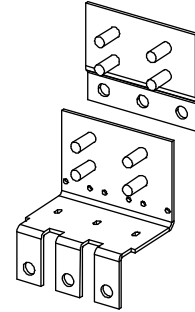
3.11 Installing Optional Lug Adapter Busbar Kit, Part No. 562888

For use with List AM and List AP.

This kit provides lug adapter busbars for use with 3-pole GJ/218 circuit breakers.

Contents of Kit P/N 562888 (for 3-pole circuit breakers)

Qty.	Part No.	Description
1	562392	Busbar
1	562393	Busbar



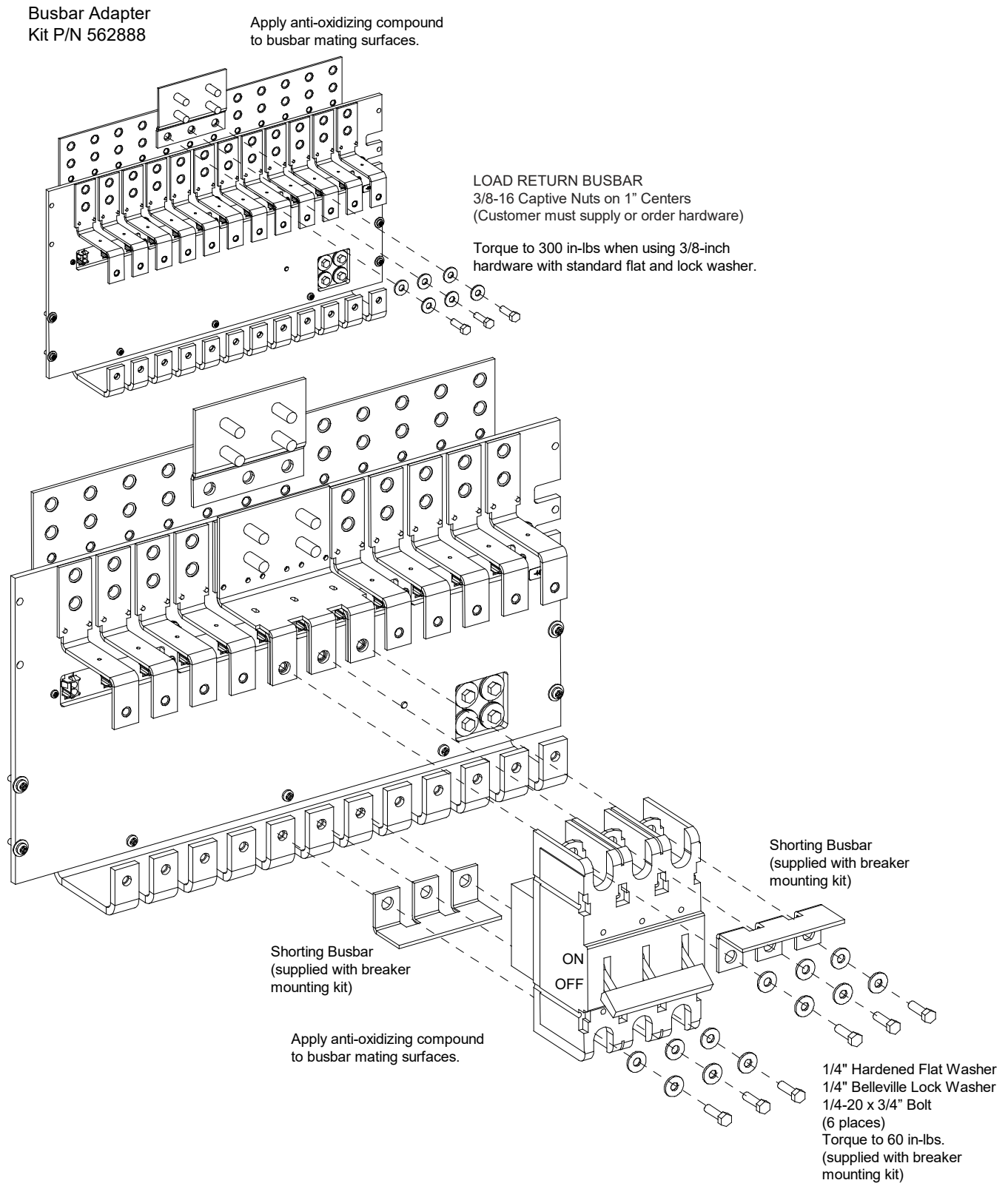
Perform the following steps to install the lug adapter busbars.

Procedure

Refer to Figure 3.24 as the procedure is performed.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Install the lug adapter busbars as shown in Figure 3.24. Apply anti-oxidizing compound to busbar mating surfaces before assembling. Refer to Figure 3.24 for recommended torque.
3. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.24 Installing Lug Adapter Busbar Kits



3.12 Installing Optional Second IB2 (Controller Interface Board) or Optional Second EIB (Controller Extended Interface Board)

A second IB2 (Controller Interface Board) or EIB (Controller Extended Interface Board) can be installed on the inside of the main bay's distribution cabinet's top panel.

This option is factory installed if ordered with the system. Refer to the following procedure to field install this option.

This board is referred to as IB2-2 or EIB-2.

Procedure

Refer to Figure 3.25 as the procedure is performed.

1. Performing this procedure may activate external alarms. Do one of the following. If possible, disable these alarms. If these alarms cannot be easily disabled, notify the appropriate personnel to disregard any future alarms associated with this system while the procedure is being performed.



DANGER! Performing the next steps exposes service personnel to battery potential. Exercise extreme caution not to inadvertently contact or have any tool inadvertently contact any energized electrical termination.

2. Open the main bay distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.



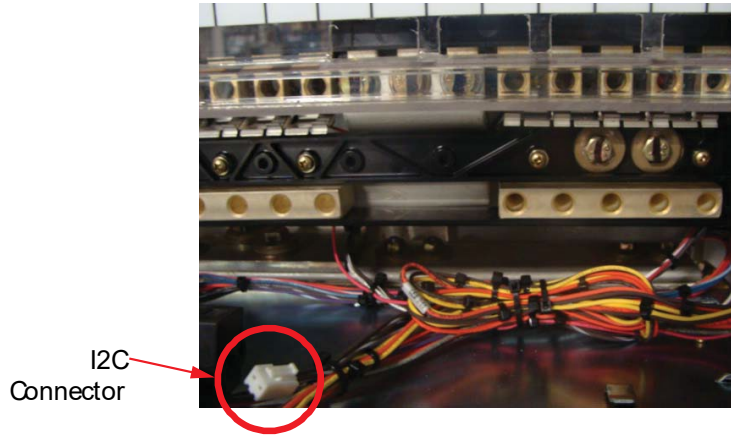
WARNING! Damage to the circuit card may result if the next step is not followed.

3. Connect an approved grounding strap to your wrist. Attach the other end to a suitable ground.
4. Set the switch on the new IB2 or EIB board as outlined in "Switch Settings on IB2 Interface Board (Main Bay Only)" on page 62 or "Switch Setting on Optional EIB Interface Board (Main Bay Only)" on page 62.
5. Refer to Figure 3.25 and install the IB2 or EIB board onto the inside top panel of the distribution cabinet.
6. Locate the I2C connector bundled at the bottom of the distribution cabinet. Route this cable up to the newly installed IB2 or EIB board. Cut cable ties as required. Refer to Figure 3.25. Plug this connector into the mating I2C connector located on the IB2 or EIB board. Refer to Figure 5.25 on page 119 or Figure 5.27 on page 125. Dress and secure the cable as required.
7. Make external connections to the IB2-2 or EIB-2 board as required. See "IB2 (Controller Interface Board) Connections (if required) (Main Bay Only)" on page 116 or "Optional EIB (Controller Extended Interface Board) Connections (if required) (Main Bay Only)" on page 122.
8. Remove the grounding wrist strap.
9. Reboot the Controller

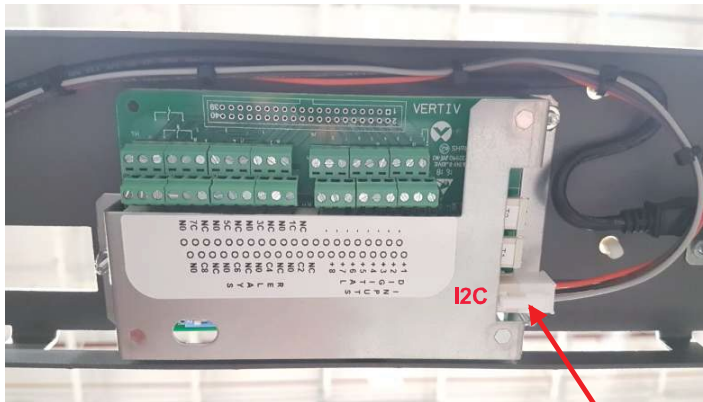
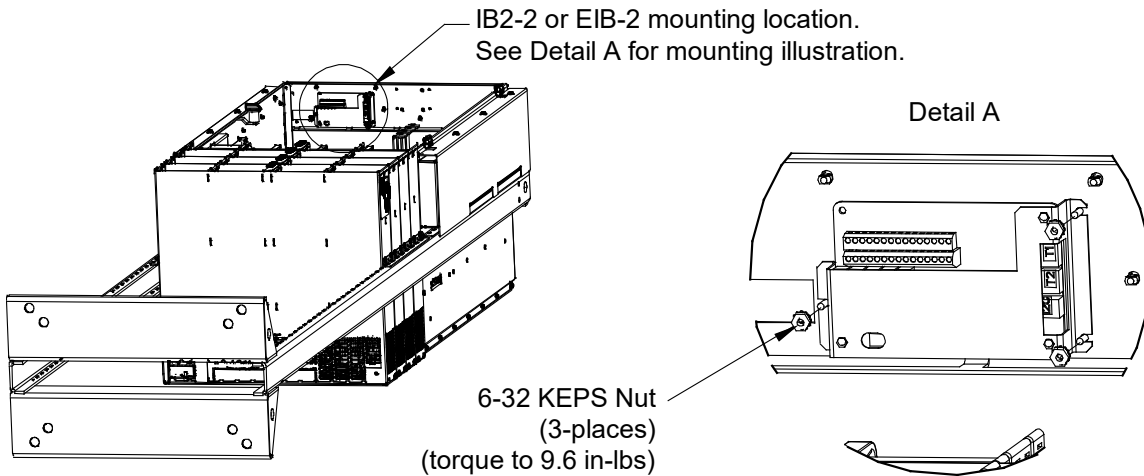
Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.

Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.
10. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack) or close the system's enclosure door.
11. Enable the external alarms or notify appropriate personnel that this procedure is finished.
12. Ensure that there are no local or remote alarms active on the system.

Figure 3.25 Installing Optional Second IB2 (Controller Interface Board) or Optional Second EIB (Controller Extended Interface Board)



All wires from distribution and main harness are routed to the lower front of the distribution cabinet and secured with cable ties. Locate the I2C connector and separate it from the wire harness to allow it to be routed up to the IB2-2 or EIB-2 board.



Route terminal J4 from the harness (562505) to I2C on the IB2-2 or EIB-2 board.

3.13 Installing Circuit Breakers and Fuses

Circuit breakers and/or fuses may have been factory installed for you. If so, verify their positions and sizes.

Installing Bullet Nose Type Fuseholders and TPS/TLS Fuses



CAUTION! 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Refer to SAG582127000 for any other restrictions.

Refer to the following procedure and install bullet nose type fuseholders and appropriately sized TPS/TLS fuses into the proper mounting positions in the distribution cabinet.

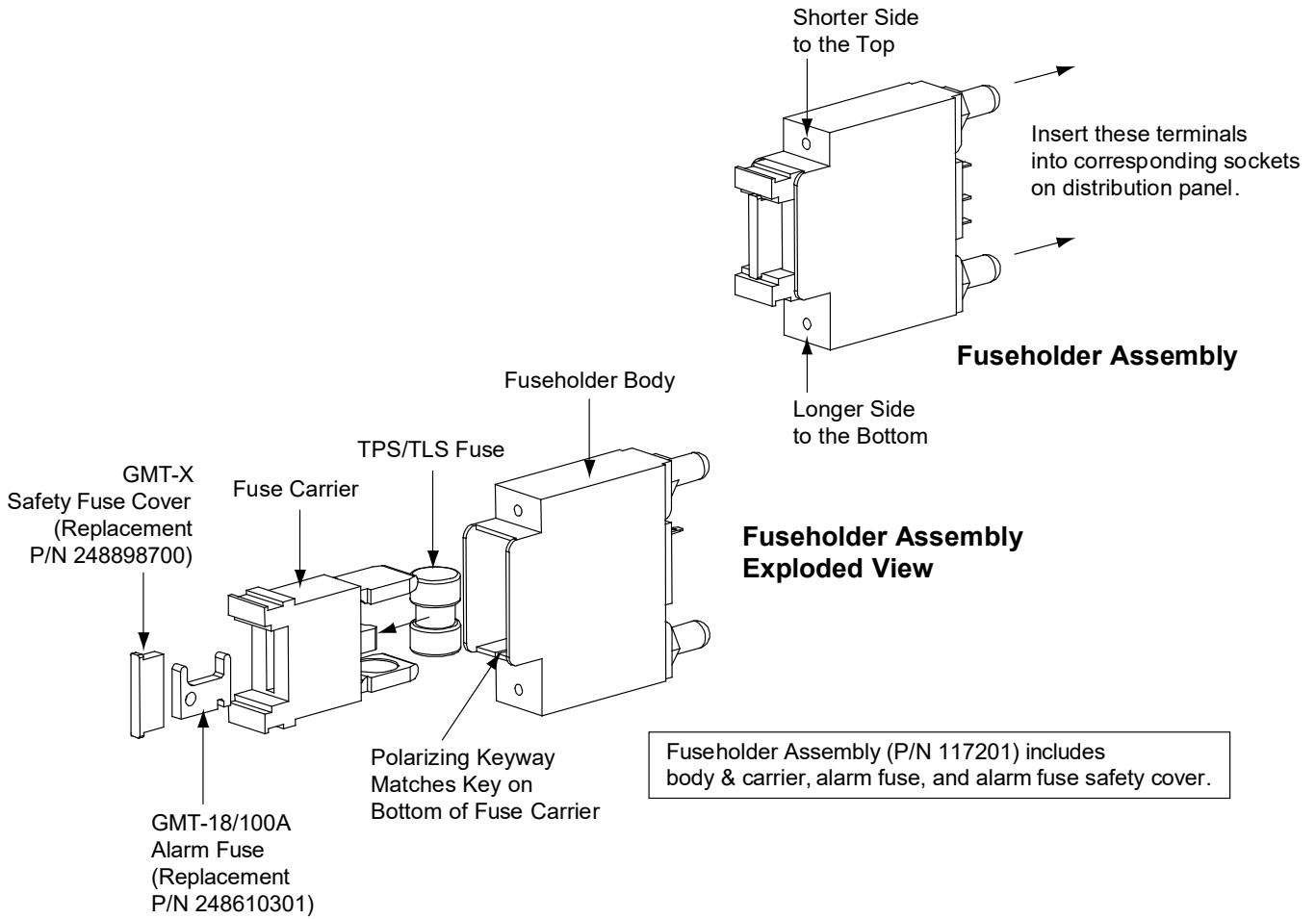
Procedure



NOTE! Refer to Figure 3.26 as this procedure is performed.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Orient the fuseholder as shown in Figure 3.26. Insert the terminals on the rear of the fuseholder into their corresponding sockets on the distribution panel. Ensure the alarm contact on the back of the fuseholder makes contact with the alarm terminal on the spring strip. Push fuseholder in firmly until fully seated in the distribution panel.
3. When all fuseholders are installed, install an appropriately sized TPS/TLS fuse in each. To do this, remove the fuse carrier from the mounted fuseholder body. Hold the fuseholder body while you pull the fuse carrier from the body. Slide the fuse in place between the contacts of the fuse carrier. When done, push the fuse carrier back into the fuseholder body. Note that a polarizing key on the bottom of the carrier prevents the carrier from being inserted upside down.
4. Verify that an 18/100 ampere alarm fuse is present in each fuseholder and that a plastic safety cover is installed on this fuse.
5. Record all fuse sizes on the label provided on the shield.
6. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.26 Installing a Bullet Nose Type Fuseholder and TPS/TLS Fuse



Installing Bullet Nose Type Circuit Breakers



CAUTION! A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Refer to SAG582127000 for any other restrictions.

Refer to the following procedure and install appropriately sized bullet nose type circuit breakers into the proper mounting positions in the distribution cabinet.

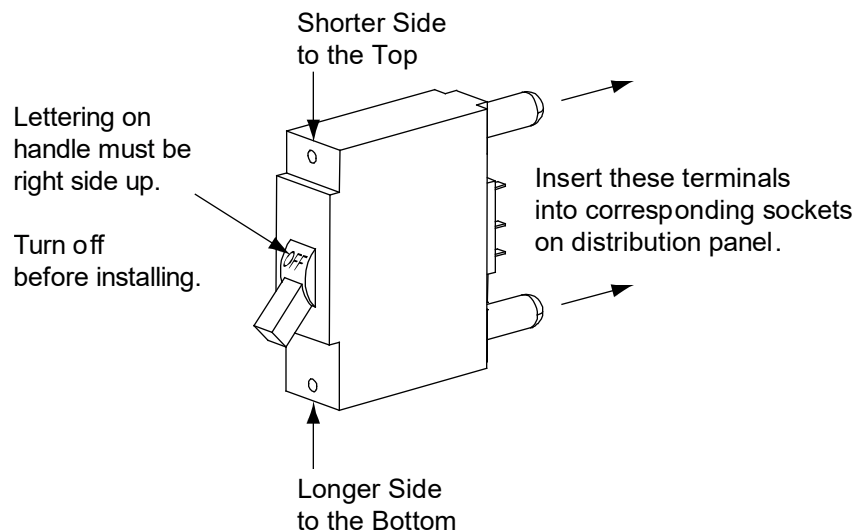
Procedure



NOTE! Refer to Figure 3.27 as this procedure is performed.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Ensure that the circuit breaker is in the OFF position and is of the correct rating. Orient the circuit breaker as shown in Figure 3.27. Insert the terminals on the rear of the circuit breaker into their corresponding sockets on the distribution panel. Ensure the alarm contact on the back of the circuit breaker makes contact with the alarm terminal on the spring strip. Push distribution device in firmly until fully seated in the distribution panel.
3. Record all circuit breaker sizes on the label provided on the shield.
4. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.27 Installing a Bullet Nose Type Circuit Breaker



Installing an Optional Bullet Nose Type 6-Position GMT Distribution Fuse Block (P/N 549017)



NOTE! Refer to Figure 3.28 as this procedure is performed.

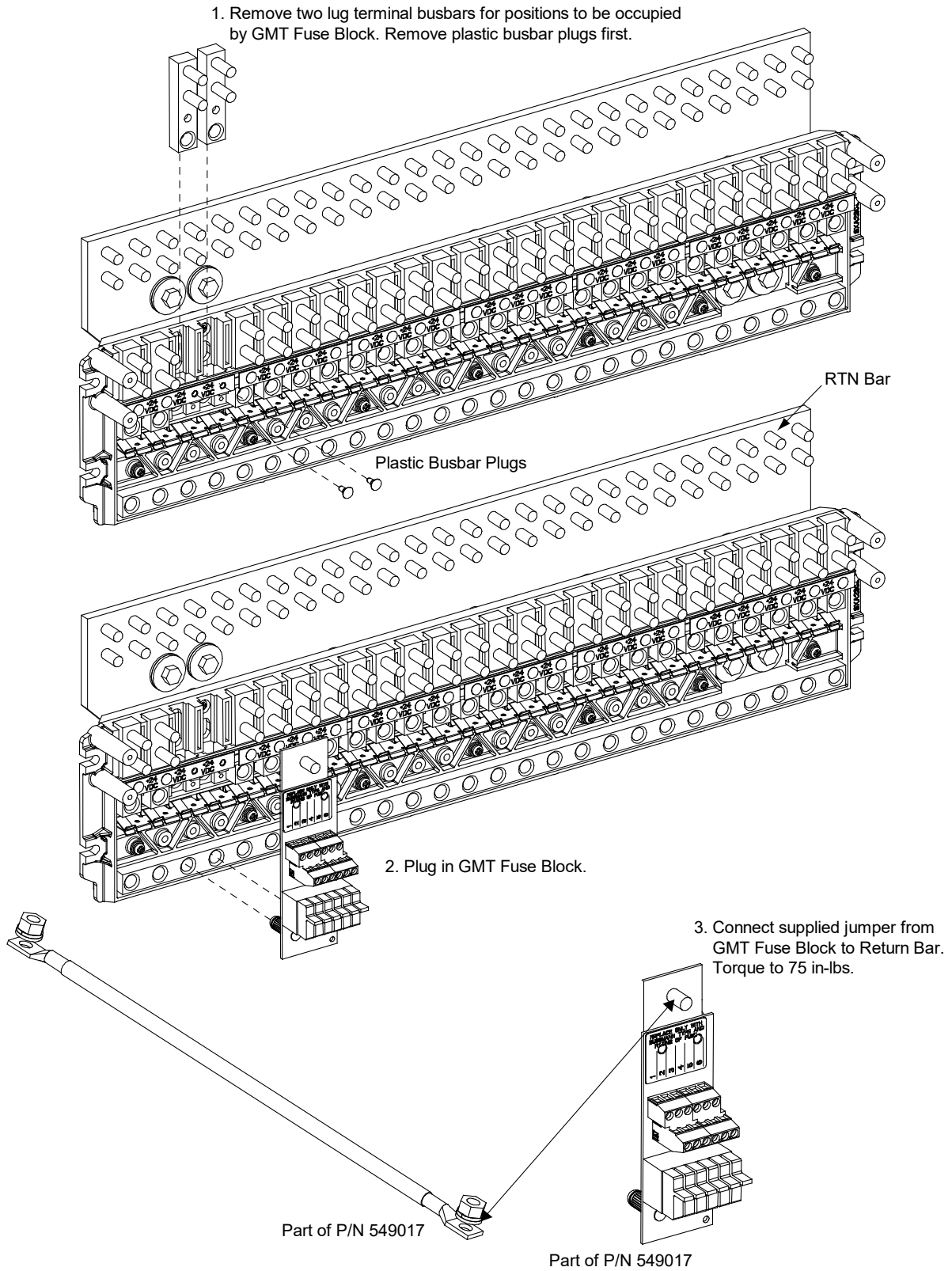


NOTE! Can be used in a List AL, AN, DE, DF, DG, DH, DJ, DK, FE, FF, FG, FH, and FK distribution panel only.

Procedure

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Follow the steps in Figure 3.28.
3. Install an appropriately sized GMT fuse in each fuse mounting position on the GMT Distribution Fuse Block as required. If dummy fuses are installed, first remove the dummy fuse.
 - a) Verify that dummy fuses are installed in all unused fuse positions on the GMT distribution fuse block.
 - b) Verify that a plastic safety cover is installed on all GMT fuses on the GMT distribution fuse block.
4. Record all fuse sizes (installed on the GMT distribution fuse block) on the label provided on the shield.
5. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.28 Installing an Optional Bullet Nose Type 6-Position GMT Distribution Fuse Block (P/N 549017)



Installing TPH Fuses

Refer to the following procedure and install appropriately sized TPH fuses into the proper fuseholders in the distribution cabinet.

Refer to SAG582127000 for any restrictions.

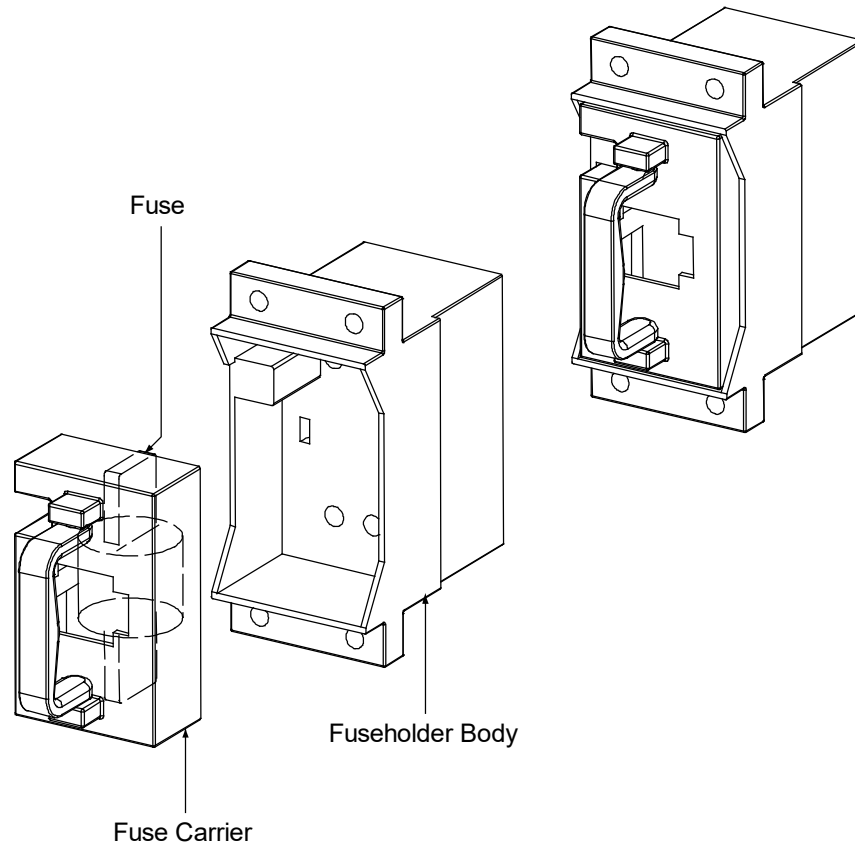
Procedure



NOTE! Refer to Figure 3.29 as this procedure is performed.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Remove the TPH fuse carrier from the mounted fuseholder body by grasping its handle and firmly pulling it straight out. Install the TPH fuse into the fuse carrier. When done, push the fuse carrier securely back into the mounted fuseholder body.
3. Verify that a 1/4 ampere alarm fuse is installed in the GMT-type fuseholder located adjacent to the TPH fuseholder and that a plastic safety cover is install on this fuse.
4. Record all fuse sizes on the cards provided within the fuseholders.
5. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.29 Installing a TPH Fuse



Installing TPL-B Fuses

Refer to the following procedure and install appropriately sized TPL-B fuses into the proper fuseholders in the distribution cabinet.

Refer to SAG582127000 for any restrictions.

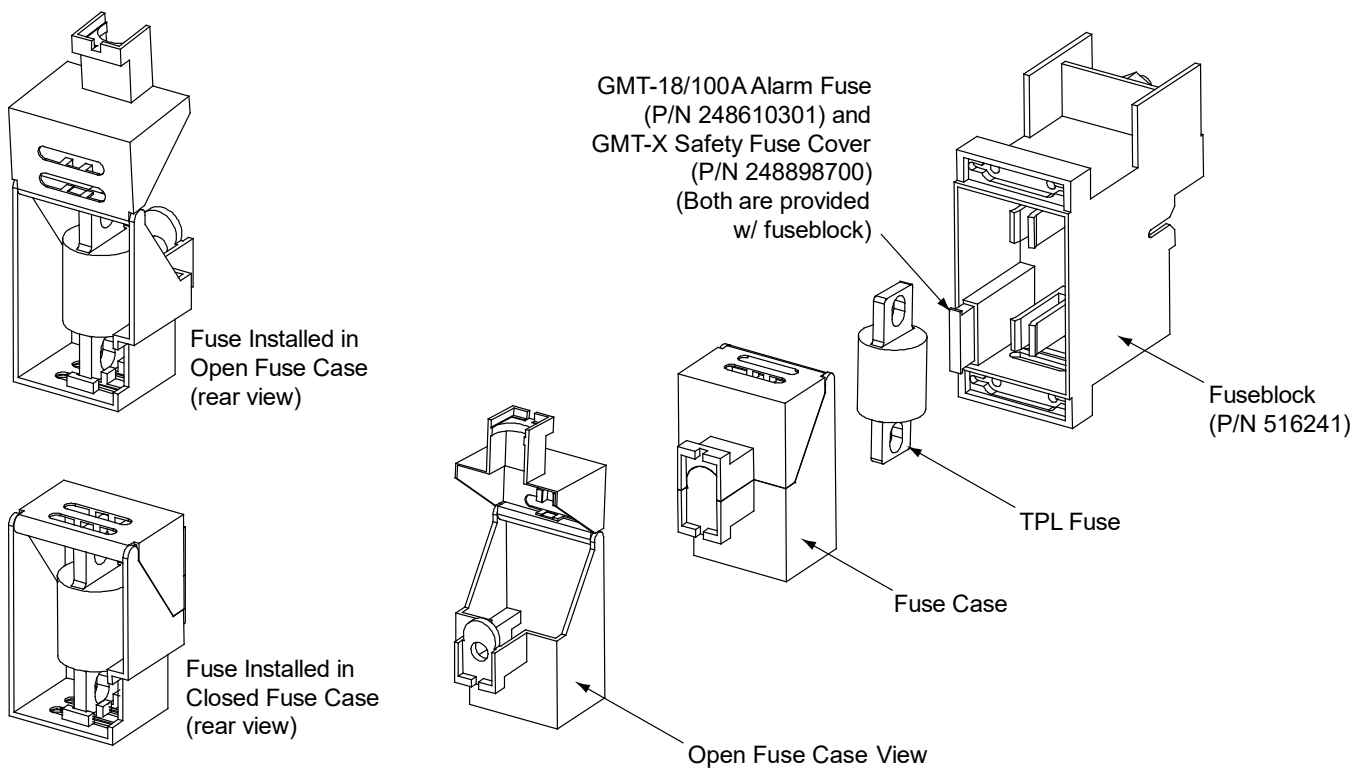
Procedure



NOTE! Refer to Figure 3.30 as this procedure is performed.

1. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Remove the fuse case from the mounted fuse block by grasping its handle and pulling it straight out.
3. Verify that an 18/100 ampere alarm fuse is present in the GMT-type fuseholder located on the fuse block and that a plastic safety cover is installed on this fuse.
4. Open the fuse case.
5. Install the TPL fuse into the fuse case.
6. Close the fuse case.
7. Firmly plug the fuse and fuse case into the fuse block.
8. Record all fuse sizes on the cards provided within the fuseholders.
9. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.30 Installing TPL-B Fuses



Installing GJ/218 Circuit Breakers

Refer to the following procedure and install appropriately sized GJ/218 circuit breakers into the proper mounting positions in the distribution cabinet.

Refer to SAG582127000 for any restrictions.

Procedure



NOTE! Refer to Figure 3.31 as this procedure is performed.

1. Locate the appropriate circuit breaker mounting kit ordered with the circuit breaker. The circuit breaker mounting kit contains installation hardware, an alarm jumper, a shunt jumper (if applicable), a busbar (for 2-pole, 3-pole, and 4-pole circuit breakers), and a circuit breaker guard. Refer to SAG582127000 for part numbers of the circuit breaker mounting kits.
2. Open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
3. Ensure that the circuit breaker is in the OFF position, and is of the correct rating and type (electrical trip/mechanical trip or electrical trip only). Apply anti-oxidizing compound to busbar mating surfaces on the distribution panel and the circuit breaker. Orient the circuit breaker over its mounting location.
 - a) Attach the alarm jumper connectors to the back of the circuit breaker, then plug the other end of the alarm jumper into its corresponding connector. See Figure 3.31.
 - b) **Shunted Breakers Only:** Attach the shunt jumper connectors to the back of the circuit breaker, then route the jumper through the hole in the distribution panel. See Figure 3.31.



DANGER! The bolts being installed in the following step may be at system potential. Use insulated tools.

4. Install the circuit breaker into its mounting position and secure with the provided hardware. Torque to 60 in-lbs.

2-Pole, 3-Pole, and 4- Pole Circuit Breakers Only: Also install the mounting kit supplied shorting busbar as shown in Figure 3.31.
5. Install the circuit breaker guard and label (refer to Figure 3.31).
6. **Shunted Breakers Only:** Route and connect shunt leads to the SM-DU+ and Shunt Interface Assembly.

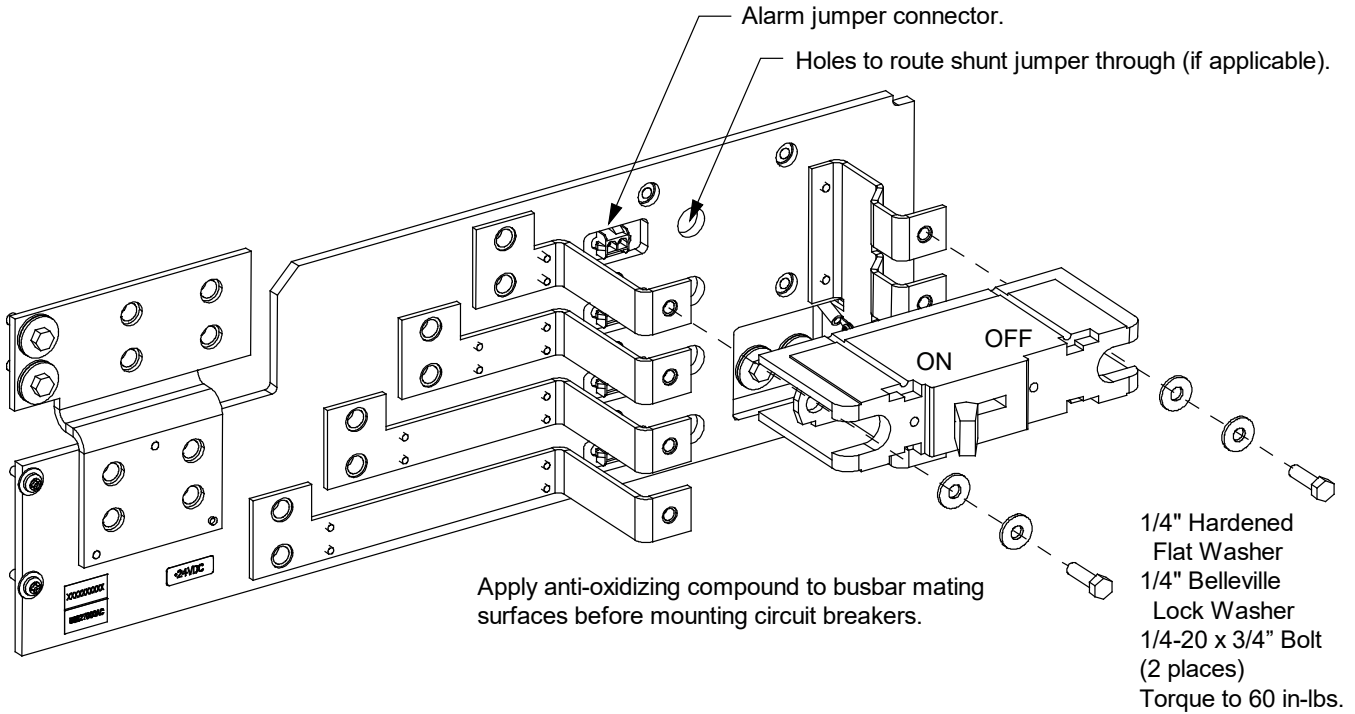


NOTE! Refer to "Optional SM-DU+ and Shunt Interface Board" on page 127 for proper wiring procedure. Leads must be terminated before switching breaker ON to avoid circuit fault.

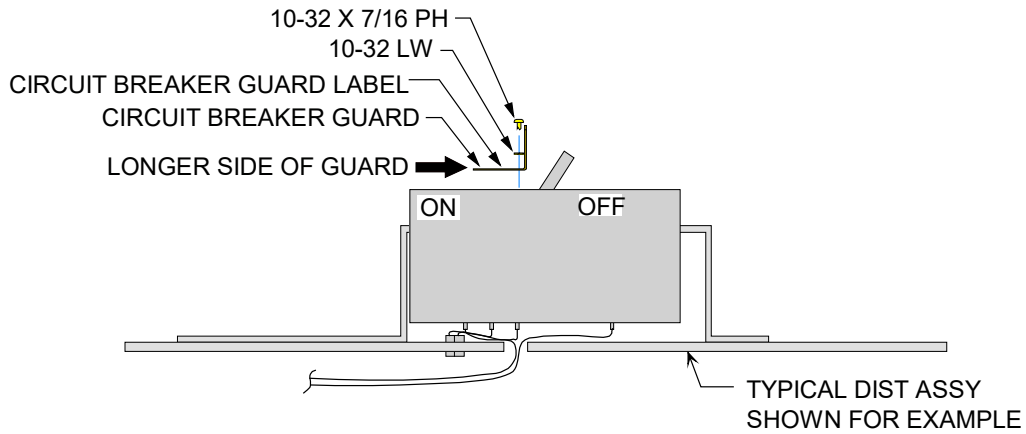
7. Record all circuit breaker sizes on the label provided on the shield.
8. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.

Figure 3.31 Installing a GJ/218 Circuit Breaker (1-Pole) (Lists AC, AD, BC, BD) (cont'd on next page)

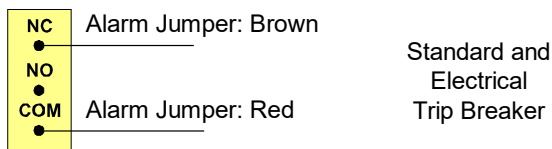
INSTALLING CIRCUIT BREAKER



INSTALLING CIRCUIT BREAKER GUARD



ALARM WIRING (BREAKERS W/OUT SHUNTS)



ALARM WIRING (BREAKERS WITH SHUNTS)

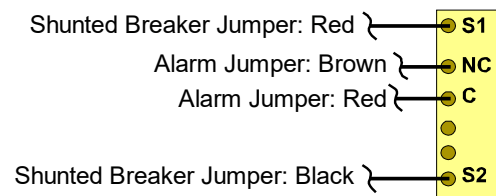
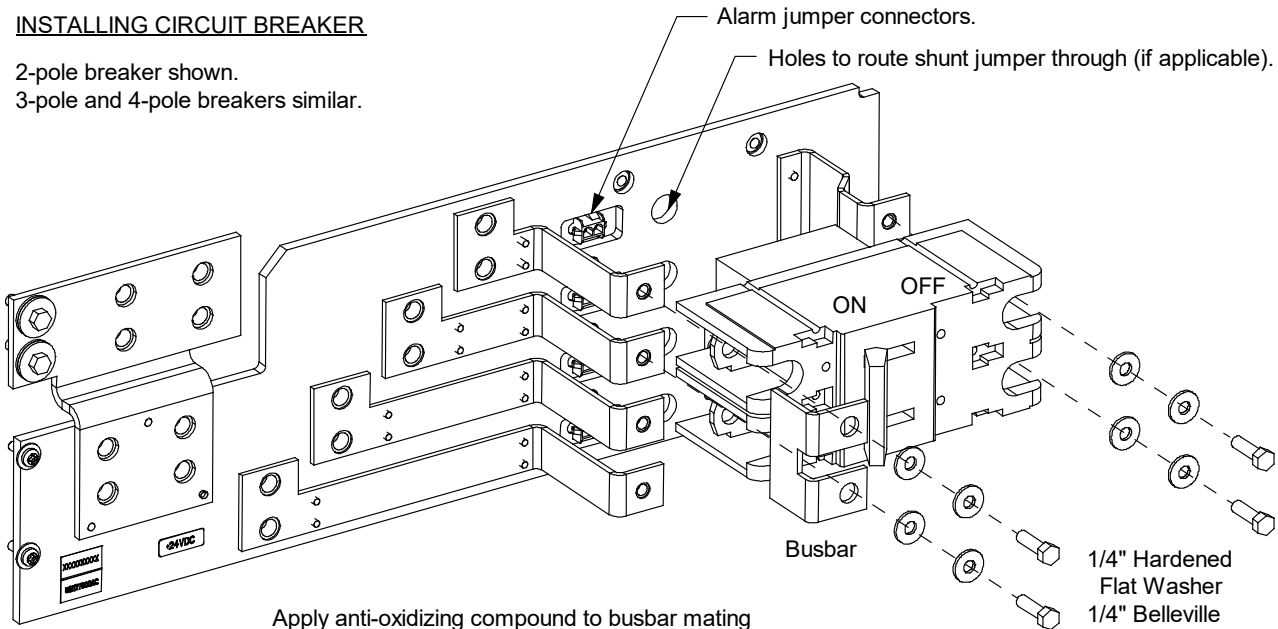


Figure 3.31 Installing a GJ/218 Circuit Breaker (2-Pole, 3-Pole, 4-Pole) (Lists AC, AD, BC, BD) (cont'd from previous page, cont'd on next page)

INSTALLING CIRCUIT BREAKER

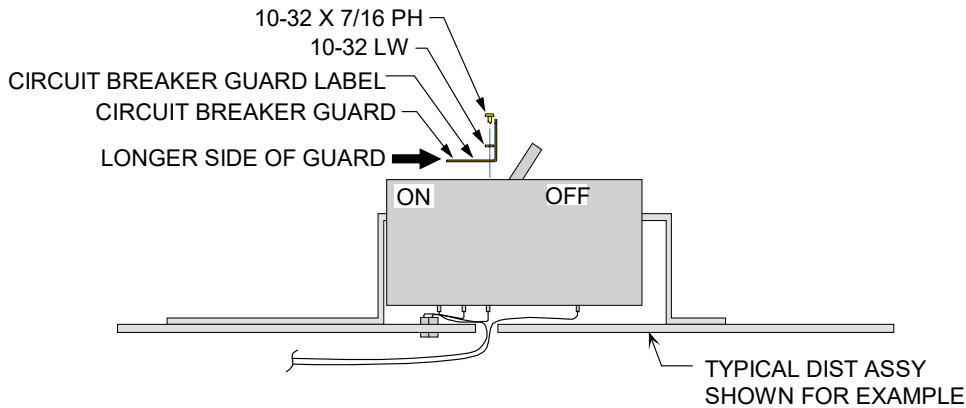
2-pole breaker shown.
3-pole and 4-pole breakers similar.



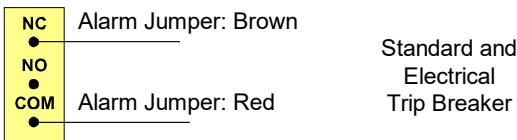
Apply anti-oxidizing compound to busbar mating surfaces before mounting circuit breakers.

- 1/4" Hardened Flat Washer
- 1/4" Belleville Lock Washer
- 1/4-20 x 3/4" Bolt
- (4 places / 2-pole brk, 6 places / 3-pole brk, 8 places / 4-pole brk)
- Torque to 60 in-lbs.

INSTALLING CIRCUIT BREAKER GUARD



ALARM WIRING (BREAKERS W/OUT SHUNTS)



ALARM WIRING (BREAKERS WITH SHUNTS)

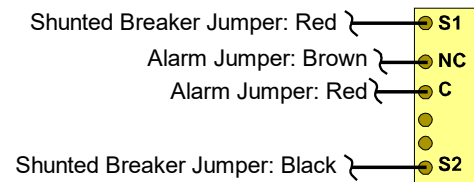
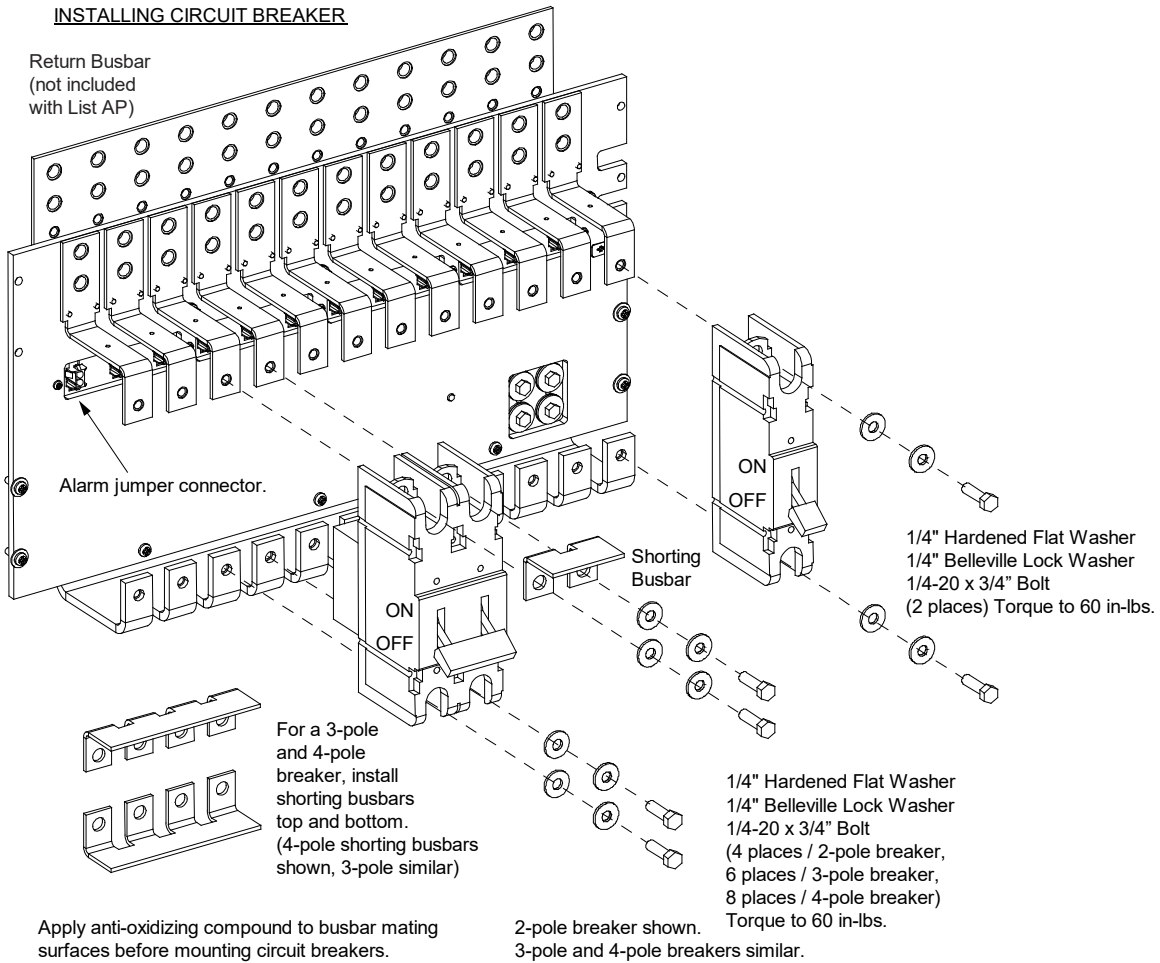
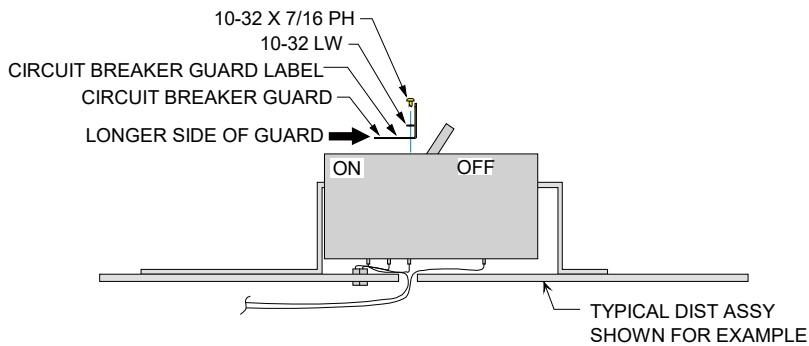


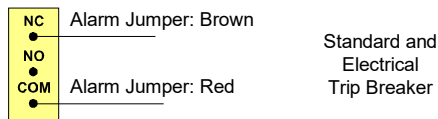
Figure 3.31 Installing a GJ/218 Circuit Breaker (1-Pole, 2-Pole, 3-Pole, 4-Pole) (List AM and List AP) (cont'd from previous page)



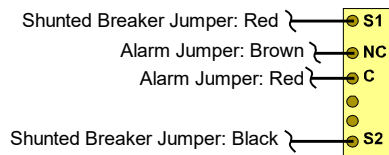
INSTALLING CIRCUIT BREAKER GUARD



ALARM WIRING (BREAKERS W/OUT SHUNTS)



ALARM WIRING (BREAKERS WITH SHUNTS)



4 Setting Jumpers and Switch Options

4.1 Circuit Card Locations

Refer to Figure 4.1.

Figure 4.1 Circuit Card Locations (Main Bay)

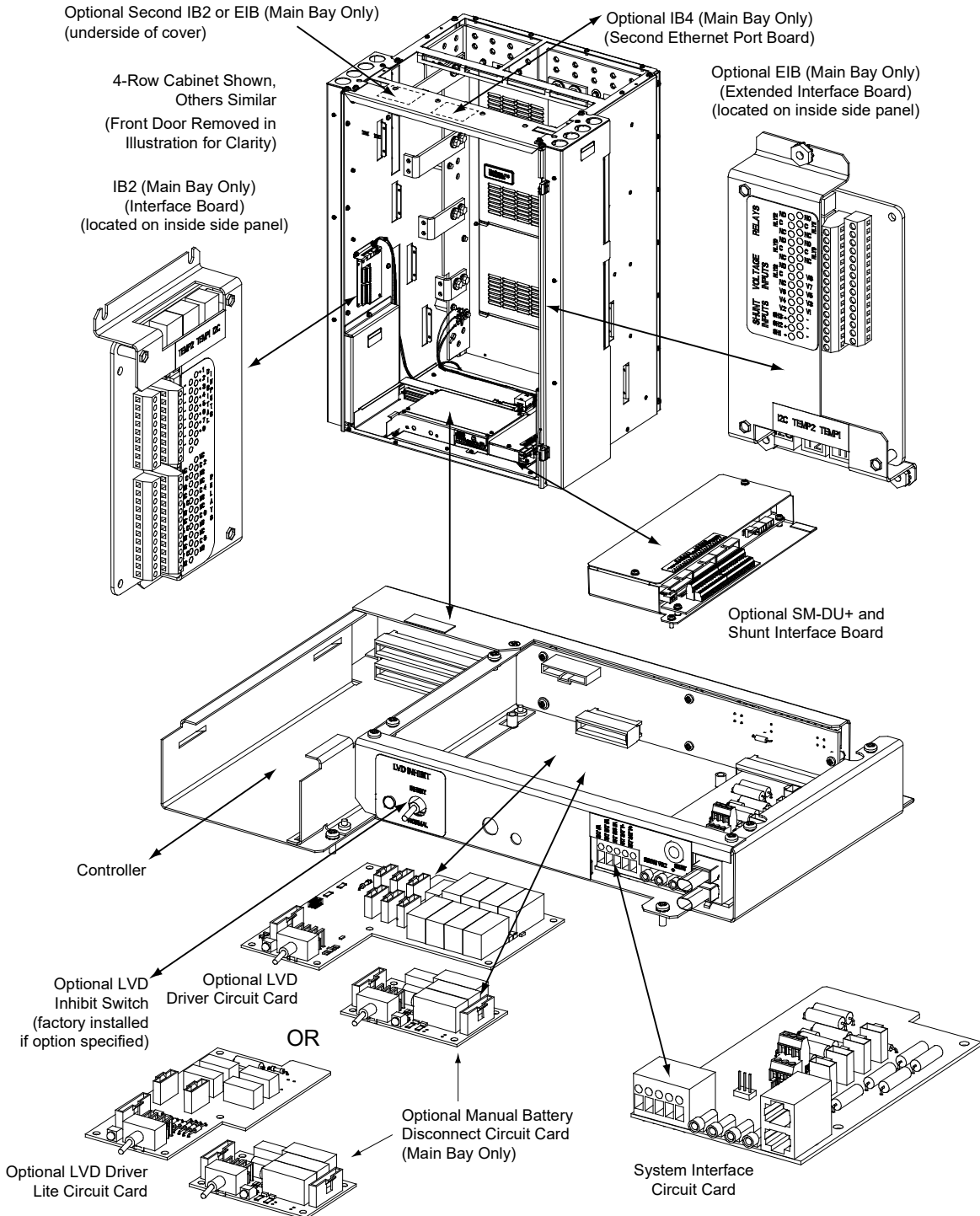
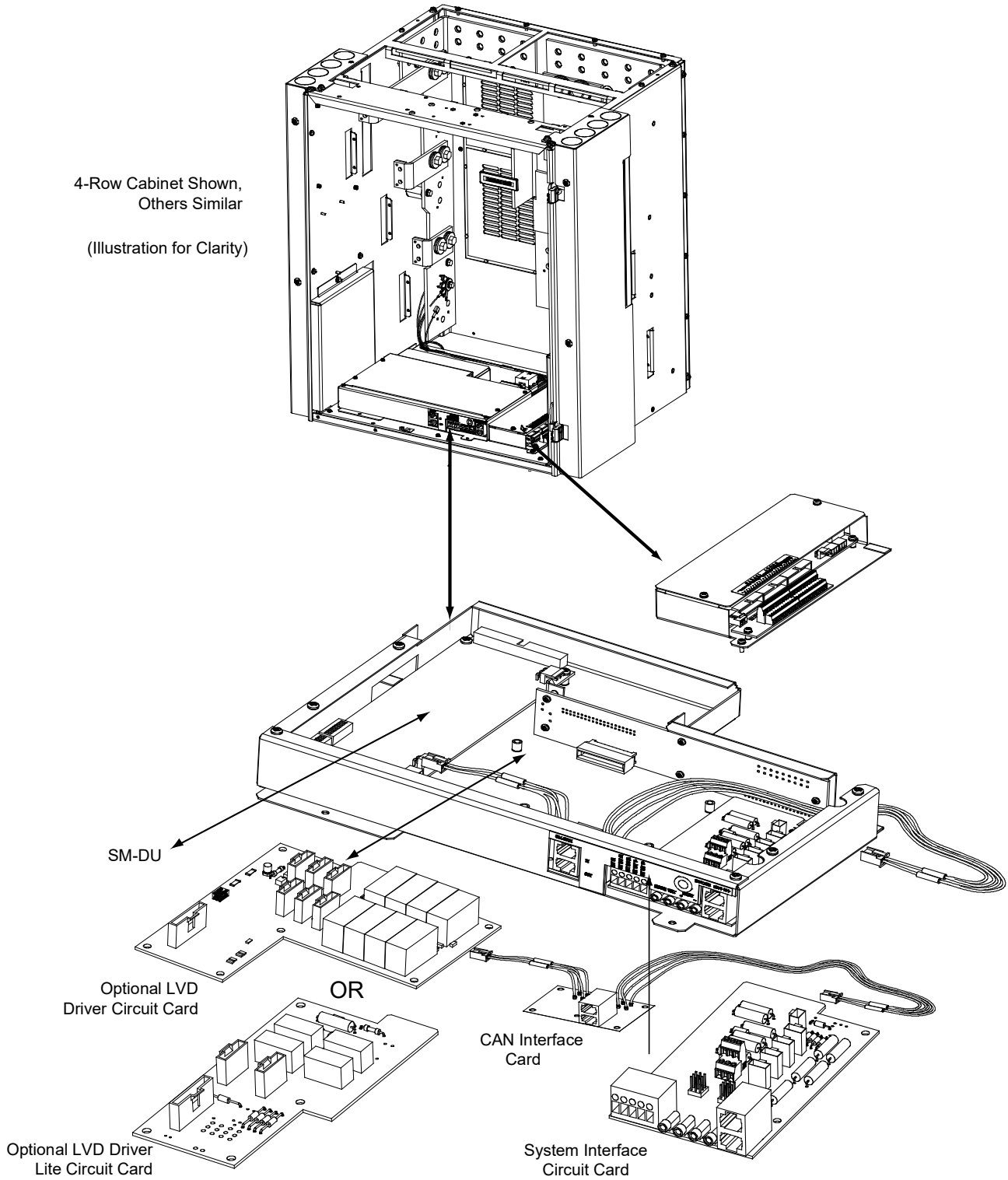


Figure 4.1 Circuit Card Locations (Supplementary Bay)



4.2 Jumpers on System Interface Circuit Card (Main Bay Only)

Perform the following procedures to verify the factory settings and/or make the required settings per your site requirements. These procedures can also be used to make adjustments on a replacement circuit card.

Controller Power Option

The controller is always powered from the internal “system” bus. A jumper option allows the controller to be also powered by battery. Battery power allows the controller to stay running in the event rectifiers are off or battery LVD opens (if installed). Note that if powering the controller from battery, the battery will drain if rectifiers are off or battery LVD opens (if installed). The controller’s power consumption is 5W.

Procedure

1. Refer to Figure 4.2 and place the jumper on J8 in the “Battery Pwr” or “No Battery Pwr” position.

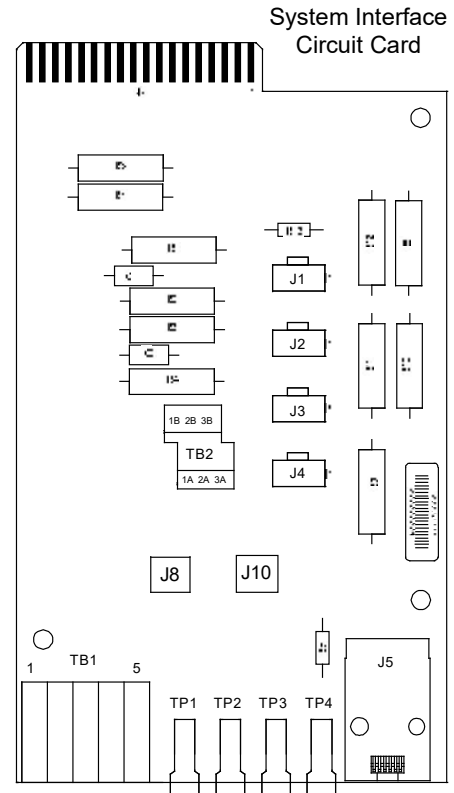
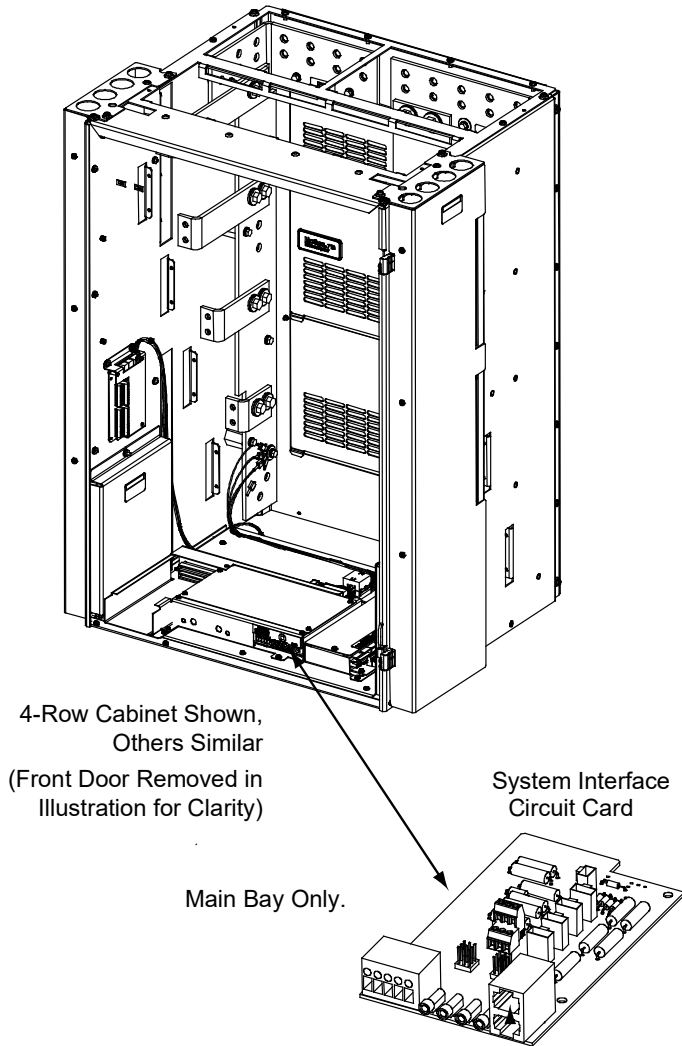
Internal/External Battery Monitoring

Selects to monitor (and display via the controller) battery voltage from either an “internal” or “external” source.

Procedure

1. Refer to Figure 4.2 and place the jumper on J10 in the “Internal” or “External” position. If “External” is selected, connect sense leads to TB1-4 and TB1-5 (see Figure 4.2).

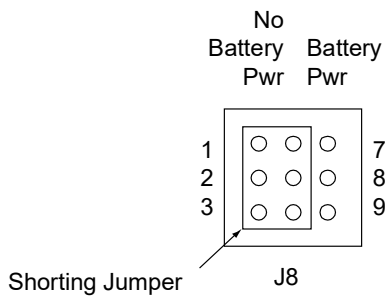
Figure 4.2 System Interface Circuit Card Jumper Locations



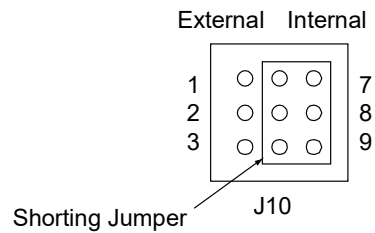
TB1-2, TB1-3, TB1-4, TB1-5 Main Bay Only.

TB1-4: External Battery Monitoring (-)
TB1-5: External Battery Monitoring (+)

J8 (Main Bay Only)
Selects to power Controller from "Battery Power" or not.



J10 (Main Bay Only)
Battery Monitoring External / Internal (see TB1-4 and TB1-5 for external monitoring points)



4.3 Switch Settings on IB2 Interface Board (Main Bay Only)

Dip Switch SW1 on the IB2 board is used to set the communications address for this board. Refer to Table 4.1 for SW1 settings. Refer to Figure 4.3 for SW1 location.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

1. Ensure SW1 is set per Table 4.1. Refer to Figure 4.3 for location.

Table 4.1 IB2 Interface Board Switch Settings

Setting	DIP Switch SW1	
	1	2
IB2-1 in Main Bay	OFF	OFF
Optional IB2-2 in Main Bay	ON	OFF

4.4 Switch Setting on Optional EIB Interface Board (Main Bay Only)

Dip Switch SW1 on the EIB board is used to set the communications address for this board. Refer to Table 4.2 for SW1 settings. Refer to Figure 4.4 for SW1 location.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

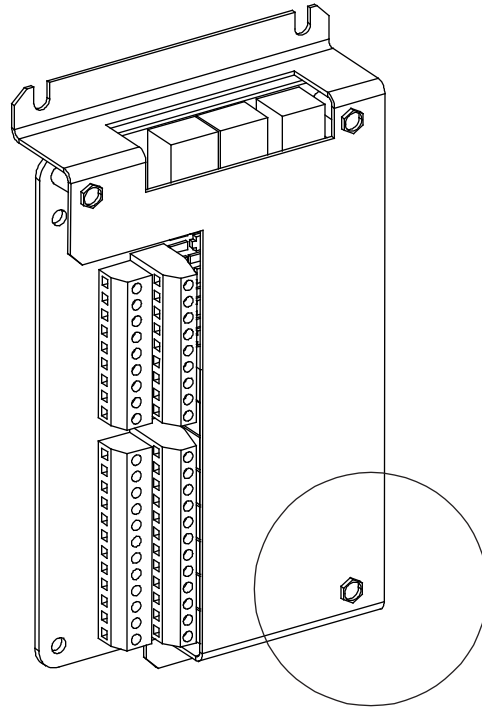
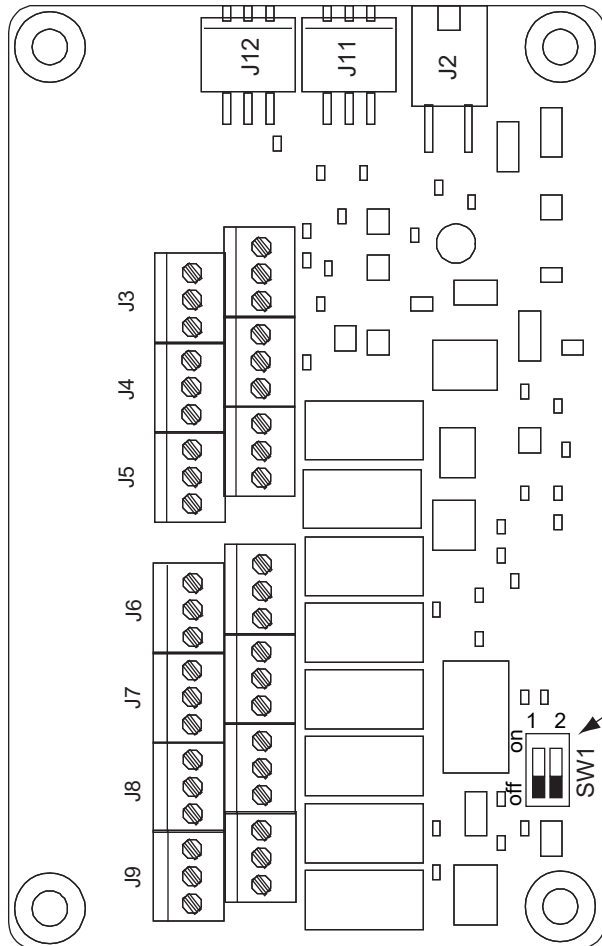
1. Ensure SW1 is set per Table 4.2. Refer to Figure 4.4 for location.

Table 4.2 Optional EIB Interface Board Switch Settings

Setting	DIP Switch SW1	
	1	2
EIB-1 in Main Bay	OFF	OFF
Optional EIB-2 in Main Bay	ON	OFF

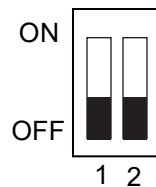
Figure 4.3 IB2 Interface Board Switch Location and Settings (installed in Main Bay only)

**IB2 Interface Board
(Top View)**



Switch SW1 is located in this corner of the IB2 Board.

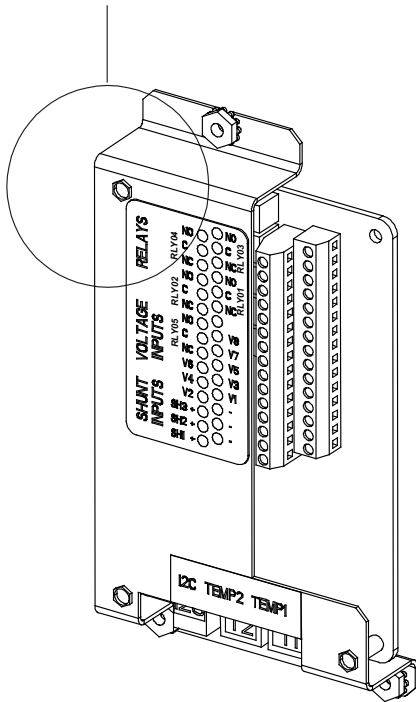
Setting	DIP Switch SW1	
	1	2
IB2-1 in Main Bay	OFF	OFF
Optional IB2-2 in Main Bay	ON	OFF



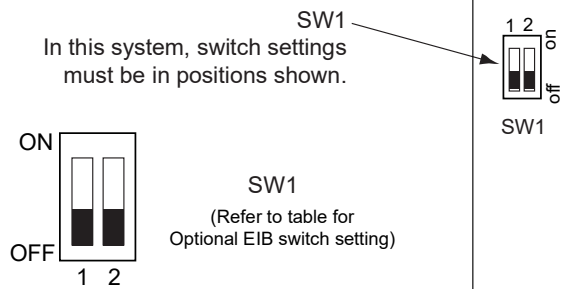
SW1
(Refer to table for Optional IB2 switch setting)

Figure 4.4 Optional EIB Interface Board Switch Location and Settings (Installed in Main Bay only)

Switch SW1 is located in this corner of the EIB Board.



Optional EIB Interface Board (Top View)



Setting	DIP Switch SW1	
	1	2
EIB-1 in Main Bay	OFF	OFF
Optional EIB-2 in Main Bay	ON	OFF

4.5 Switch Setting on SM-DU (Supplemental Bays Only)

SM-DU uses three (3) 8-bit switches for parameter setting (S1, S2, and S3). Refer to Table 4.3 for switch settings. Refer to Figure 4.5 for switch locations.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

1. Ensure S1, S2, and S3 are set per Table 4.3. Refer to Figure 4.5 for location.

Figure 4.5 SM-DU Switch Location

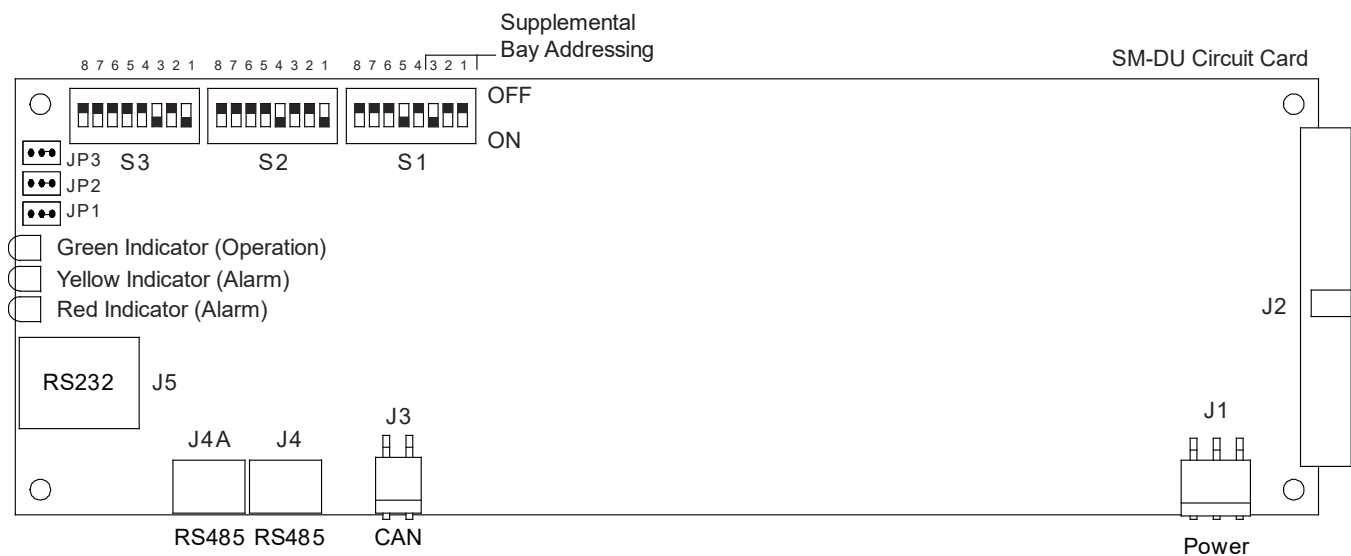


Table 4.3 SM-DU Switch Settings (cont'd on next page)

DIP Switch S1								Description of Status
Communication Address			Shunt Voltage		Shunt Current			
1	2	3	4	5	6	7	8	
OFF	OFF	OFF	NA					Address 8#
OFF	OFF	ON						Address 1# (Setting for SM-DU in 1st Supp. Bay)
OFF	ON	OFF						Address 2# (Setting for SM-DU in 2nd Supp. Bay)
OFF	ON	ON						Address 3# (Setting for SM-DU in 3rd Supp. Bay)
ON	OFF	OFF						Address 4# (Setting for SM-DU in 4th Supp. Bay)
ON	OFF	ON						Address 5# (Setting for SM-DU in 5th Supp. Bay)
ON	ON	OFF						Address 6#
ON	ON	ON						Address 7#
NA			OFF	OFF	NA			Shunt Voltage: 75mV
			OFF	ON				Shunt Voltage: 25mV (Note 1)
			ON	OFF				Shunt Voltage: 50mV
			ON	ON				Shunt Voltage: 60mV
NA					OFF	OFF	OFF	Shunt Current: 500A (Note 1)
					OFF	OFF	ON	Shunt Current: 100A
					OFF	ON	OFF	Shunt Current: 200A
					OFF	ON	ON	Shunt Current: 300A
					ON	OFF	OFF	Shunt Current: 400A
					ON	OFF	ON	Shunt Current: 1000A
					ON	ON	OFF	Shunt Current: 1500A
					ON	ON	ON	Shunt Current: 2000A

Note 1: Setting for this system.

Table 4.3 SM-DU Switch Settings (cont'd from previous page, cont'd on next page)

DIP Switch S2								Description of Status										
Shunt 1 Setting		Shunt 2 Setting		Shunt 3 Setting		Shunt 4 Setting												
1	2	3	4	5	6	7	8											
OFF	OFF	NA						Shunt 1 is Disabled										
OFF	ON											Shunt 1 is Used for Battery						
ON	OFF															Shunt 1 is Used for Load (Note 1)		
ON	ON																	
NA		OFF	OFF	NA														
		OFF	ON															
		ON	OFF															
		ON	ON															
NA			OFF	OFF	NA													
			OFF	ON														
			ON	OFF														
			ON	ON														
NA				OFF	OFF													
				OFF	ON													
				ON	OFF													
				ON	ON													

Note 1: Setting for this system.

Table 4.3 SM-DU Switch Settings (cont'd from previous page)

DIP Switch S3				
Set via Software	Contactor Type	Safe Mode	Dry Contact	Description of Status
1	2	3	4	
Off	NA			Shunt parameter is set through DIP switch.
On	NA			Shunt parameter is set via software. (Note 1)
NA	Off	NA		Bi-Stable Contactor (Note 1)
	On	NA		Mono-Stable Contactor
NA		Off	NA	LVD / reconnection is disabled upon communication failure.
		On		LVD / reconnection is enabled upon communication failure. (Note 1)
NA			On	LVD2 is a Dry Contact
			Off	LVD2 (Note 1)
DIP Switch S3				
Shunt 5 Setting	Reserved	Calibration Mode	Description of Status	
5	6	7	8	
Off	Off	NA		Shunt 5 is Disabled (Note 1)
Off	On	NA		Shunt 5 is Used for Battery
On	Off	NA		Shunt 5 is Used for Load
On	On	NA		Set via Software
NA			Off	Operation Mode (Note 1)
			On	Calibration Mode

Note 1: Setting for this system.

4.6 Switch Setting on SM-DU+

SM-DU+ uses two (2) 8-bit switches for parameter setting (SW1 and SW2). Refer to Table 4.4 for SW1 and SW2 settings. Refer to Figure 4.6 for SW1 and SW2 locations.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

1. Ensure SW1 and SW2 are set per Table 4.4. Refer to Figure 4.6 for location.

Figure 4.6 Optional SM-DU+ Switch Location and Settings

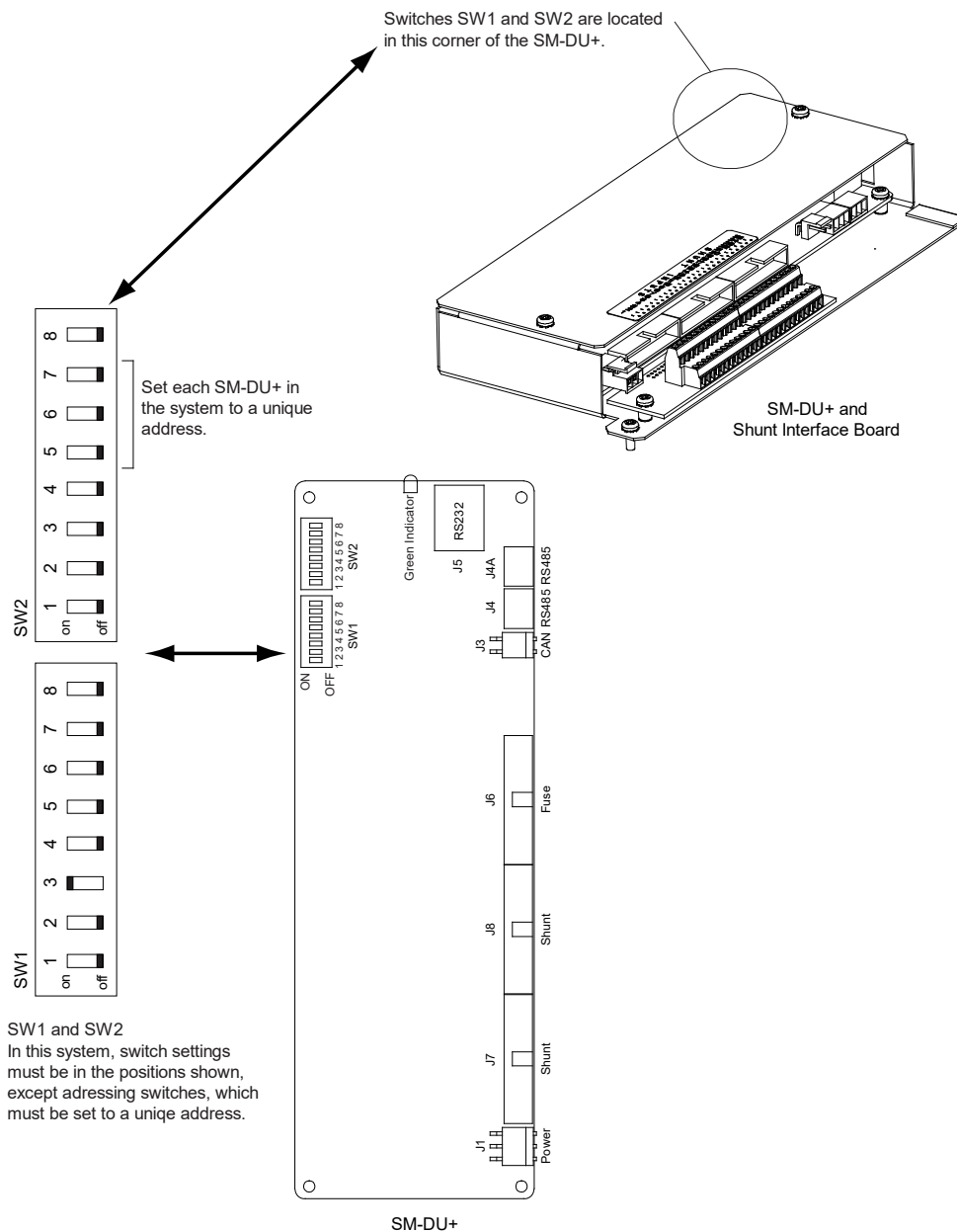


Table 4.4 Optional SM-DU+ Switch Settings

DIP Switch SW1								Description of Status	
Reserved		HW/ SW	Shunt Voltage		Shunt Current				
1	2	3	4	5	6	7	8		
NA	OFF	NA	NA			NA			Shunt parameter is set through DIP switch.
	ON		NA			NA			Shunt parameter is set through software (note 1) .
NA	OFF	OFF	NA	OFF	NA	OFF	NA	Shunt Voltage: 25mV (note 1)	
	OFF	ON		OFF		Shunt Voltage: 50mV			
	ON	OFF		OFF		Shunt Voltage: 60mV			
	ON	ON		OFF		Shunt Voltage: 75mV			
NA	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Shunt Current: 500A (note 1)	
	OFF	OFF	ON	OFF	OFF	OFF	OFF	Shunt Current: 100A	
	OFF	ON	OFF	OFF	OFF	OFF	OFF	Shunt Current: 200A	
	OFF	ON	ON	OFF	OFF	OFF	OFF	Shunt Current: 300A	
	ON	OFF	OFF	OFF	OFF	OFF	OFF	Shunt Current: 400A	
	ON	OFF	ON	OFF	OFF	OFF	OFF	Shunt Current: 1000A	
	ON	ON	OFF	OFF	OFF	OFF	OFF	Shunt Current: 1500A	
	ON	ON	ON	OFF	OFF	OFF	OFF	Shunt Current: 2000A	
DIP Switch SW2								Description of Status	
Reserved			Communications Address			Baud Rate			
1	2	3	4	5	6	7	8		
NA	OFF	OFF	OFF	OFF	OFF	OFF	OFF	NA	Address 1# (Setting for SM-DU+ in Main Bay)
	OFF	OFF	ON	OFF	OFF	OFF	OFF	NA	Address 2# (Setting for SM-DU+ in 1st Supp. Bay)
	OFF	ON	OFF	OFF	OFF	OFF	OFF	NA	Address 3# (Setting for SM-DU+ in 2nd Supp. Bay)
	OFF	ON	ON	OFF	OFF	OFF	OFF	NA	Address 4# (Setting for SM-DU+ in 3rd Supp. Bay)
	ON	OFF	OFF	OFF	OFF	OFF	OFF	NA	Address 5# (Setting for SM-DU+ in 4th Supp. Bay)
	ON	OFF	ON	OFF	OFF	OFF	OFF	NA	Address 6# (Setting for SM-DU+ in 5th Supp. Bay)
	ON	ON	OFF	OFF	OFF	OFF	OFF	NA	Address 7#
	ON	ON	ON	OFF	OFF	OFF	OFF	NA	Address 8#
NA							OFF	19200 (note 1)	
NA							ON	9600	

Note 1: Setting for this system.

5 Making Electrical Connections

5.1 Important Safety Instructions



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

5.2 Wiring Considerations

All wiring and branch circuit protection should follow the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), and applicable local codes. For operation in countries where the NEC is not recognized, follow applicable codes.

For wire size, branch circuit protection, crimp lug, and general wiring recommendations; refer to System Application Guide SAG582127000.

Lugs should be crimped per lug manufacturer's specifications.

Refer to Table 5.1 for supplemental lug crimping information when using the special application crimp lug / strap combination.

Table 5.1 Supplemental Lug Crimping Information when using the Special Application Crimp Lug / Strap Combination

Crimp Lug Part No.		Crimp Tool Required ¹ , T&B Model TBM12 or TBM15 Hydraulic Heads		
		Color Key	Die Index/ Code No.	Die Cat. Number
245393500	Burndy: YA25L-4TCG1	Pink	42H	15508
245393600	Burndy: YA26L-4TCG1	Black	45	15526
245393700	Burndy: YA27L-4TCG1	Orange	50	15530
245393800	Burndy: YA28L-4TCG1	Purple	54H	15511
514872	T & B: 256-30695-1879	Yellow	62	15510
	Burndy: YA29L-4TCG1			
514873	T & B: 256-30695-1880	Red	71	15514
	Burndy: YA31L-4TCG1			

¹ The lugs should be crimped to the specifications given in the manufacturer's instructions furnished with the crimp tool or lug.

5.3 Relay Rack or Enclosure Grounding Connection (Frame Ground)

System components are factory mounted in a relay rack, on shipping rails, or in an enclosure as specified when ordered.

For relay rack and enclosure grounding requirements, refer to the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), applicable local codes, and your specific site requirements.

A customer's grounding network lead can be attached to the top of the relay rack or enclosure. Provision is made for installing a lead with a two-hole lug that has 1/4" bolt clearance holes on 5/8" centers. When using 1/4-inch hardware, recommended torque is 84 in-lbs when a standard flat washer and lock washer are used. Refer to Figure 5.1 for locations.



NOTE! REMOVE TAPE (IF PRESENT) FROM HOLE LOCATIONS BEFORE INSTALLING LUG.



NOTE! The DC return connection to this system can remain isolated from system frame and chassis (DC-I).

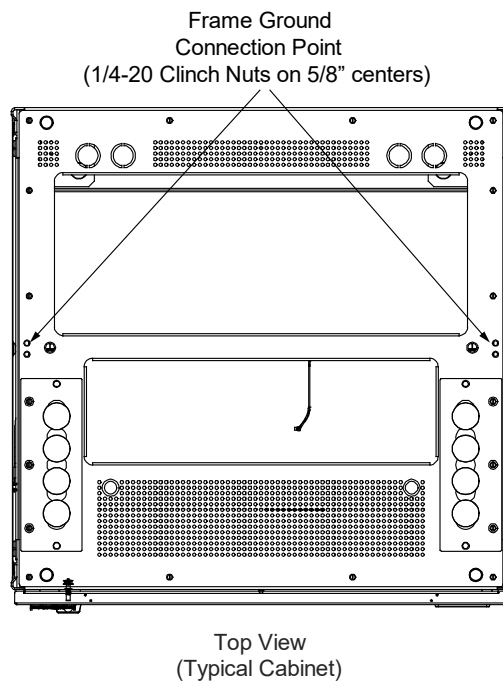
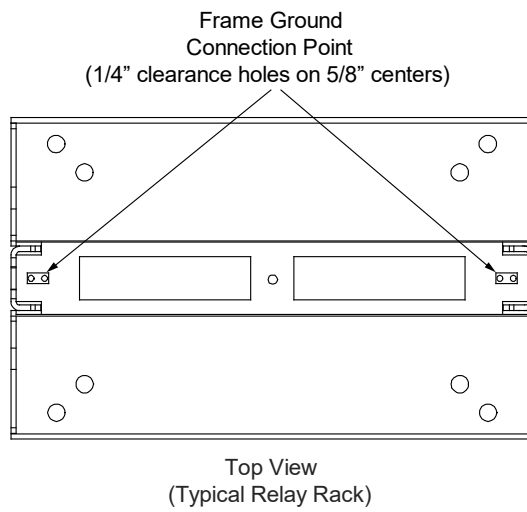
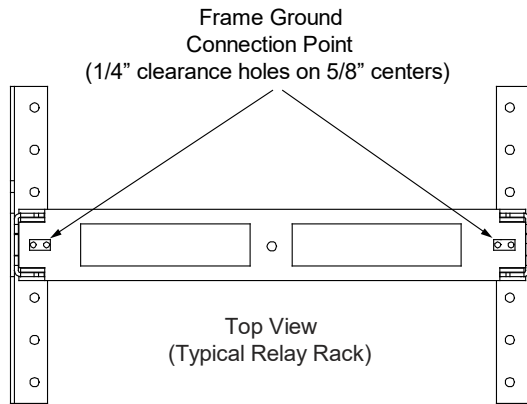


NOTE! This system is suitable for installation as part of the Common Bonding Network (CBN).

5.4 Central Office Ground Connection

Landing points are provided on the battery return bus for a central office ground lead (see Figure 5.63, Figure 5.64, and Figure 5.67). For central office grounding requirements, refer to the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), applicable local codes, and your specific site requirements.

Figure 5.1 Relay Rack and Enclosure Frame Grounding Connection Points



5.5 Nominal 208 VAC, 240 VAC, 277 VAC, or 277 VAC / 480 VAC Input and Equipment Grounding Connections (if equipped)

System components are factory mounted in a relay rack, on shipping rails, or in an enclosure as specified when ordered.



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Wiring Considerations

For wire size, branch circuit protection, crimp lug, and general wiring recommendations; refer to System Application Guide SAG582127000.

AC Input Termination Assemblies

The available AC input options for this system are:

- The system can be equipped with an AC input termination assembly which provides a separate single phase AC input connection for each rectifier position (582127000 List 40).
- The system can be equipped with an AC input termination assembly which provides a separate single phase AC input connection for every two (2) rectifier positions (582127000 List 41).
- The system can be equipped with an AC input termination assembly which provides a separate three phase AC input connection for every three (3) rectifier positions (582127000 List 42 and List 43).

Direct AC Input Connections to the Module Mounting Assemblies

- The system can be equipped with module mounting assemblies that contain AC input terminal blocks which provide a separate single phase AC input connection for each rectifier position (588705000 List 31; 588705500 List 03).
- The system can be equipped with module mounting assemblies that contain AC input terminal blocks which provide a separate three phase AC input connection for every three (3) rectifier positions (588705000 List 32 and List 33; 588705500 List 04 and List 05).
- The system can be equipped with module mounting assemblies that contain AC input line cords (one for each rectifier module position) (588705000 List 22; 588705500 List 02).
- The system can be equipped with module mounting assemblies that contain AC input cable assemblies or AC input line cords which provide a separate single phase AC input connection for every two (2) rectifier positions (588705300 List 03).
- The system can be equipped with module mounting assemblies that contain AC input cable assemblies or AC input line cords (one for each rectifier module position) (588705400 List 02).
- The system can be equipped with module mounting assemblies that contain AC input line cords which provide a separate three phase AC input connection for every three (3) rectifier positions (588705400 List 03 and List 04).

AC Input Conduit Options (For System Mounted in an Enclosure)

Two types of conduit plates are available. Select and install the conduit plate appropriate for your application. See “AC Input Conduit Options” on page 5.

Connections to AC Input Termination Assemblies (582127000 List 40, 41, 42, 43) (For System Mounted in a Relay Rack)

The AC input termination assemblies provide circular openings at the top for AC input and grounding conductors. The openings accept 1 inch conduit fittings. It is recommended that AC input wiring be provided to all rectifier mounting positions, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.



NOTE! A grounding conductor must be provided with each conduit.

Procedure

Refer to Figure 5.2, Figure 5.3, Figure 5.4, or Figure 5.5 as these procedures are performed.

Accessing Connections and Routing Wire

1. Remove the two AC input connector covers and the AC input wireway covers by first loosening the fasteners that secure each of them.
2. Install conduit fittings as required in the top of the AC Input Termination Assembly. Plug buttons are provided, and must be installed in the openings not being used.
3. Route wiring into the AC Input Termination Assembly through the previously installed conduit fittings.

Making AC Input Connections

1. Make AC input connections as shown in Figure 5.2, Figure 5.3, Figure 5.4, or Figure 5.5. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Torque connections to value shown in the appropriate illustration.



NOTE! Terminal blocks for a system with maximum possible rectifier shelves shown. Your system may have fewer terminal blocks than shown.

Making Equipment Grounding Connections



NOTE! Make equipment grounding connections to earth ground, *not* to the branch circuit neutral conductor.

1. Connect equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Torque connections to value shown in the appropriate illustration.

Reinstalling Covers

1. After all AC input and equipment grounding connections have been made and checked, reinstall the two AC input connector covers and the AC input wireway covers. Secure each by tightening the fasteners.

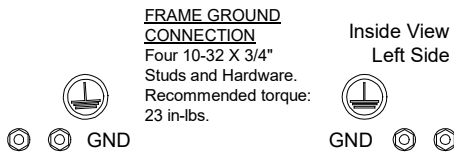
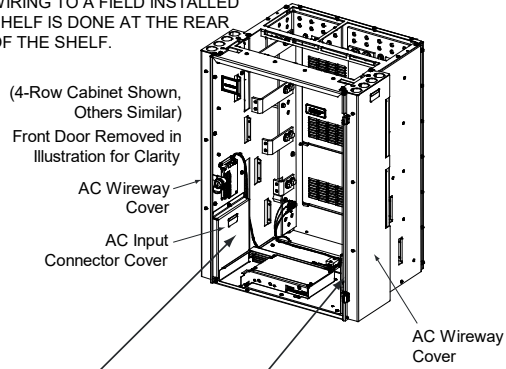
Figure 5.2 AC Input Connections to AC Input Termination Assembly List 40 when Used with 588705000 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705300 (Nominal 208 VAC, 240 VAC) or 588705400 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705500 (Nominal 208 VAC, 240 VAC, 277 VAC) Module Mounting Assemblies with Rectifiers (1 Feed per 1 Rectifier, Single Phase) (Installed in a Relay Rack) (cont'd on next page)

**AC INPUT CONNECTIONS,
1 FEED PER 1 RECTIFIER, SINGLE PHASE
(582127000 LIST 40)**

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

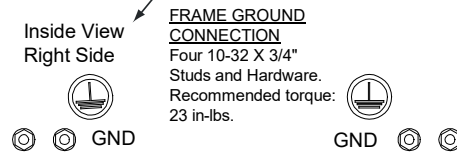
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #4
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #5

Rectifier Module (PCU) Mounting Slots



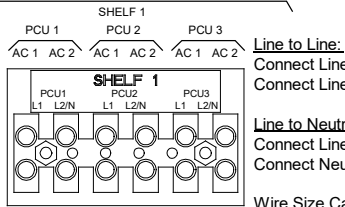
Inside View Left Side

Inside View Right Side



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE

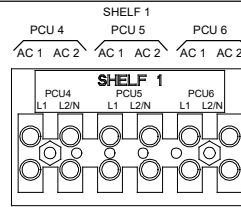
RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE



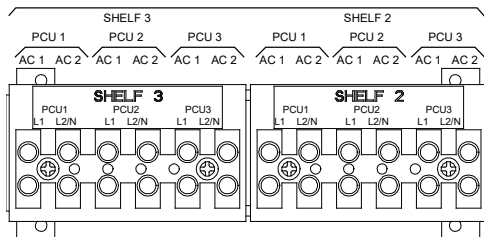
Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

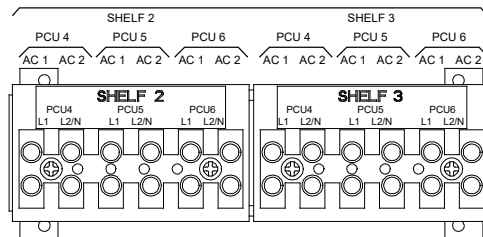
Wire Size Capacity: 10-24 AWG.
Recommended Torque: 10 in-lbs.



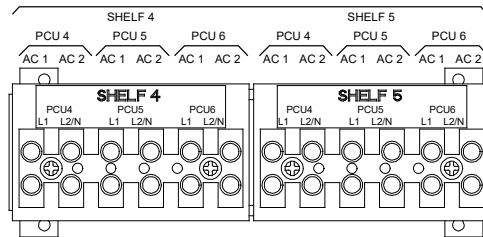
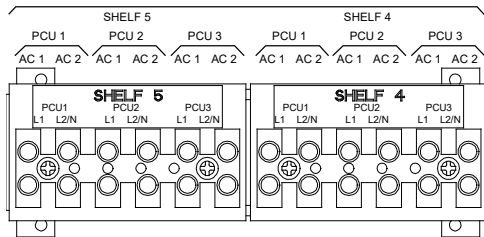
RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE

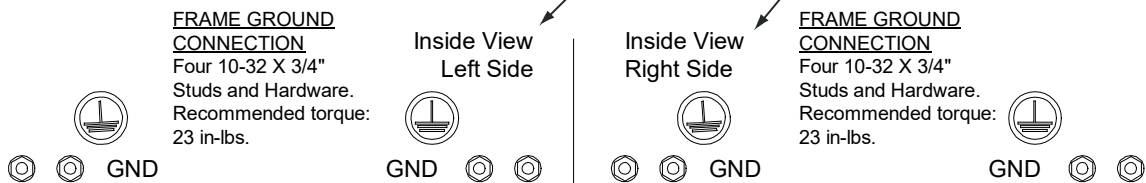
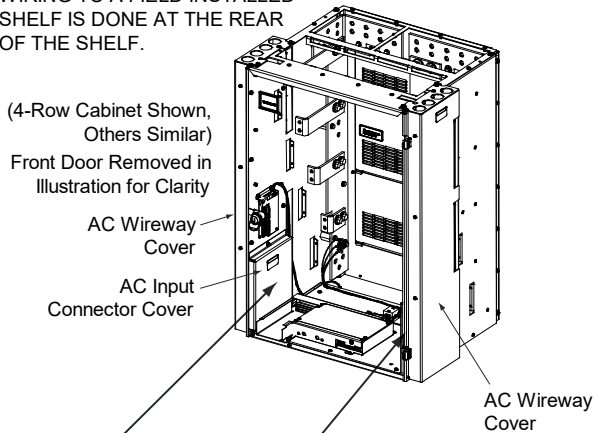
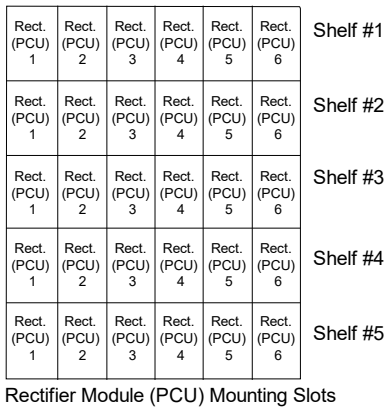


Note: For fewer power shelves than shown, only the connections for the installed shelves are present.

Figure 5.3 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705300 (Nominal 208 VAC, 240 VAC) or 588705400 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705500 (Nominal 208 VAC, 240 VAC, 277 VAC) Module Mounting Assemblies with Rectifiers (1 Feed per 2 Rectifiers, Single Phase) - with Five (5) Shelves Installed (Installed in a Relay Rack) (cont'd on next page)

AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Five (5) Shelves Installed

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.



Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Wire Size Capacity: 6-14 AWG.
Recommended Torque: 18 in-lbs.

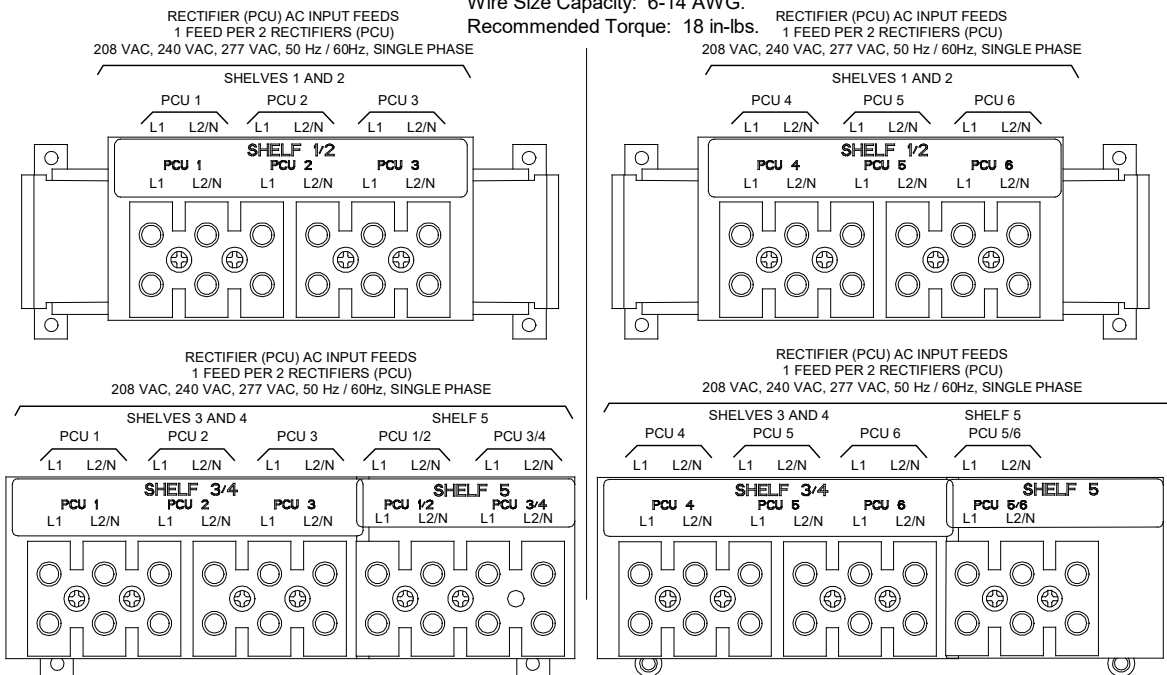


Figure 5.3 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705300 (Nominal 208 VAC, 240 VAC) or 588705400 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705500 (Nominal 208 VAC, 240 VAC, 277 VAC) Module Mounting Assemblies with Rectifiers (1 Feed per 2 Rectifiers, Single Phase) - with Four (4) Shelves Installed (Installed in a Relay Rack) (cont'd from previous page, cont'd on next page)

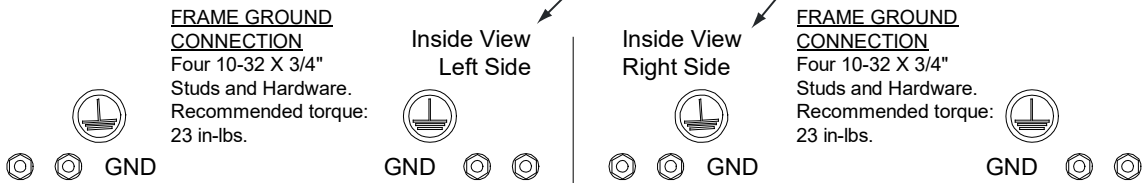
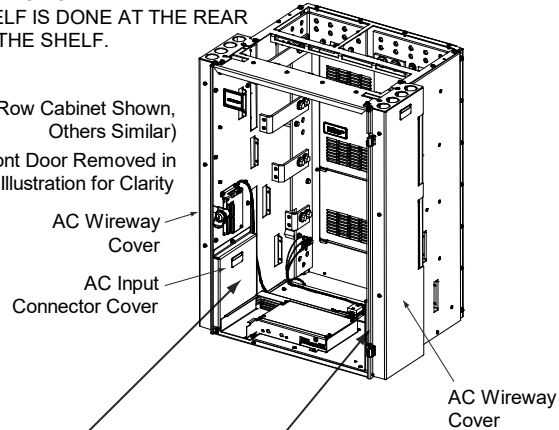
AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Four (4) Shelves Installed

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #4

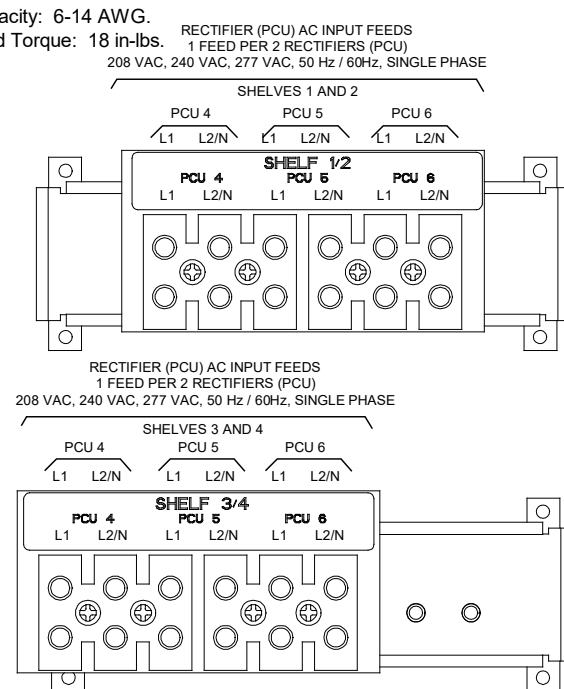
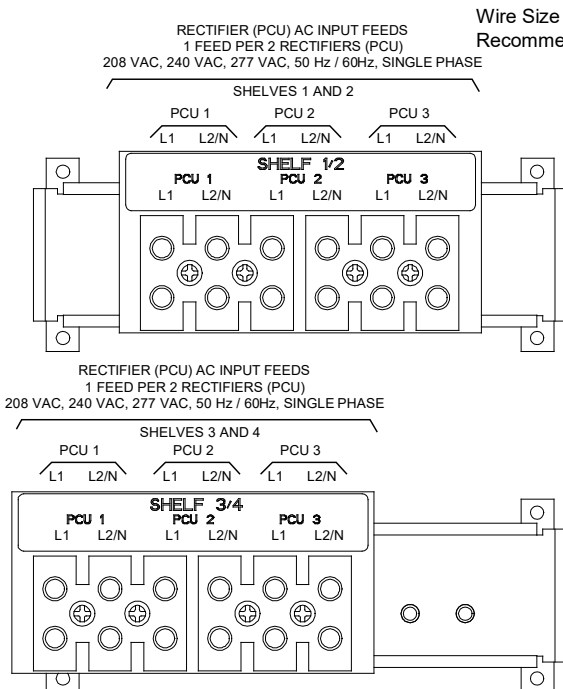
Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown,
Others Similar)
Front Door Removed in
Illustration for Clarity



Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.



Wire Size Capacity: 6-14 AWG.
Recommended Torque: 18 in-lbs.

Figure 5.3 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705300 (Nominal 208 VAC, 240 VAC) or 588705400 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705500 (Nominal 208 VAC, 240 VAC, 277 VAC) Module Mounting Assemblies with Rectifiers (1 Feed per 2 Rectifiers, Single Phase) - with Three (3) Shelves Installed (Installed in a Relay Rack) (cont'd from previous page, cont'd on next page)

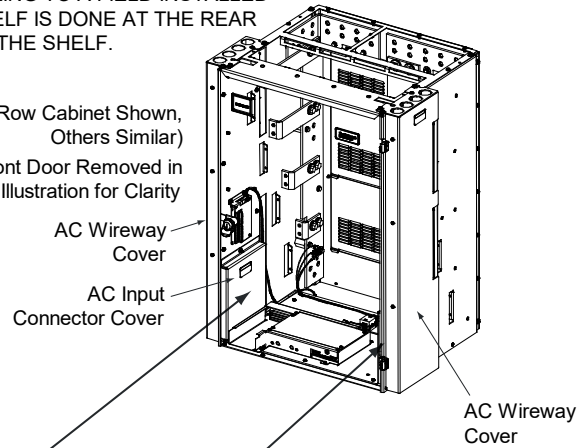
AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Three (3) Shelves Installed

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	

Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity



FRAME GROUND CONNECTION

Four 10-32 X 3/4" Studs and Hardware.
Recommended torque: 23 in-lbs.



Inside View Left Side



Inside View Right Side



FRAME GROUND CONNECTION

Four 10-32 X 3/4" Studs and Hardware.
Recommended torque: 23 in-lbs.



Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Wire Size Capacity: 6-14 AWG.
Recommended Torque: 18 in-lbs.

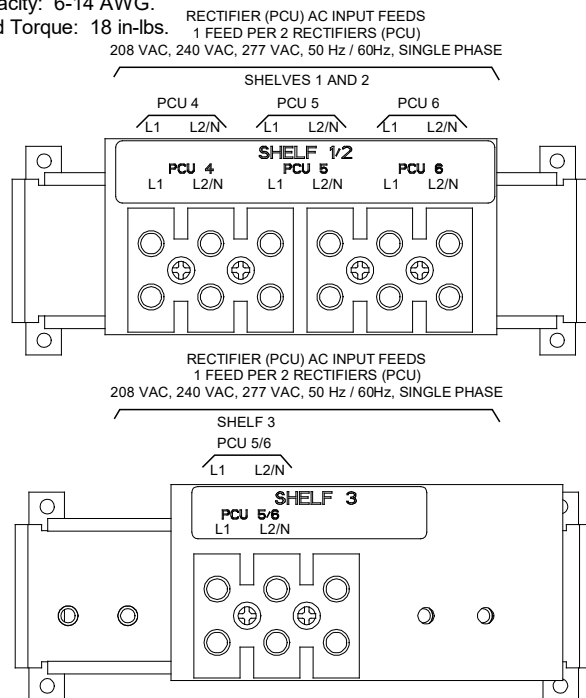
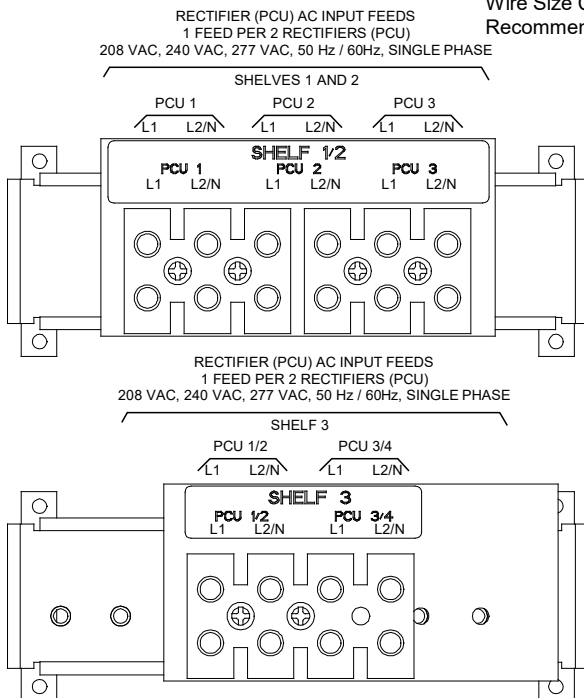


Figure 5.3 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705300 (Nominal 208 VAC, 240 VAC) or 588705400 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705500 (Nominal 208 VAC, 240 VAC, 277 VAC) Module Mounting Assemblies with Rectifiers (1 Feed per 2 Rectifiers, Single Phase) - with Two (2) Shelves Installed (Installed in a Relay Rack) (cont'd from previous page, cont'd on next page)

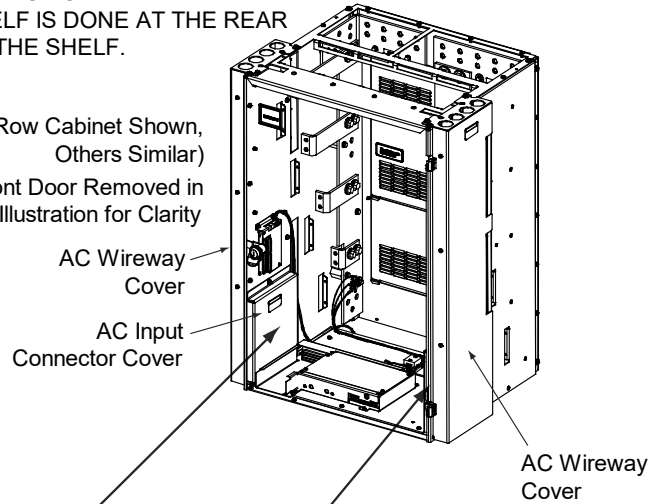
**AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Two (2) Shelves Installed**

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	

Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown,
Others Similar)
Front Door Removed in
Illustration for Clarity

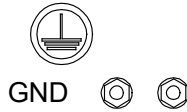


FRAME GROUND CONNECTION

Four 10-32 X 3/4" Studs and Hardware.
Recommended torque: 23 in-lbs.



Inside View Left Side



Inside View Right Side



FRAME GROUND CONNECTION

Four 10-32 X 3/4" Studs and Hardware.
Recommended torque: 23 in-lbs.

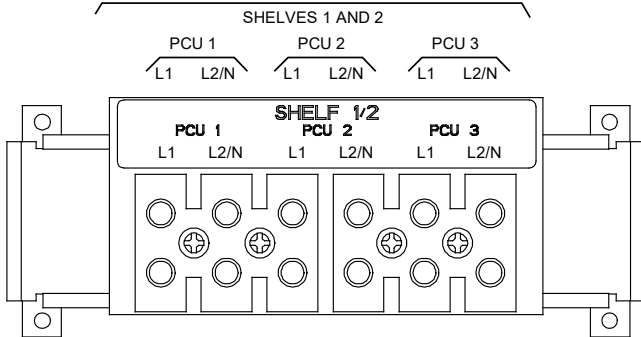


Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Wire Size Capacity: 6-14 AWG.
Recommended Torque: 18 in-lbs.

RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE

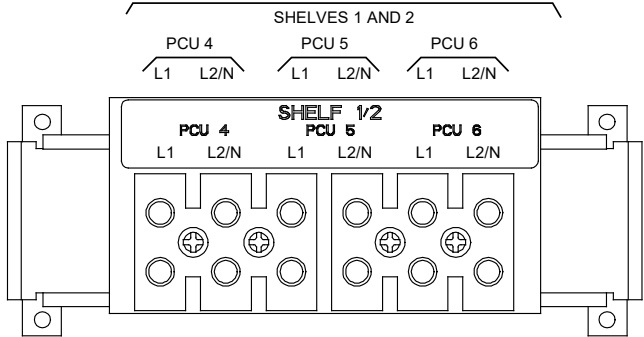
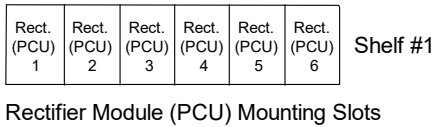


Figure 5.3 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705300 (Nominal 208 VAC, 240 VAC) or 588705400 (Nominal 208 VAC, 240 VAC, 277 VAC) or 588705500 (Nominal 208 VAC, 240 VAC, 277 VAC) Module Mounting Assemblies with Rectifiers (1 Feed per 2 Rectifiers, Single Phase) - with One (1) Shelf Installed (Installed in a Relay Rack) (cont'd from previous page)

AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with One (1) Shelf Installed

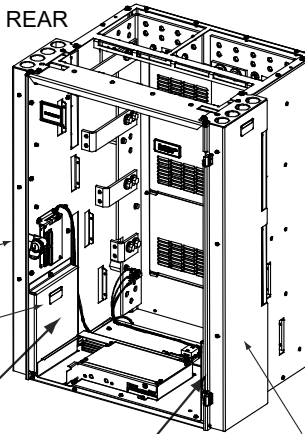
NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.



(4-Row Cabinet Shown, Others Similar)

Front Door Removed in Illustration for Clarity

AC Wireway Cover
AC Input Connector Cover



AC Wireway Cover

FRAME GROUND CONNECTION

Four 10-32 X 3/4" Studs and Hardware.
Recommended torque: 23 in-lbs.



Inside View Left Side



Inside View Right Side



FRAME GROUND CONNECTION

Four 10-32 X 3/4" Studs and Hardware.
Recommended torque: 23 in-lbs.

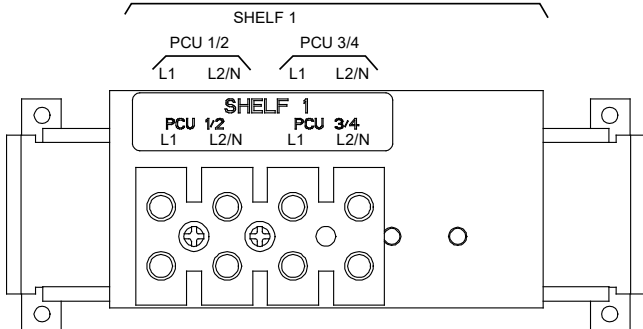


Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Wire Size Capacity: 6-14 AWG.
Recommended Torque: 18 in-lbs.

RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60Hz, SINGLE PHASE

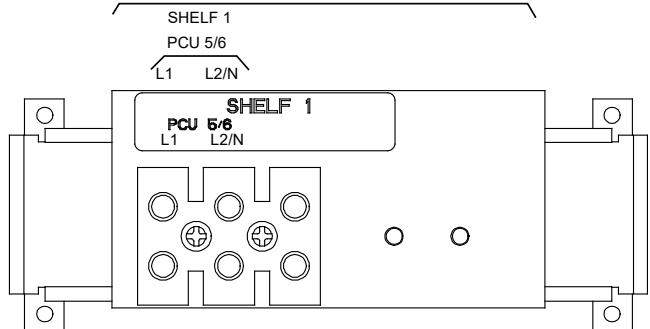
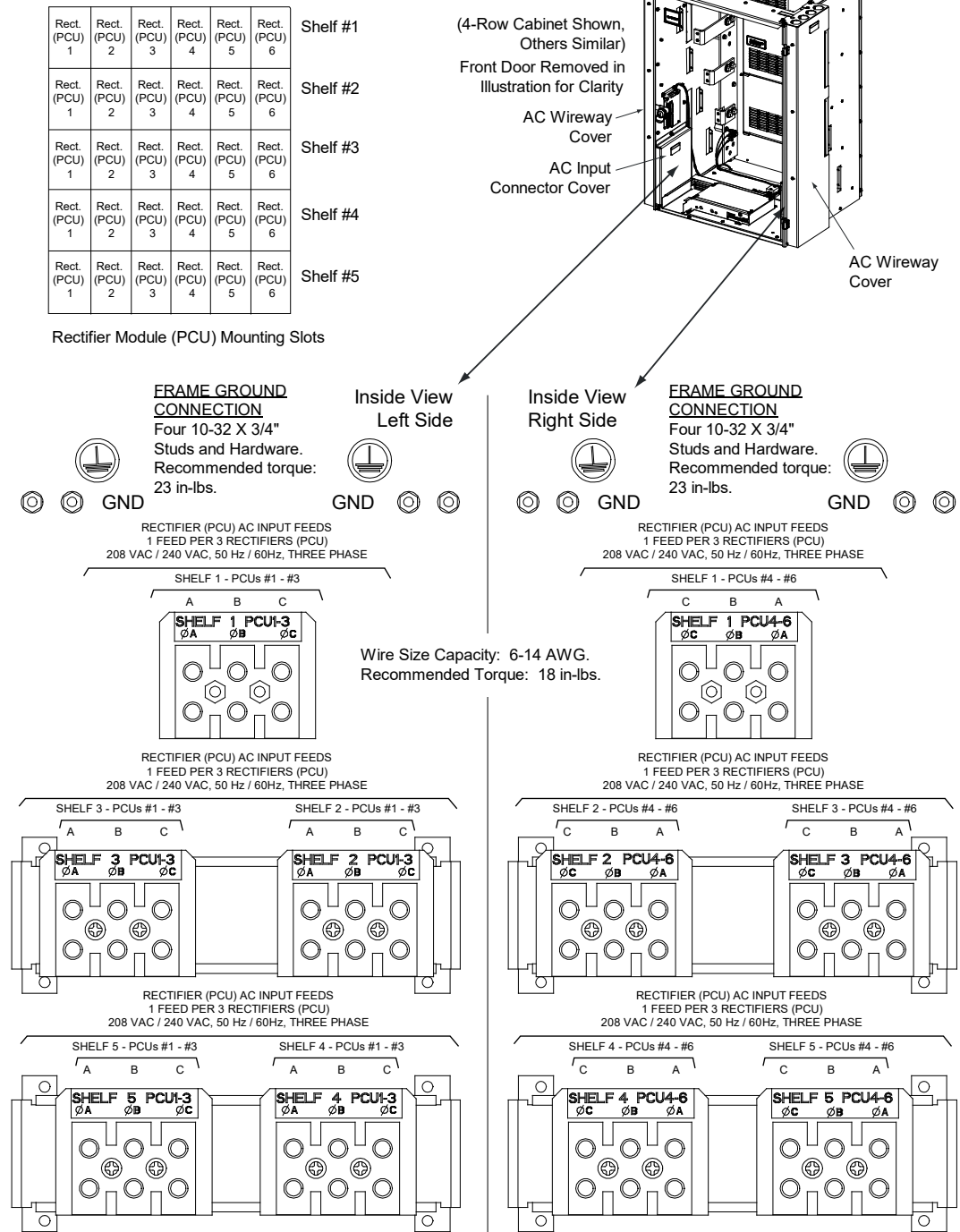


Figure 5.4 AC Input Connections to AC Input Termination Assembly List 42 when used with 588705000 or 588705300 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC) (1 Feed per 3 Rectifiers, Three Phase) (Installed in a Relay Rack)

AC INPUT CONNECTIONS,
1 FEED PER 3 RECTIFIERS, THREE PHASE
(582127000 LIST 42)

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.



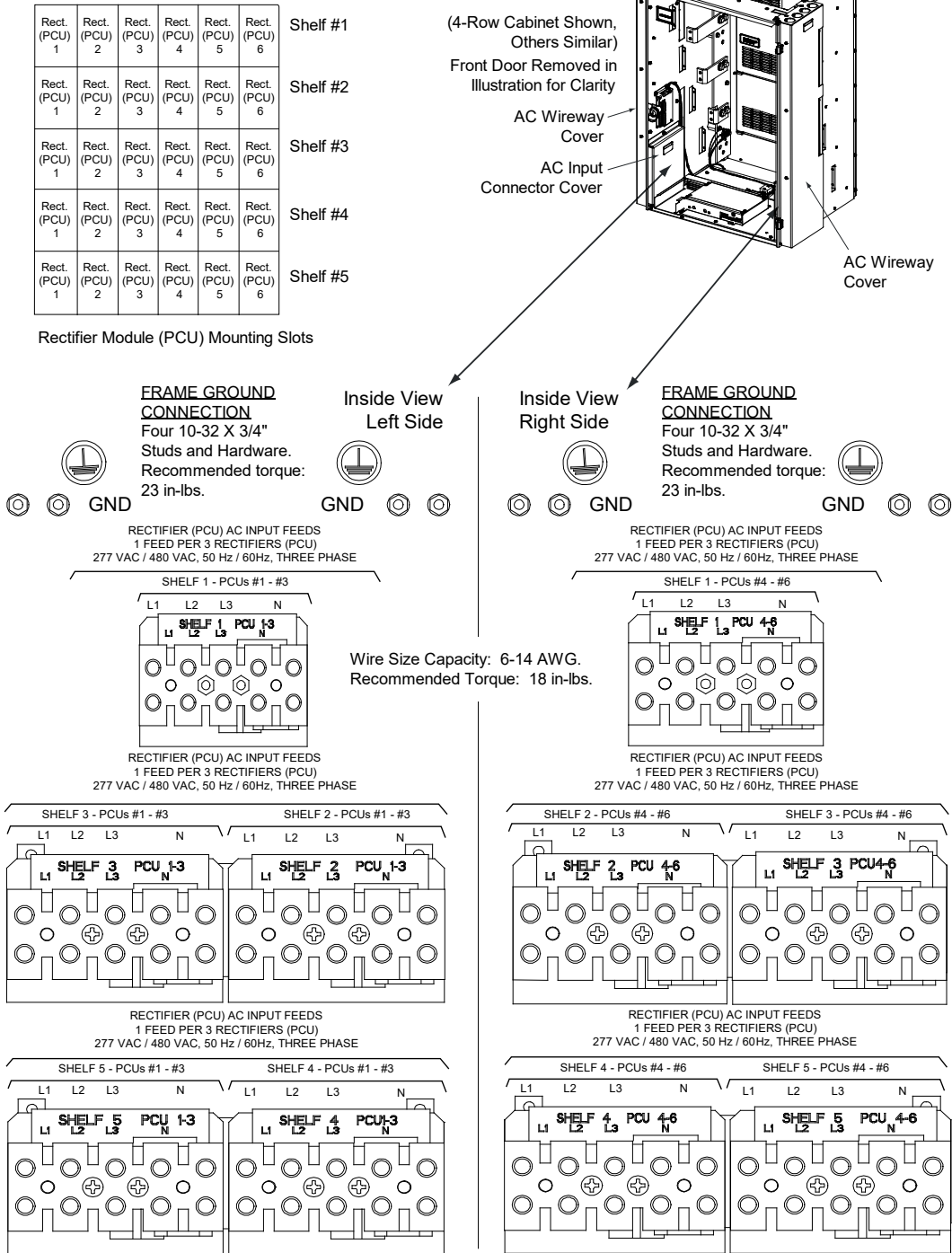
Note: For fewer power shelves than shown, only the connections for the installed shelves are present.

Note: The three-phase input is internally distributed within the system to provide a single-phase line to neutral connection to each rectifier position, evenly distributed across the three phases.

Figure 5.5 AC Input Connections to AC Input Termination Assembly List 43 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 277/480 VAC) (1 Feed per 3 Rectifiers, Three Phase) (Installed in a Relay Rack)

AC INPUT CONNECTIONS,
1 FEED PER 3 RECTIFIERS, THREE PHASE
(582127000 LIST 43)

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.



Note: For fewer power shelves than shown, only the connections for the installed shelves are present.
Note: The three-phase input is internally distributed within the system to provide a single-phase line to neutral connection to each rectifier position, evenly distributed across the three phases.

Connections to AC Input Termination Assemblies (582127000 List 40, 41, 42, 43) (For System Mounted in an Enclosure)

The enclosure provides conduit plates attached to the top of the enclosure. Two types of conduit plates are available. Select and install the conduit plate appropriate for your application. See “AC Input Conduit Options” on page 5. It is recommended that AC input wiring be provided to all rectifier mounting positions, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.



NOTE! A grounding conductor must be provided with each conduit.

Procedure

Refer to Figure 5.6, Figure 5.7, Figure 5.8, or Figure 5.9 as these procedures are performed.

Accessing Connections and Routing Wire

1. Ensure the proper conduit plates are attached to the top of the enclosure. See “AC Input Conduit Options” on page 5.
2. Install conduit fittings as required in the conduit plates attached to the top of the enclosure. Plug buttons are provided, and must be installed in the openings not being used.
3. Inside the distribution cabinet, remove the two AC input connector covers by first loosening the fasteners that secure each of them.
4. Route wiring into the enclosure through the previously installed conduit fittings.

Making AC Input Connections

1. Make AC input connections as shown in Figure 5.6, Figure 5.7, Figure 5.8, or Figure 5.9. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Torque connections to value shown in the appropriate illustration.



NOTE! Terminal blocks for a system with maximum possible rectifier shelves shown. Your system may have fewer terminal blocks than shown.

Making Equipment Grounding Connections



NOTE! Make equipment grounding connections to earth ground, **not** to the branch circuit neutral conductor.

1. Connect equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Torque connections to value shown in the appropriate illustration.

Reinstalling Covers

1. After all AC input and equipment grounding connections have been made and checked, reinstall the two AC input connector covers inside the distribution cabinet. Secure each by tightening the fasteners.

Figure 5.6 AC Input Connections to AC Input Termination Assembly List 40 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 1 Rectifier, Single Phase) (Installed in an Enclosure) (cont'd on next page)

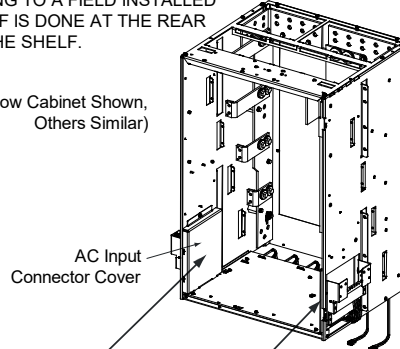
**AC INPUT CONNECTIONS,
1 FEED PER 1 RECTIFIER, SINGLE PHASE
(582127000 LIST 40)**

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #4
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #5
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #6

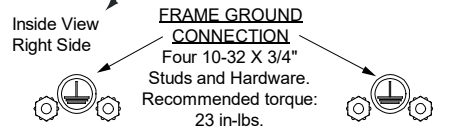
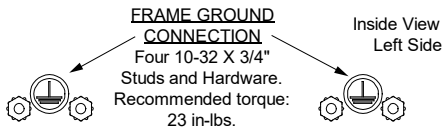
Rectifier Module (PCU) Mounting Slots

NOTE:
WIRING TO A FIELD INSTALLED SHELF IS DONE AT THE REAR OF THE SHELF.

(4-Row Cabinet Shown, Others Similar)

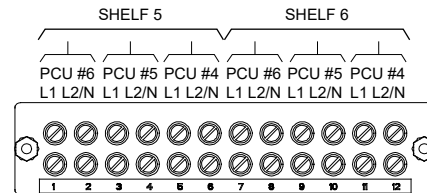
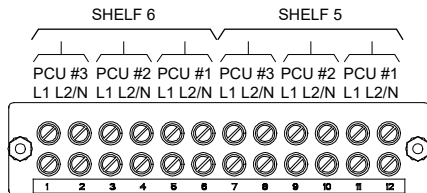
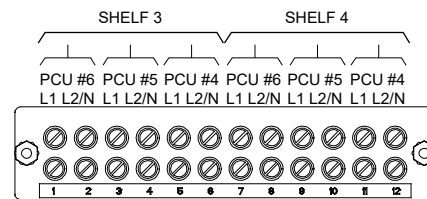
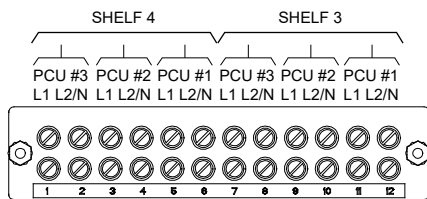
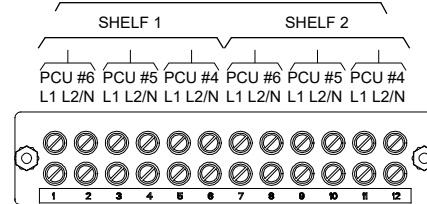
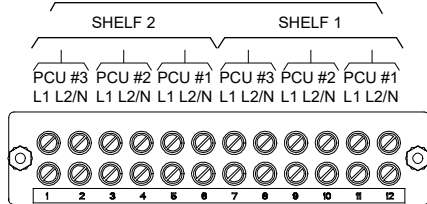


Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in-lbs.
8 AWG 25 in-lbs.
4 AWG 35 in-lbs.



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE

RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 1 RECTIFIER (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.7 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 2 Rectifiers, Single Phase) - with Six (6) Shelves Installed (Installed in an Enclosure) (cont'd on next page)

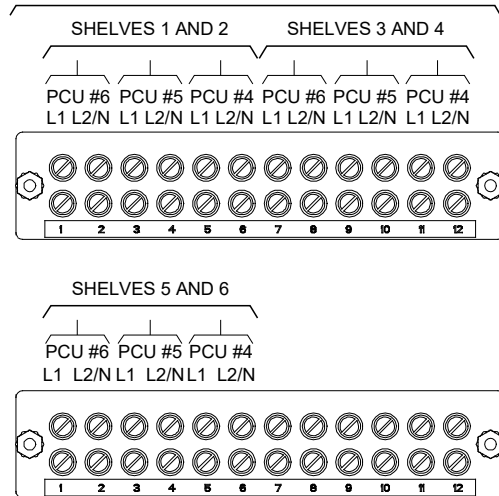
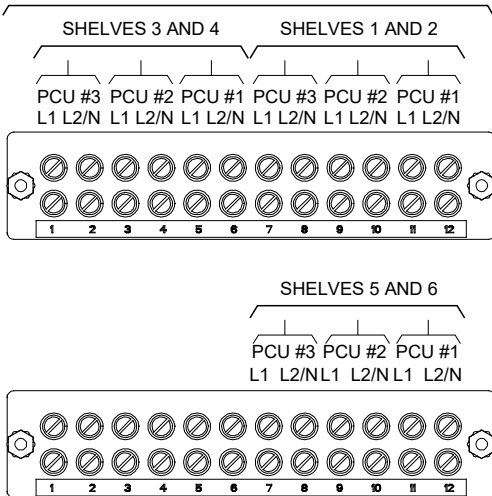
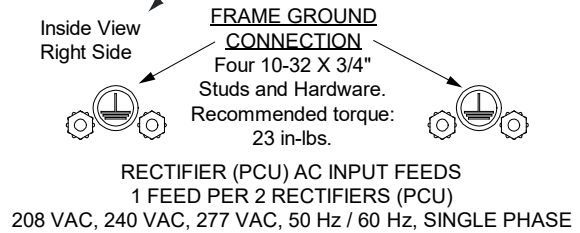
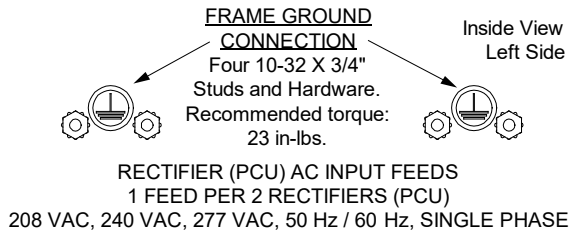
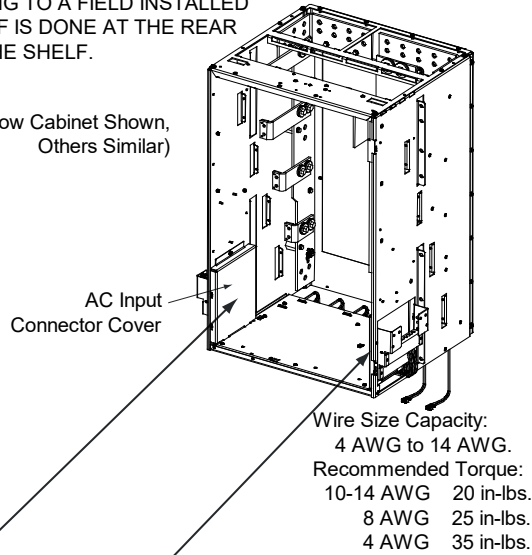
**AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Six (6) Shelves Installed**

NOTE:
WIRING TO A FIELD INSTALLED SHELF IS DONE AT THE REAR OF THE SHELF.

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #4
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #5
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #6

Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown, Others Similar)



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.7 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 2 Rectifiers, Single Phase) - with Five (5) Shelves Installed (Installed in an Enclosure) (cont'd on next page)

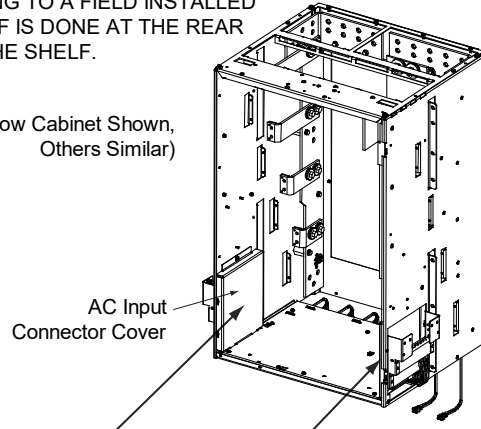
AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Five (5) Shelves Installed

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

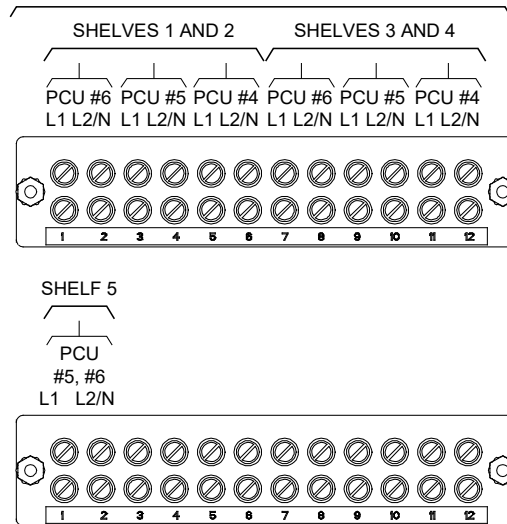
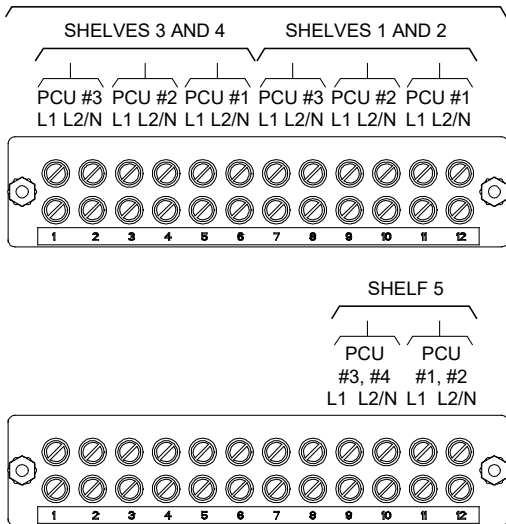
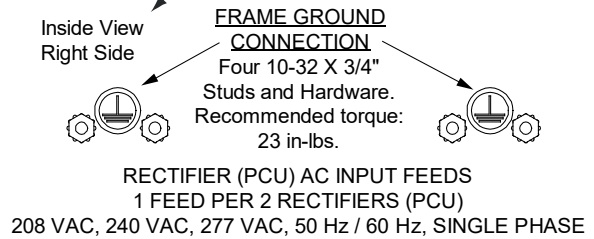
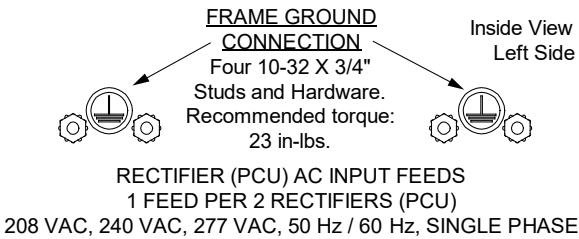
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #4
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #5

Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown, Others Similar)



Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in-lbs.
8 AWG 25 in-lbs.
4 AWG 35 in-lbs.



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.7 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 2 Rectifiers, Single Phase) - with Four (4) Shelves Installed (Installed in an Enclosure) (cont'd from previous page, cont'd on next page)

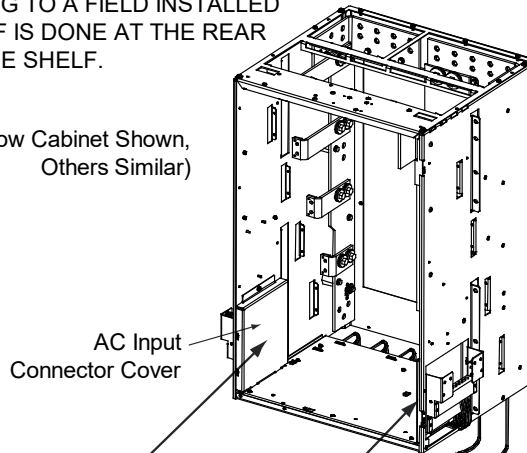
**AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Four (4) Shelves Installed**

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

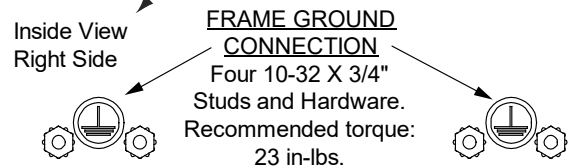
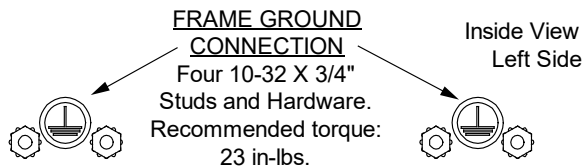
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #4

Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown,
Others Similar)

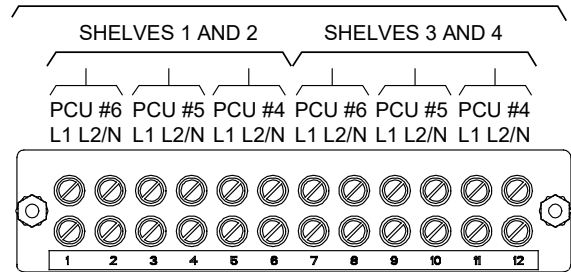
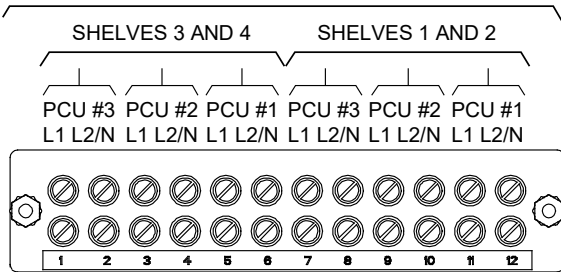


Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in-lbs.
8 AWG 25 in-lbs.
4 AWG 35 in-lbs.



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE

RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.7 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 2 Rectifiers, Single Phase) - with Three (3) Shelves Installed (Installed in an Enclosure) (cont'd from previous page, cont'd on next page)

**AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Three (3) Shelves Installed**

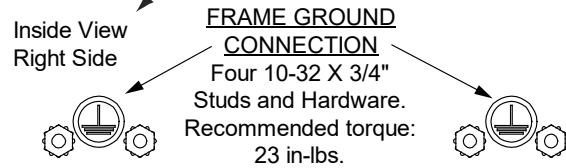
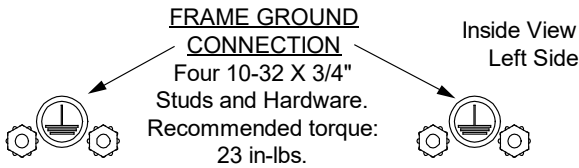
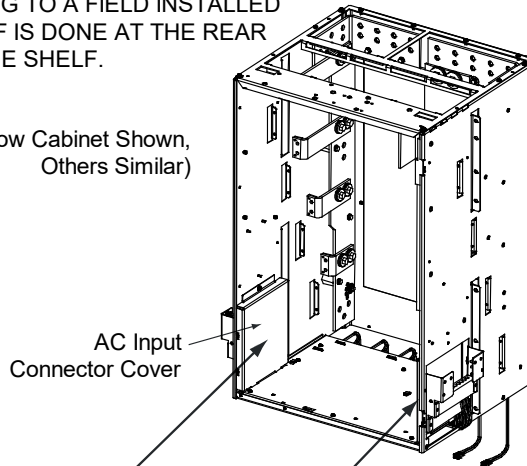
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #3

Rectifier Module (PCU) Mounting Slots

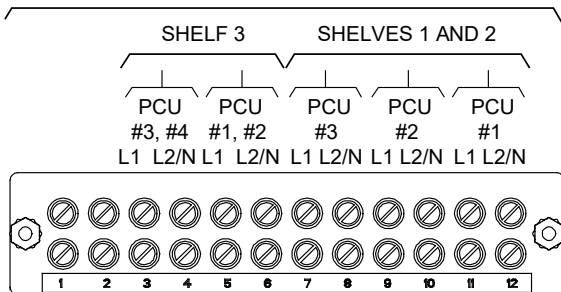
Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in.-lbs.
8 AWG 25 in.-lbs.
4 AWG 35 in.-lbs.

NOTE:
WIRING TO A FIELD INSTALLED SHELF IS DONE AT THE REAR OF THE SHELF.

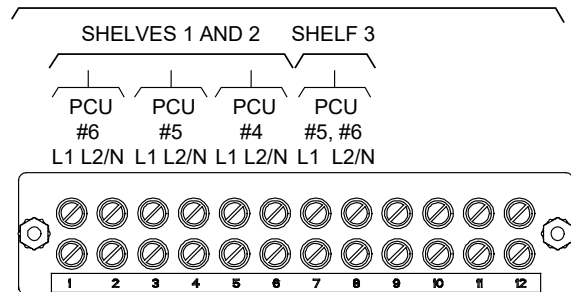
(4-Row Cabinet Shown, Others Similar)



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



Note: Customer wiring to top terminals of terminal blocks.

For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.7 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 2 Rectifiers, Single Phase) - with Two (2) Shelves Installed (Installed in an Enclosure) (cont'd from previous page, cont'd on next page)

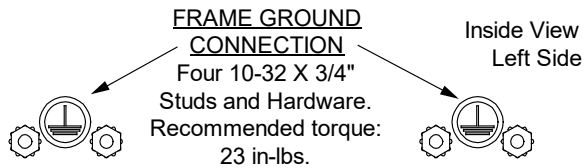
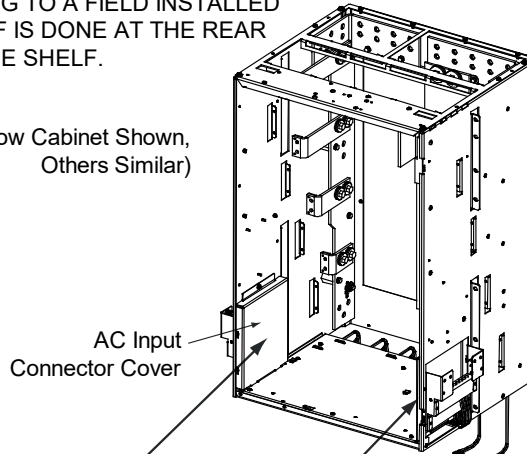
**AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with Two (2) Shelves Installed**

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

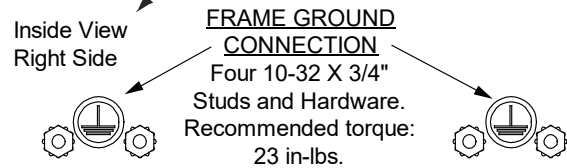
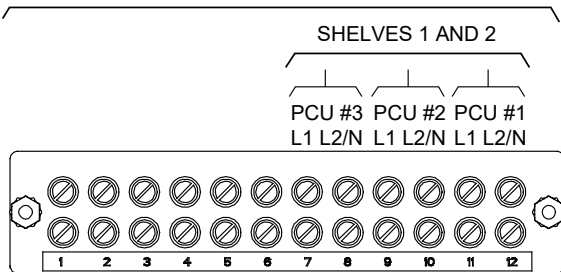
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #2

Rectifier Module (PCU) Mounting Slots

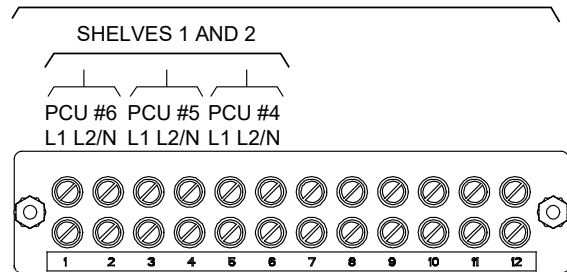
Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in-lbs.
8 AWG 25 in-lbs.
4 AWG 35 in-lbs.



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral:
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.7 AC Input Connections to AC Input Termination Assembly List 41 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC, 277 VAC) (1 Feed per 2 Rectifiers, Single Phase) - with One (1) Shelf Installed (Installed in an Enclosure) (cont'd from previous page)

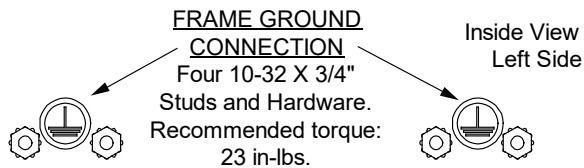
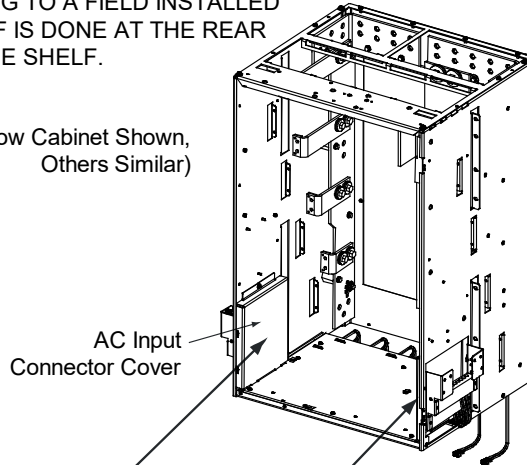
**AC INPUT CONNECTIONS,
1 FEED PER 2 RECTIFIERS, SINGLE PHASE
(582127000 LIST 41),
with One (1) Shelf Installed**

NOTE:
WIRING TO A FIELD INSTALLED
SHELF IS DONE AT THE REAR
OF THE SHELF.

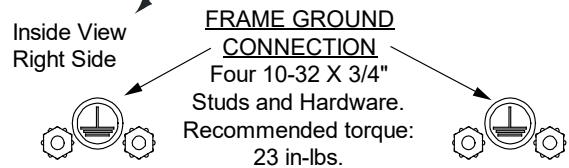
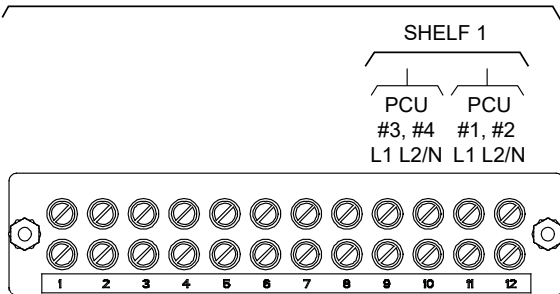
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rectifier Module (PCU) Mounting Slots						

Rectifier Module (PCU) Mounting Slots

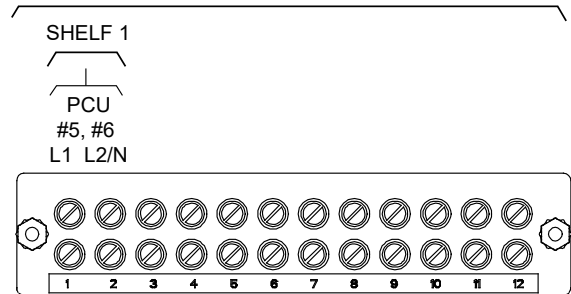
Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in.-lbs.
8 AWG 25 in.-lbs.
4 AWG 35 in.-lbs.



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 2 RECTIFIERS (PCU)
208 VAC, 240 VAC, 277 VAC, 50 Hz / 60 Hz, SINGLE PHASE



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Line to Line:
Connect Line 1 to Terminal L1.
Connect Line 2 to Terminal L2/N.

Line to Neutral
Connect Line to Terminal L1.
Connect Neutral to Terminal L2/N.

Figure 5.8 AC Input Connections to AC Input Termination Assembly List 42 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 208 VAC, 240 VAC) (1 Feed per 3 Rectifiers, Three Phase) (Installed in an Enclosure)

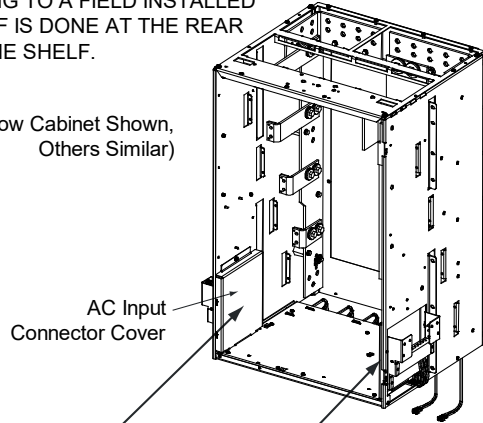
**AC INPUT CONNECTIONS,
1 FEED PER 3 RECTIFIERS, THREE PHASE
(582127000 LIST 42)**

NOTE:
WIRING TO A FIELD INSTALLED SHELF IS DONE AT THE REAR OF THE SHELF.

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1	
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #4
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #5
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6		Shelf #6

Rectifier Module (PCU) Mounting Slots

(4-Row Cabinet Shown, Others Similar)



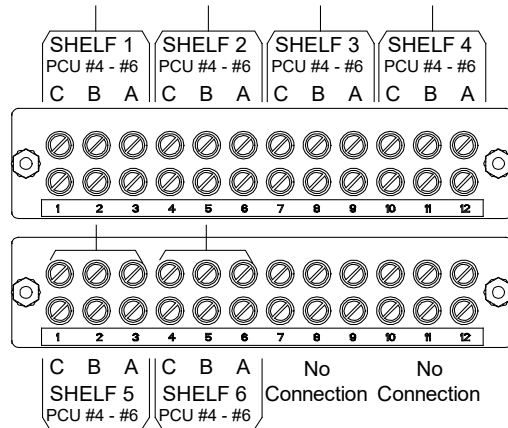
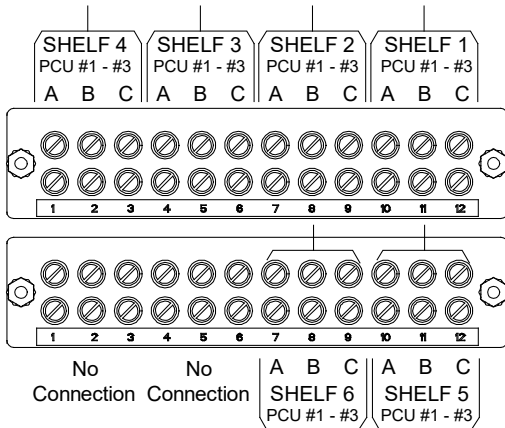
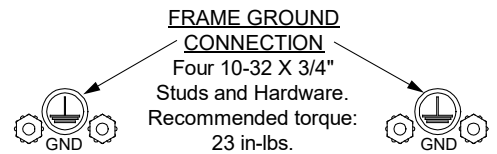
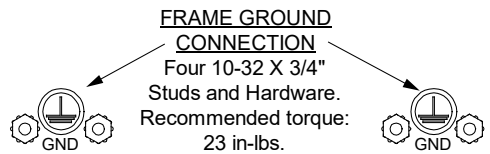
Wire Size Capacity:
4 AWG to 14 AWG.
Recommended Torque:
10-14 AWG 20 in-lbs.
8 AWG 25 in-lbs.
4 AWG 35 in-lbs.

Inside View
Left Side

Inside View
Right Side

RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 3 RECTIFIERS (PCU)
208 VAC / 240 VAC, 50 Hz / 60 Hz, THREE PHASE

RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 3 RECTIFIERS (PCU)
208 VAC / 240 VAC, 50 Hz / 60 Hz, THREE PHASE



Note: Customer wiring to top terminals of terminal blocks.

For fewer power shelves than shown, only the connections for the installed shelves are present.

Note: The three-phase input is internally distributed within the system to provide a single-phase line to neutral connection to each rectifier position, evenly distributed across the three phases.

Figure 5.9 AC Input Connections to AC Input Termination Assembly List 43 when used with 588705000 or 588705400 or 588705500 Module Mounting Assemblies with Rectifiers (Nominal 277/480 VAC) (1 Feed per 3 Rectifiers, Three Phase) (Installed in an Enclosure)

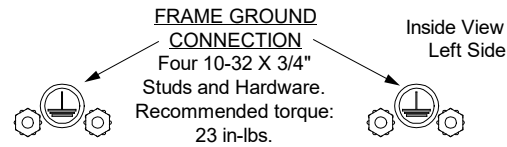
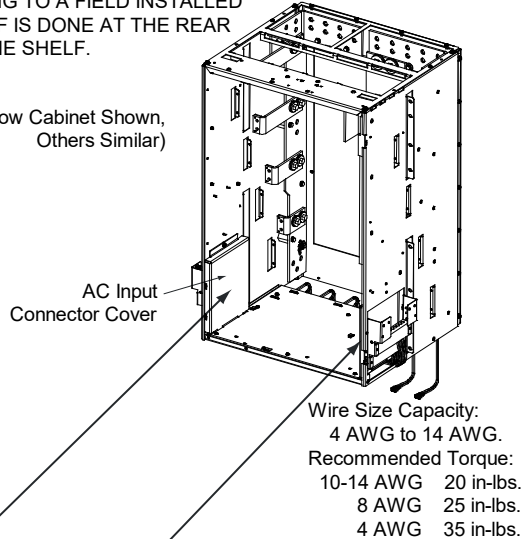
**AC INPUT CONNECTIONS,
1 FEED PER 3 RECTIFIERS, THREE PHASE
(582127000 LIST 43)**

Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #1
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #2
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #3
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #4
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #5
Rect. (PCU) 1	Rect. (PCU) 2	Rect. (PCU) 3	Rect. (PCU) 4	Rect. (PCU) 5	Rect. (PCU) 6	Shelf #6

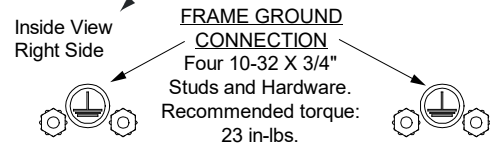
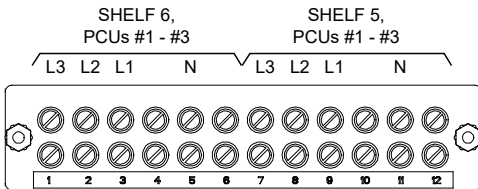
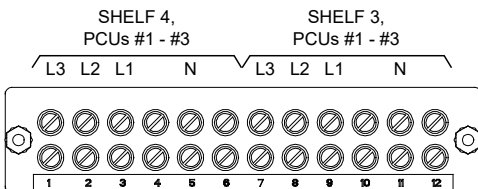
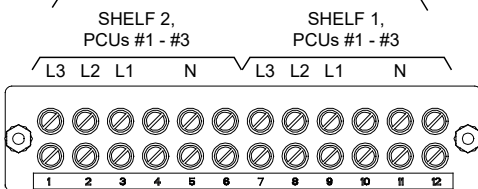
Rectifier Module (PCU) Mounting Slots

NOTE:
WIRING TO A FIELD INSTALLED SHELF IS DONE AT THE REAR OF THE SHELF.

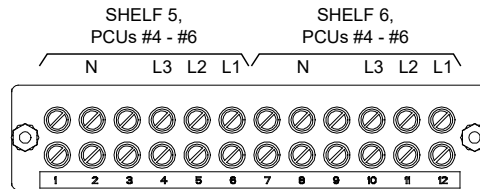
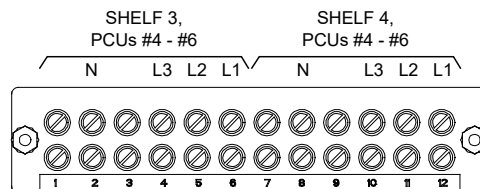
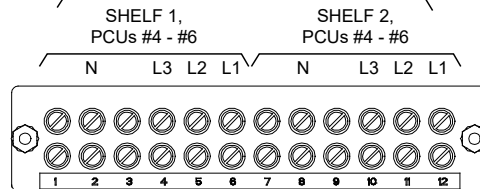
(4-Row Cabinet Shown, Others Similar)



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 3 RECTIFIERS (PCU)
277 VAC / 480 VAC, 50 Hz / 60 Hz, THREE PHASE



RECTIFIER (PCU) AC INPUT FEEDS
1 FEED PER 3 RECTIFIERS (PCU)
277 VAC / 480 VAC, 50 Hz / 60 Hz, THREE PHASE



Note: Customer wiring to top terminals of terminal blocks.
For fewer power shelves than shown, only the connections for the installed shelves are present.

Note: The three-phase input is internally distributed within the system to provide a single-phase line to neutral connection to each rectifier position, evenly distributed across the three phases.

Direct AC Input Connections to 588705000 List 31 and 588705500 List 03 Module Mounting Assemblies

Spec. No. 588705000 List 31 and 588705500 List 03 module mounting assembly contains AC input terminal blocks which provide a separate single phase AC input connection for each rectifier position.

Circular openings are provided in the side panels (side feed) and rear covers (rear feed) of the module mounting assembly for AC input and equipment-grounding conductors. The openings accept 3/4 inch conduit fittings. AC input wiring should be provided to all rectifier mounting positions, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.



NOTE! One ground conductor per conduit required.

Procedure

Refer to Figure 5.10 as these procedures are performed.



NOTE! Repeat the following procedures for each module mounting assembly in the power system.

Accessing Connections and Routing Wire

1. Remove the two AC input access covers from the rear of the module mounting assembly by first removing the screws that secure them.
2. Install conduit fittings in the side or rear openings as required. Plug buttons are provided, and must be installed in the openings not being used.
3. Route wiring into the shelf through the previously installed conduit fittings.

Making AC Input Connections



NOTE! In each shelf, module mounting positions are number 1-6 from left to right as viewed from the front.

1. Make AC input connections as shown in Figure 5.10. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Torque connections to value shown in Figure 5.10.

Making Equipment Grounding Connections



NOTE! Make equipment grounding connections to earth ground, *not* to the branch circuit neutral conductor.

1. Connect equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Torque connections to value shown in Figure 5.10.

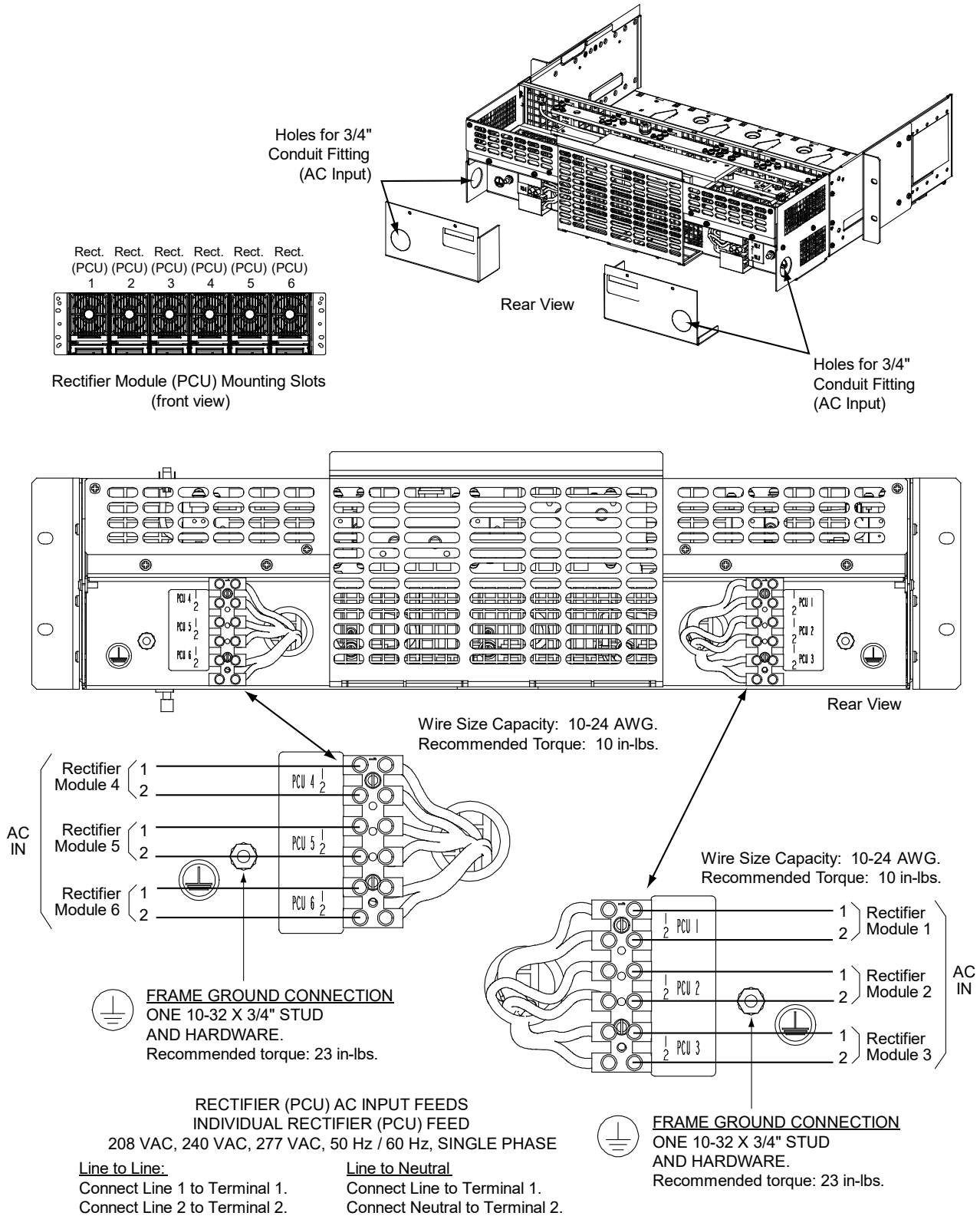
Reinstalling Covers

1. After all AC input and equipment grounding connections have been made and checked, reinstall the two AC input access covers on the back of the shelf. Secure with the previously removed screws.

Table 5.2 Nominal 208 VAC / 240 VAC Input Connections (Single-Phase) to a 588705000 List 31 and 588705500 List 03 Module Mounting Assembly

Module Mounting Assembly				
Left Side as Viewed from Rear		208 VAC, 240 VAC, 277 VAC Service Type:	Right Side as Viewed from Rear	
PCU 4	1	Line to Line: Connect Line 1 to Terminal 1. Connect Line 2 to Terminal 2. Line to Neutral: Connect Line to Terminal 1. Connect Neutral to Terminal 2.	1	PCU 1
	2		2	
PCU 5	1		1	PCU 2
	2		2	
PCU 6	1		1	PCU 3
	2		2	

Figure 5.10 Nominal 208 VAC, 240 VAC, 277 VAC Input Connections (Single-Phase) to a 588705000 List 31 and 588705500 List 03 Module Mounting Assembly



Direct AC Input Connections to 588705000 List 32, List 33 and 588705500 List 04, List 05 Module Mounting Assemblies

Spec. No. 588705000 List 32, List 33 and 588705500 List 04, List 05 module mounting assembly contains AC input terminal blocks which provide a separate three phase AC input connection for every three (3) rectifier positions (two 3-phase AC input circuits, each phase of each input circuit supplies one rectifier module).

Circular openings are provided in the side panels (side feed) and rear covers (rear feed) of the module mounting assembly for AC input and equipment-grounding conductors. The openings accept 3/4 inch conduit fittings. AC input wiring should be provided to all rectifier mounting positions, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.



NOTE! One ground conductor per conduit required.

Procedure

Refer to Figure 5.11 and Figure 5.12 as these procedures are performed.



NOTE! Repeat the following procedures for each module mounting assembly in the power system.

Accessing Connections and Routing Wire

1. Remove the two AC Input Access Covers from the rear of the module mounting assembly by first removing the screws that secure them.
2. Install conduit fittings in the side or rear openings as required. Plug buttons are provided, and must be installed in the openings not being used.
3. Route wiring into the shelf through the previously installed conduit fittings.

Making AC Input Connections



NOTE! In each shelf, module mounting positions are number 1-6 from left to right as viewed from the front.

1. Make AC input connections as shown in Figure 5.11 and Figure 5.12. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Torque connections to value shown in Figure 5.11 and Figure 5.12.

Making Equipment Grounding Connections



NOTE! Make equipment grounding connections to earth ground, **not** to the branch circuit neutral conductor.

1. Connect equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Torque connections to value shown in Figure 5.11 and Figure 5.12.

Reinstalling Covers

1. After all AC input and equipment grounding connections have been made and checked, reinstall the two AC input access covers on the back of the shelf. Secure with the previously removed screws.

Figure 5.11 Nominal 208 VAC / 240 VAC Input Connections (Three-Phase) to a 588705000 List 32 and 588705500 List 04 Module Mounting Assembly

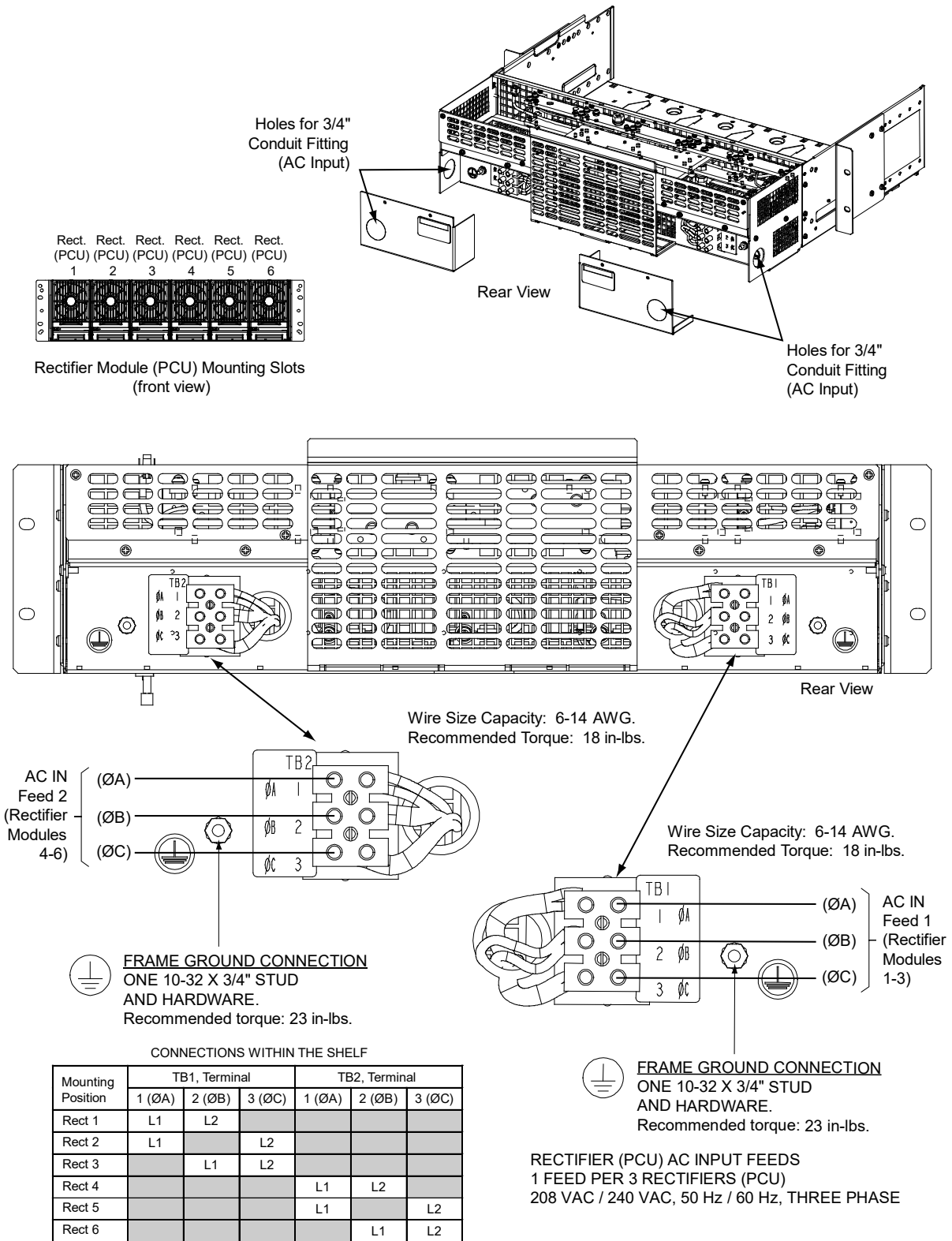
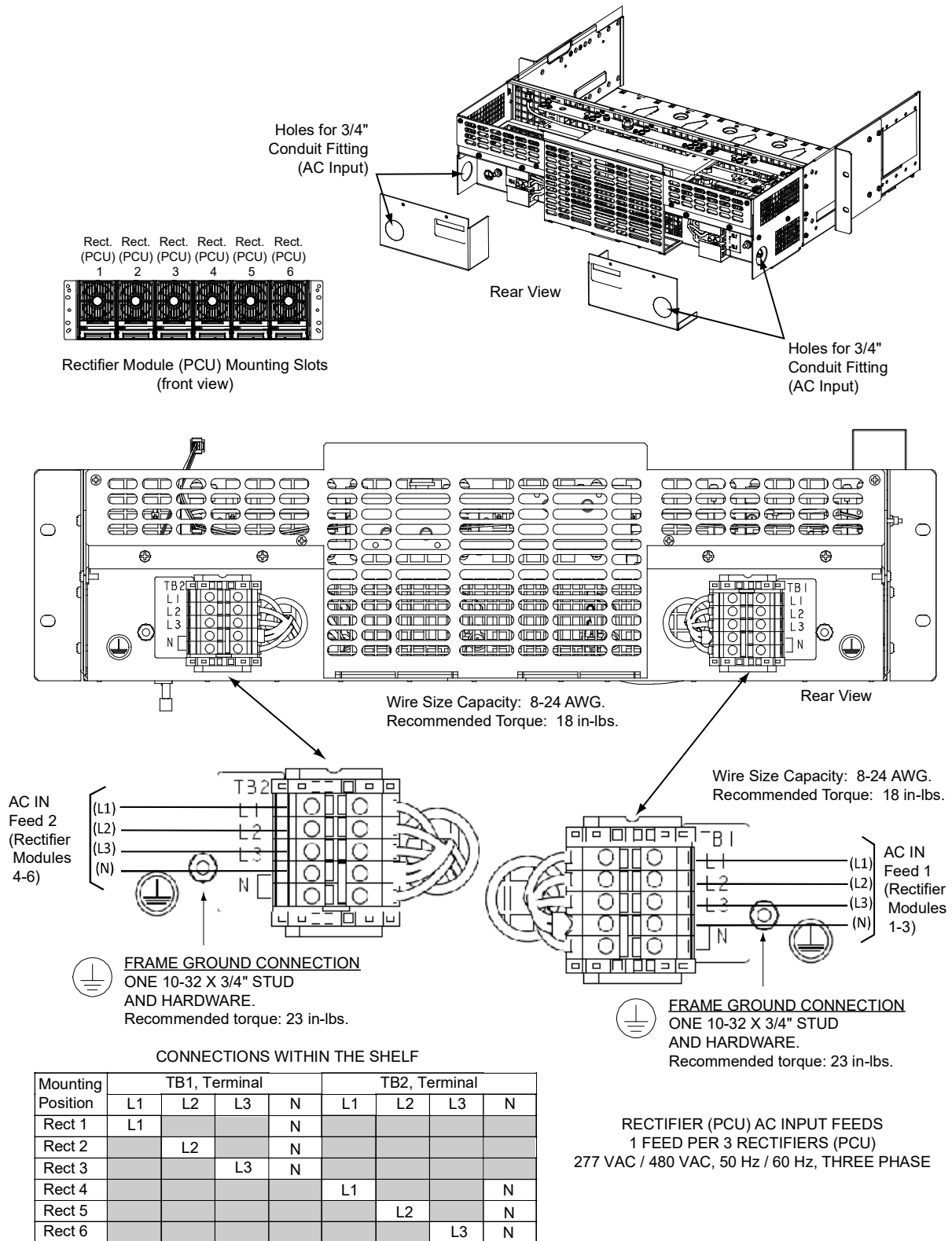


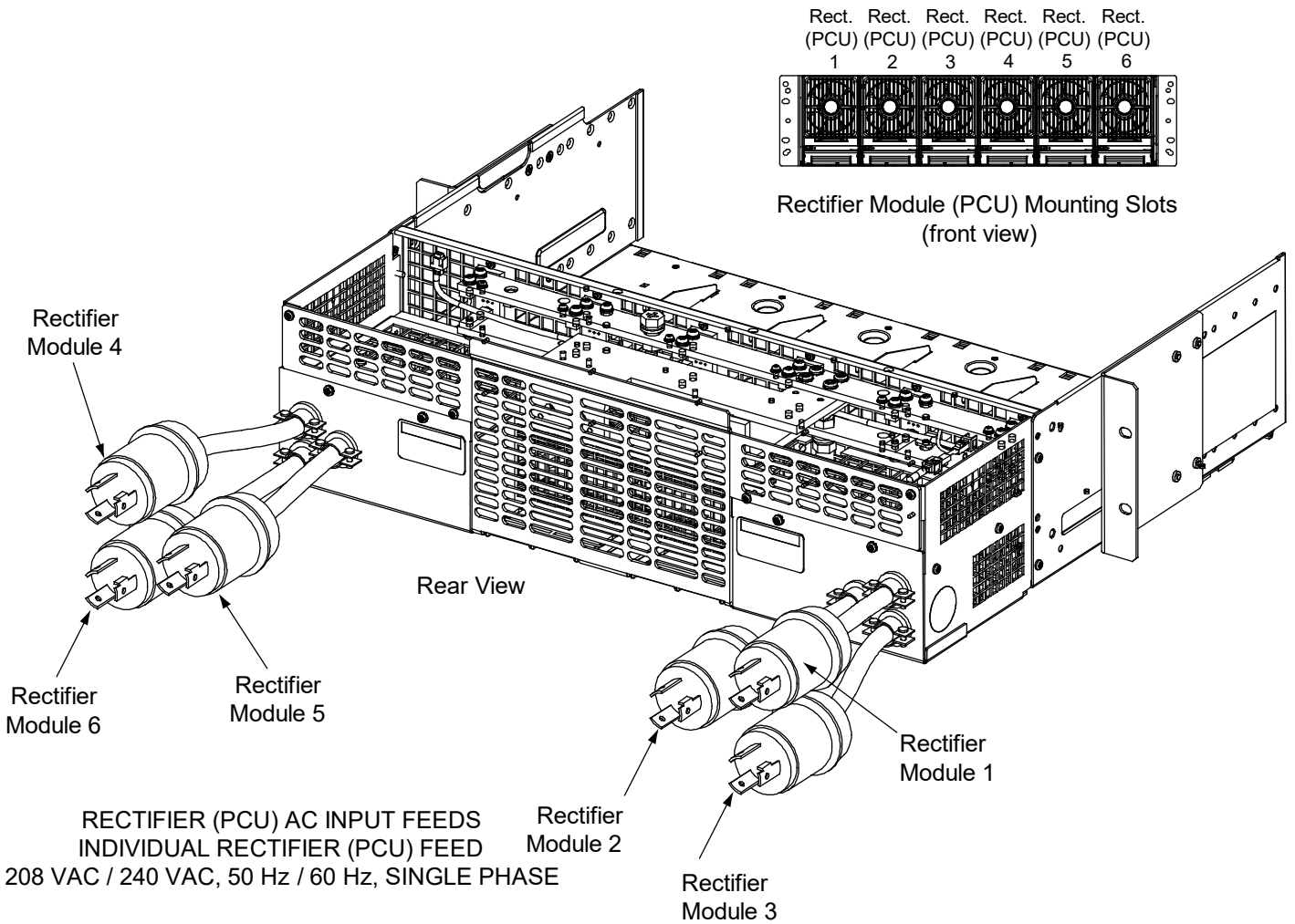
Figure 5.12 Nominal 277 VAC / 480 VAC Input Connections (Three-Phase) to a 588705000 List 33 and 588705500 List 05 Module Mounting Assembly



Direct AC Input Connections to 588705000 List 22 and 588705500 List 02 Module Mounting Assemblies

Spec. No. 588705000 List 22 and 588705500 List 02 module mounting assembly is provided with six (6) factory installed AC input line cords (one for each rectifier module position). Plug each AC line cord into a properly wired AC outlet or distribution box. Refer to Figure 5.13.

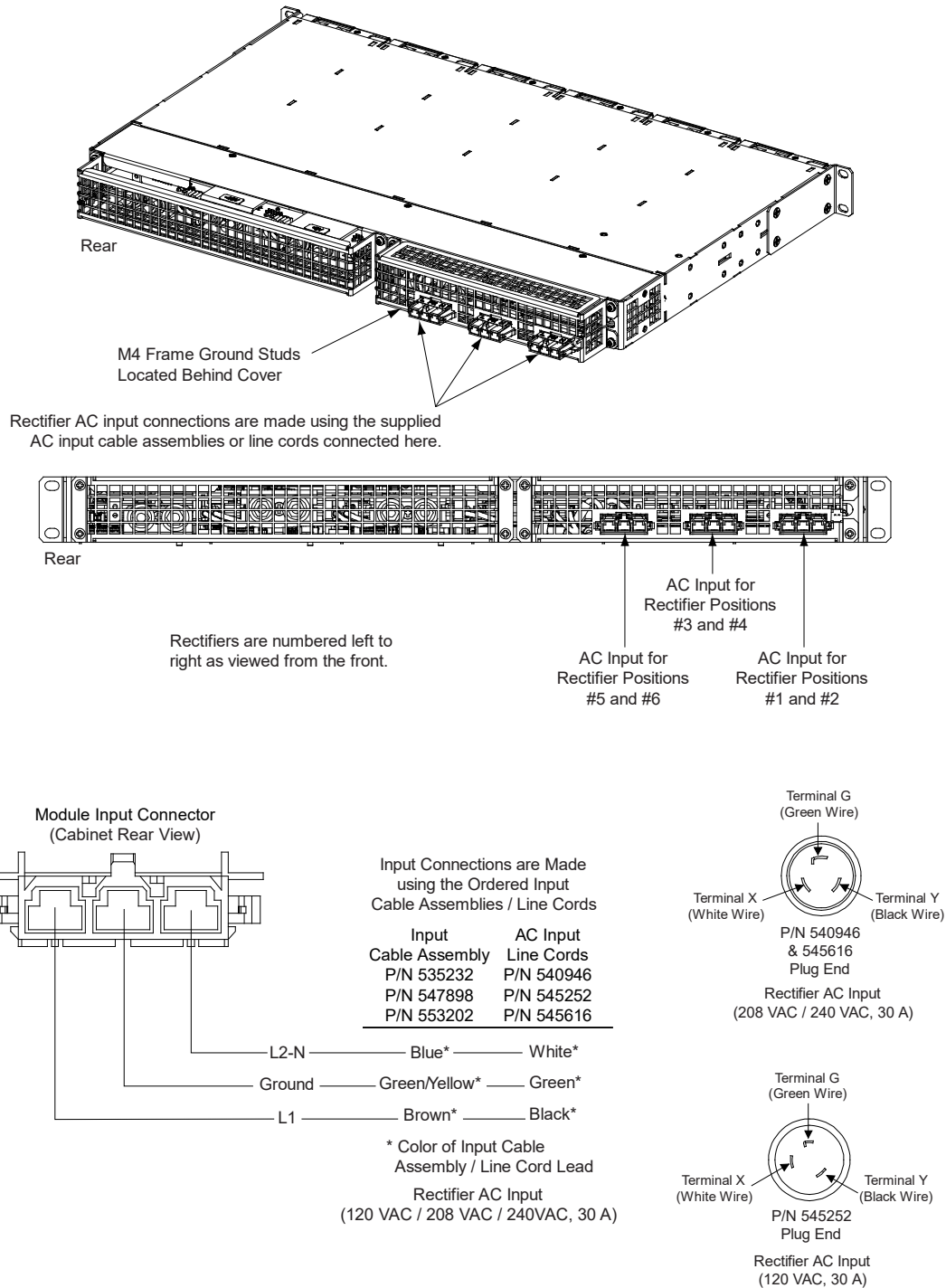
Figure 5.13 Nominal 208 VAC / 240 VAC Input and Equipment Grounding Connections to Module Mounting Assembly 588705000 List 22 and 588705500 List 02 (Single Phase, Line Cords)



Direct AC Input Connections to 588705300 List 03 Module Mounting Assemblies

Spec. No. 588705300 List 03 is equipped with plug-in AC input connectors located on the rear of the shelf. AC input cable assemblies or AC input line cords with mating connectors are available (see SAG582127000). Make AC input connections per Figure 5.14.

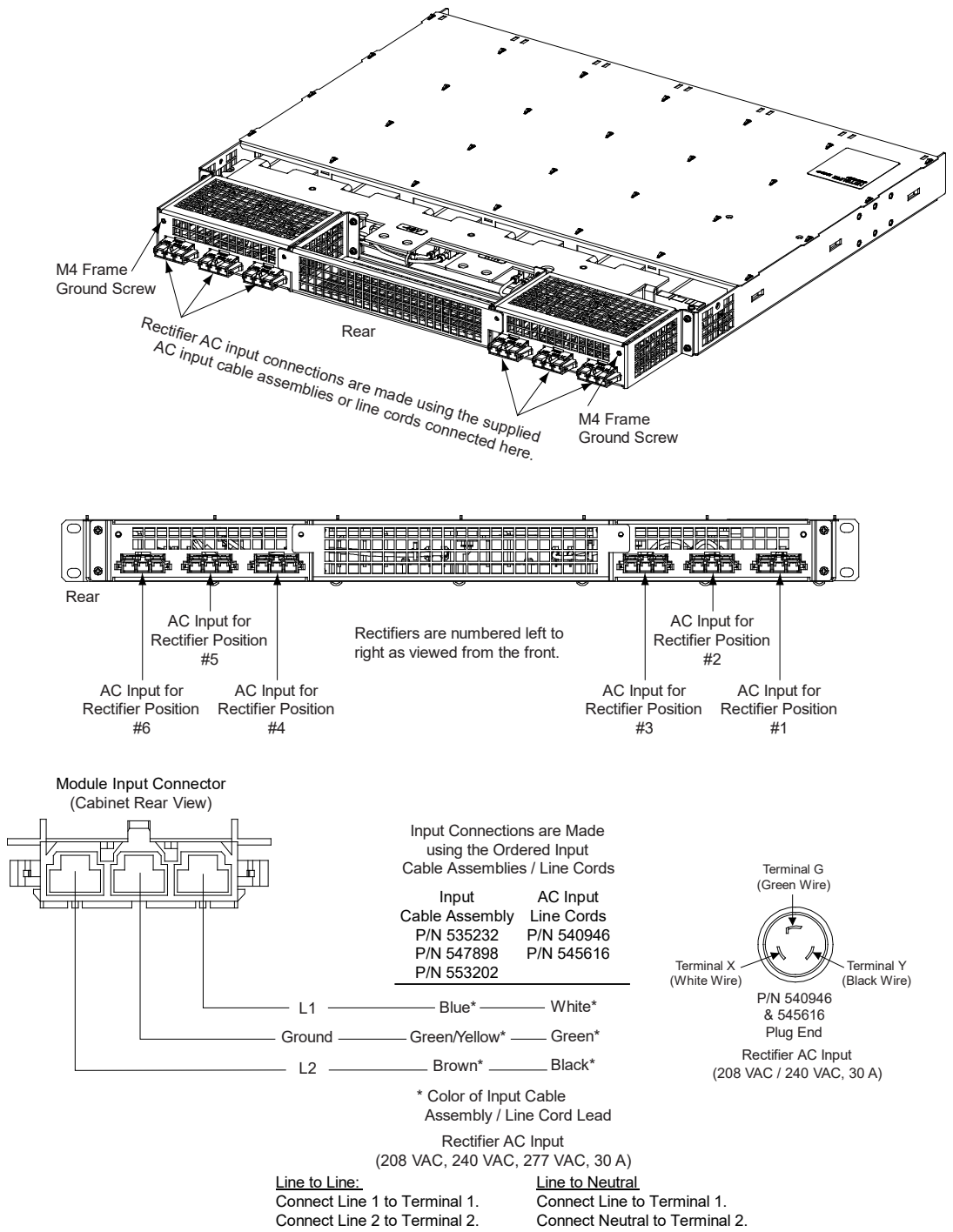
Figure 5.14 Nominal 120 VAC / 208 VAC / 240 VAC Input and Equipment Grounding Connections to Module Mounting Assembly 588705300 List 03 (Single Phase, Cable Assemblies or Line Cords)



Direct AC Input Connections to 588705400 List 02 Module Mounting Assemblies

Spec. No. 588705400 List 02 is equipped with plug-in AC input connectors located on the rear of the shelf. AC input cable assemblies or AC input line cords with mating connectors are available (see SAG582127000). Make AC input connections per Figure 5.15.

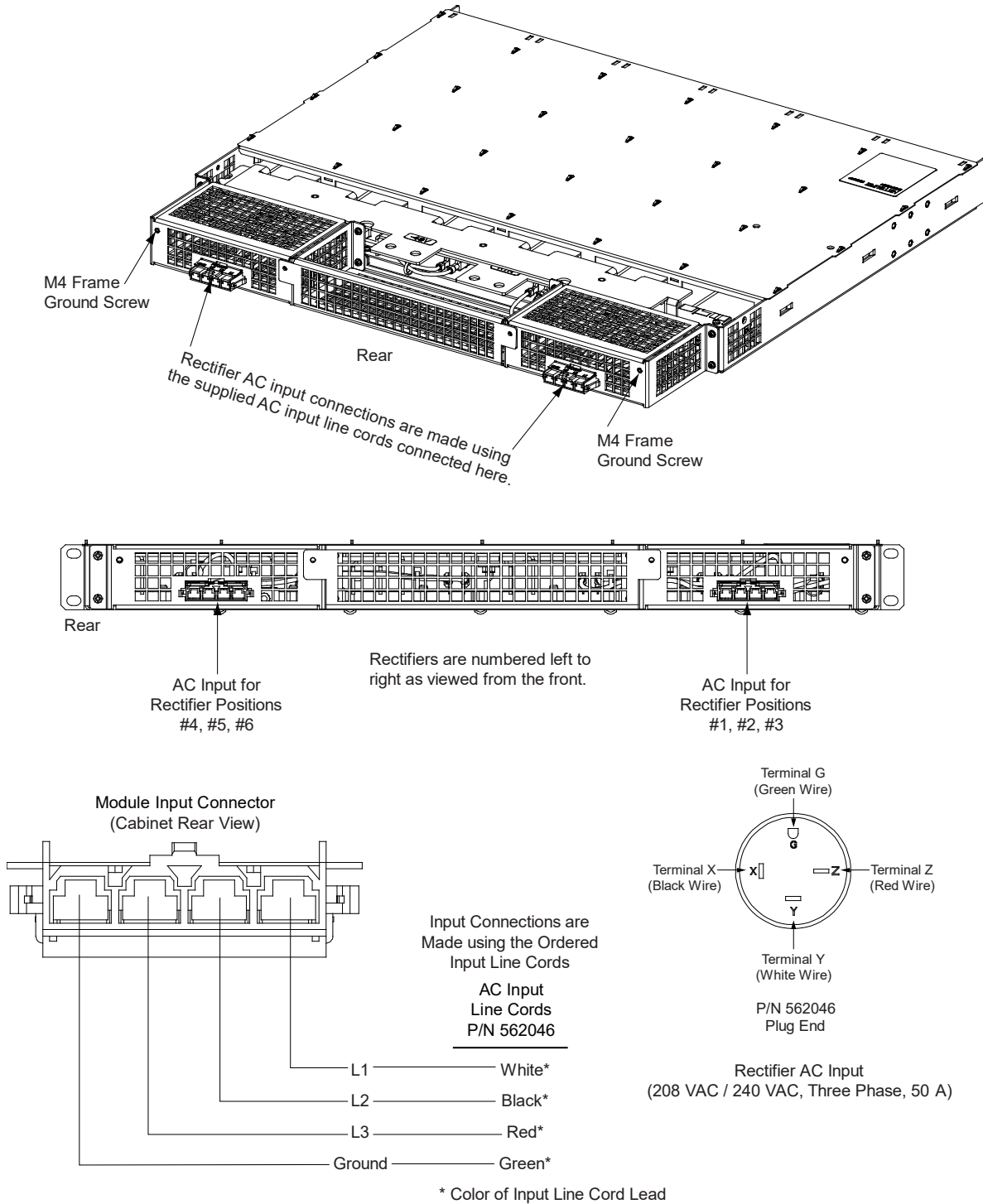
Figure 5.15 Nominal 208 VAC, 240 VAC, 277 VAC Input and Equipment Grounding Connections to Module Mounting Assembly 588705400 List 02 (Single Phase, Cable Assemblies or Line Cords)
(The 277 VAC input rating does not apply to line cords supplied with plugs.)



Direct AC Input Connections to 588705400 List 03 Module Mounting Assemblies

Spec. No. 588705400 List 03 is equipped with plug-in AC input connectors located on the rear of the shelf. AC input line cords with mating connectors are available (see SAG582127000). Make AC input connections per Figure 5.16.

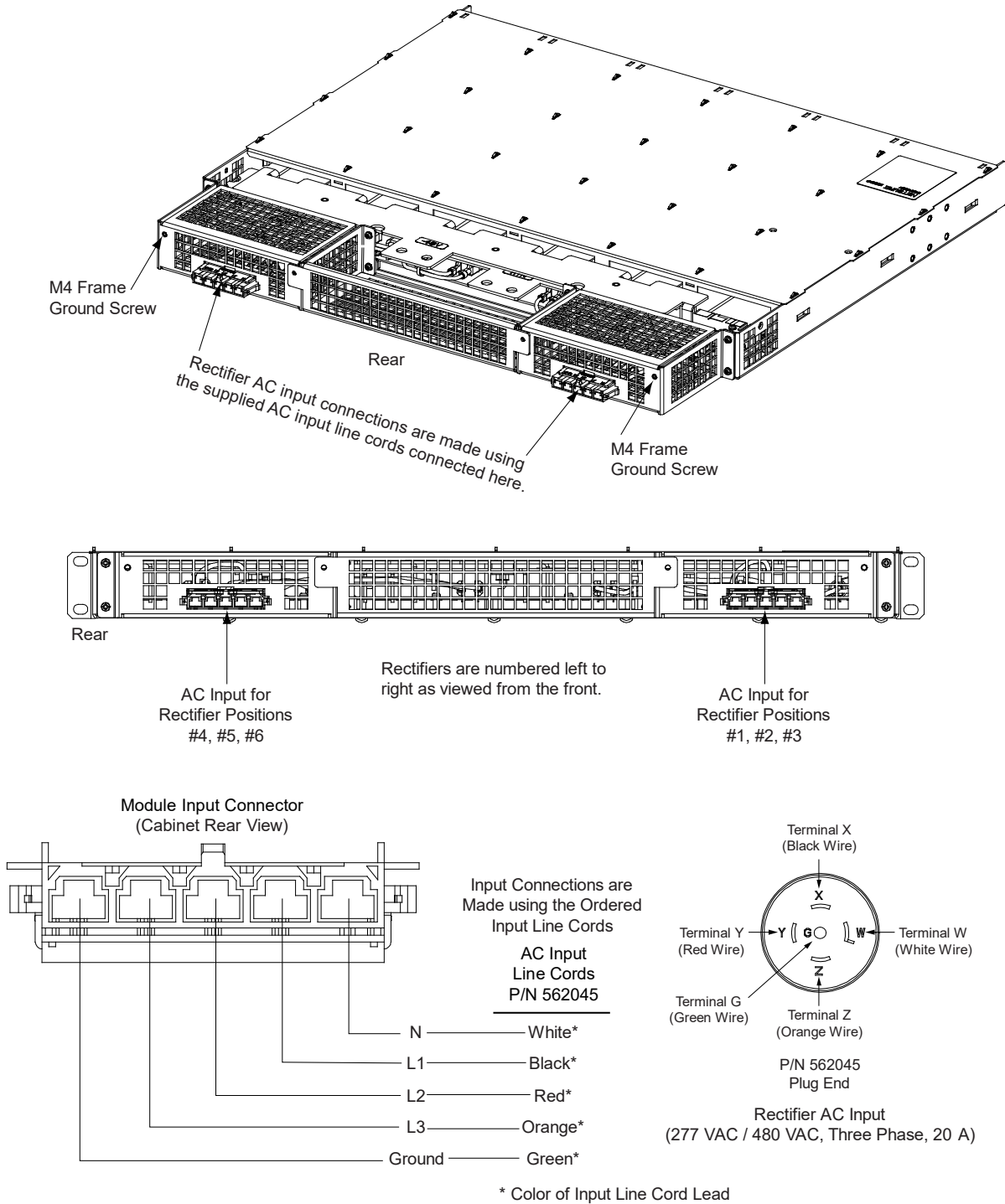
Figure 5.16 Nominal 208 VAC / 240 VAC Input Connections (Three-Phase) to a 588705400 List 03 Module Mounting Assembly



Direct AC Input Connections to 588705400 List 04 Module Mounting Assemblies

Spec. No. 588705400 List 04 is equipped with plug-in AC input connectors located on the rear of the shelf. AC input line cords with mating connectors are available (see SAG582127000). Make AC input connections per Figure 5.17.

Figure 5.17 Nominal 277 VAC / 480 VAC Input Connections (Three-Phase) to a 588705400 List 04 Module Mounting Assembly



5.6 Nominal 120 VAC Input and Equipment Grounding Connections to 582127000 List 50, 51, 52, 53 Inverter Module Assembly

The AC input connections are made to the inverter module mounting shelf(s) comprising the system. Refer to Figure 5.18 to identify the shelf.

Procedure

Refer to Figure 5.19 as this procedure is performed.

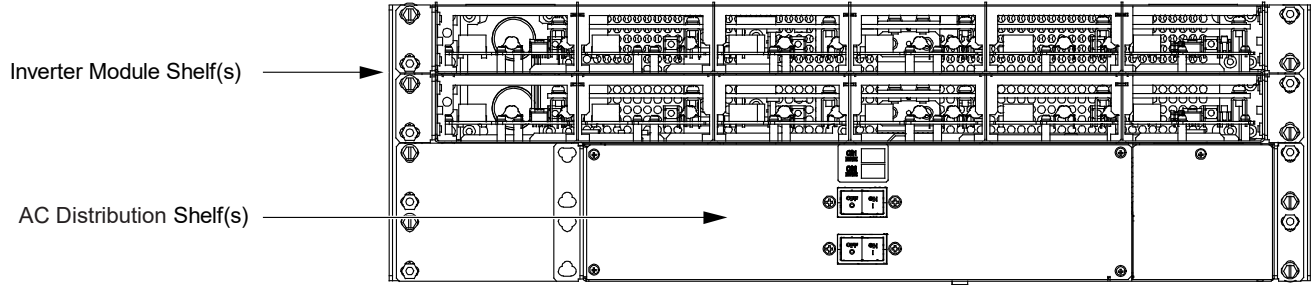


NOTE! A grounding conductor must be provided with each conduit. Make equipment grounding connections to earth ground, not to the branch circuit neutral conductor.

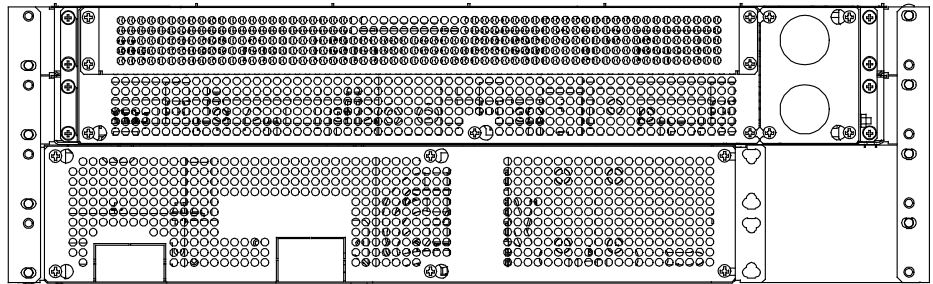
1. Remove the access cover from the rear of the inverter module mounting shelf(s). Remove the conduit plate(s) from the rear of the inverter module mounting shelf(s).
2. Install a 3/4-inch conduit fitting(s) as required in the right-side panel (as viewed from the rear) or the conduit plate(s) removed in above step (from the rear of the inverter module mounting shelf). If using the rear panel location, transfer the plug button factory installed in this location to the conduit hole in the right-side panel.
3. Route commercial AC input and ground leads into the inverter module mounting shelf(s) through the previously installed conduit fitting(s).
4. Connect the commercial AC input leads to the appropriate AC input terminal block inside the inverter module mounting shelf(s) as shown in Figure 5.19. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Torque connections to value shown in Figure 5.19.
5. Connect equipment grounding leads to the frame ground stud(s) using installer-provided lug(s) and factory-supplied mounting hardware. Torque connections to value shown in Figure 5.19.
6. After all AC input and equipment grounding connections have been made and checked, reinstall the rear access covers and rear conduit plate.

Figure 5.18 System Shelves Identification

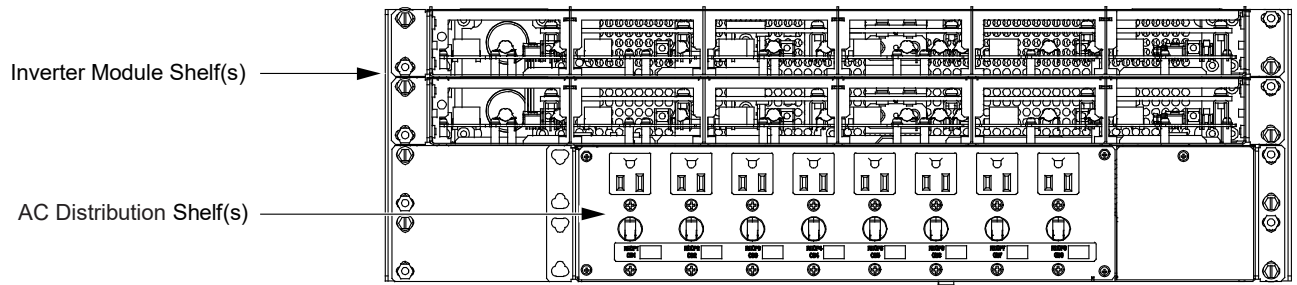
List 52 and List 53 Shown.
Other Configurations Similar.



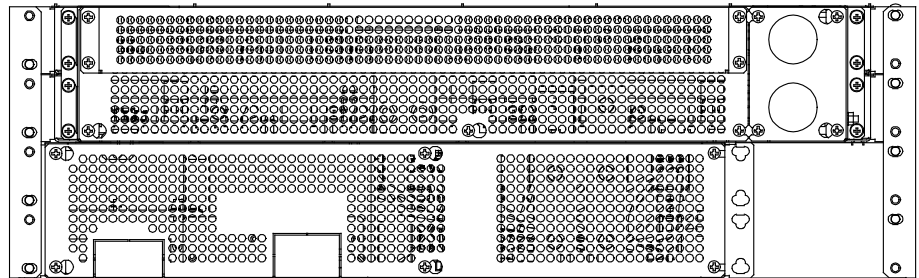
Front View



Rear View

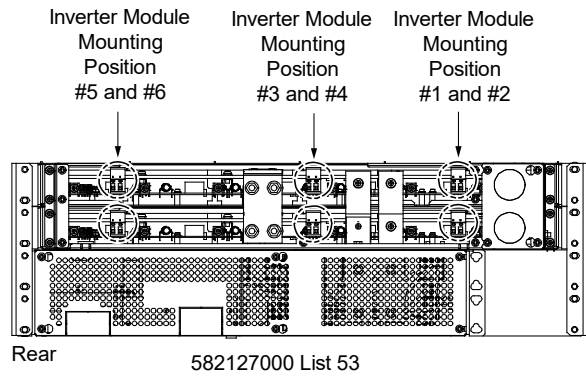
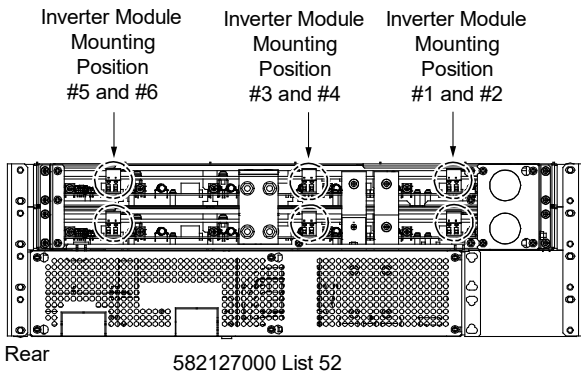
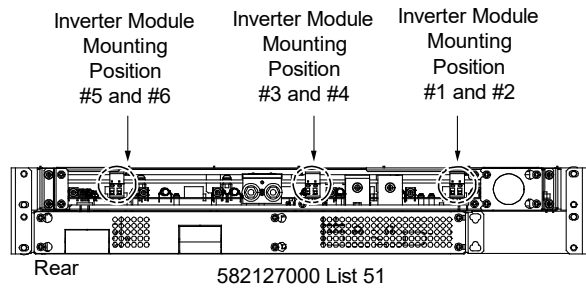
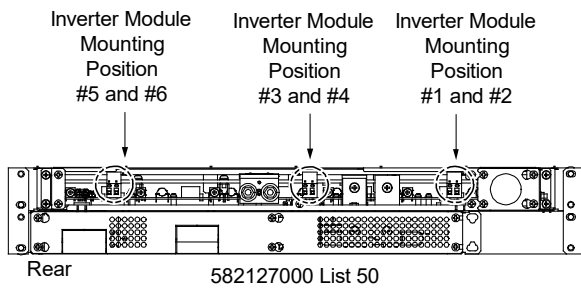
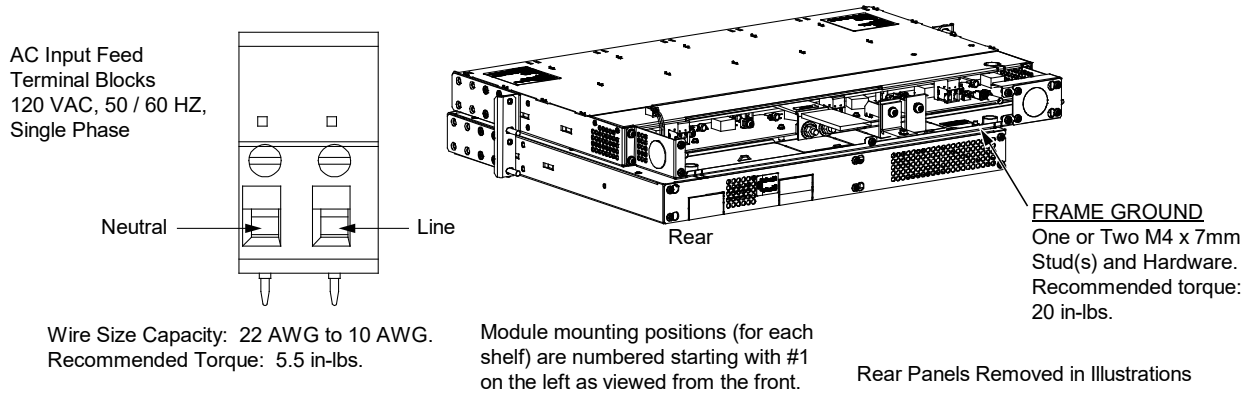


Front View



Rear View

Figure 5.19 Nominal 120 VAC Input and Equipment Grounding Connections



5.7 AC "Neutral" Reference Point (If Equipped with Optional Inverter System)

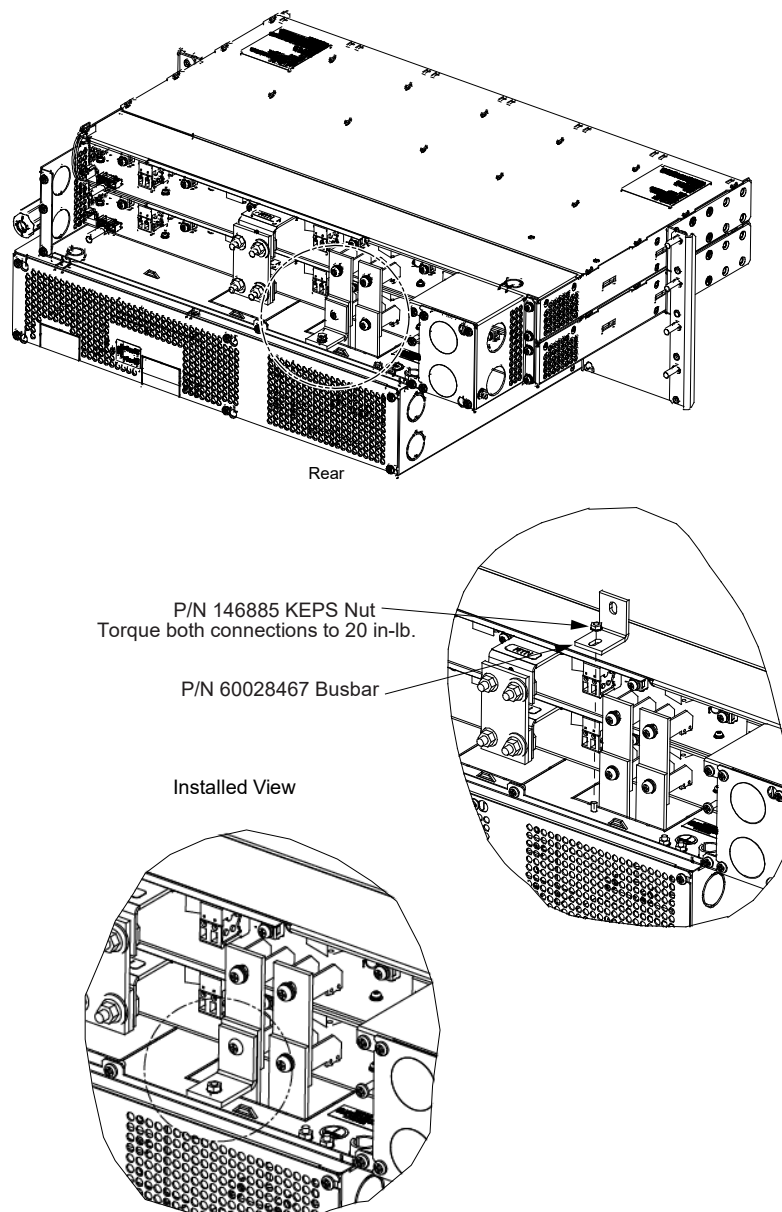
If the inverter system is not provided with an AC input source and is only powered from a DC source, an AC "Neutral" reference point must be provided by connecting the AC output neutral of the inverter shelf to frame ground using furnished P/N 60028467. Refer to the following procedure.

Procedure

Refer to Figure 5.20 as this procedure is performed.

1. Remove the access cover from the rear of the top-most inverter module mounting shelf.
2. Install P/N 60028467 busbar furnished with the system between the shelf chassis and the AC output neutral busbar. Use the hardware provided on the AC output neutral busbar and the furnished KEPS nut. Torque these connections as indicated in Figure 5.20.

Figure 5.20 AC "Neutral" Reference Point



5.8 Nominal 120 VAC Output Connections (List 50, 51, 52, 53 Inverter Module Assembly)

The AC output connections are made to the AC distribution shelf(s) comprising the system. Refer to Figure 5.18 to identify the shelf.

5.8.1 List 50 and 52 (bulk output)

Procedure

Refer to Figure 5.21 as this procedure is performed.



NOTE! A grounding conductor must be provided with each conduit.

1. Remove the access cover from the rear of the AC distribution shelf(s).
2. Install a 3/4-inch conduit fitting(s) as required in the right-side panel (as viewed from the rear) of the AC distribution shelf(s).
3. Route AC output and ground leads into the AC distribution shelf(s) through the previously installed conduit fitting(s).
4. Connect the AC output leads to the appropriate AC output terminal block inside the AC distribution shelf(s) as shown in Figure 5.21. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Torque connections to value shown in Figure 5.21.
5. Connect ground leads to the frame ground stud(s) using installer-provided lug(s) and factory-supplied mounting hardware. Torque connections to value shown in Figure 5.21.
6. After all AC output and ground connections have been made and checked, reinstall the rear access cover(s).

5.8.2 List 51 and 53 (NEMA output)

Procedure

Refer to Figure 5.22. as this procedure is performed.

1. Connect the AC output leads to the NEMA 5-15R receptacles provided on the front of the system. See Figure 5.22.

Figure 5.21 Nominal 120 VAC Output Connections, Lists 50, 52 (Bulk Output)

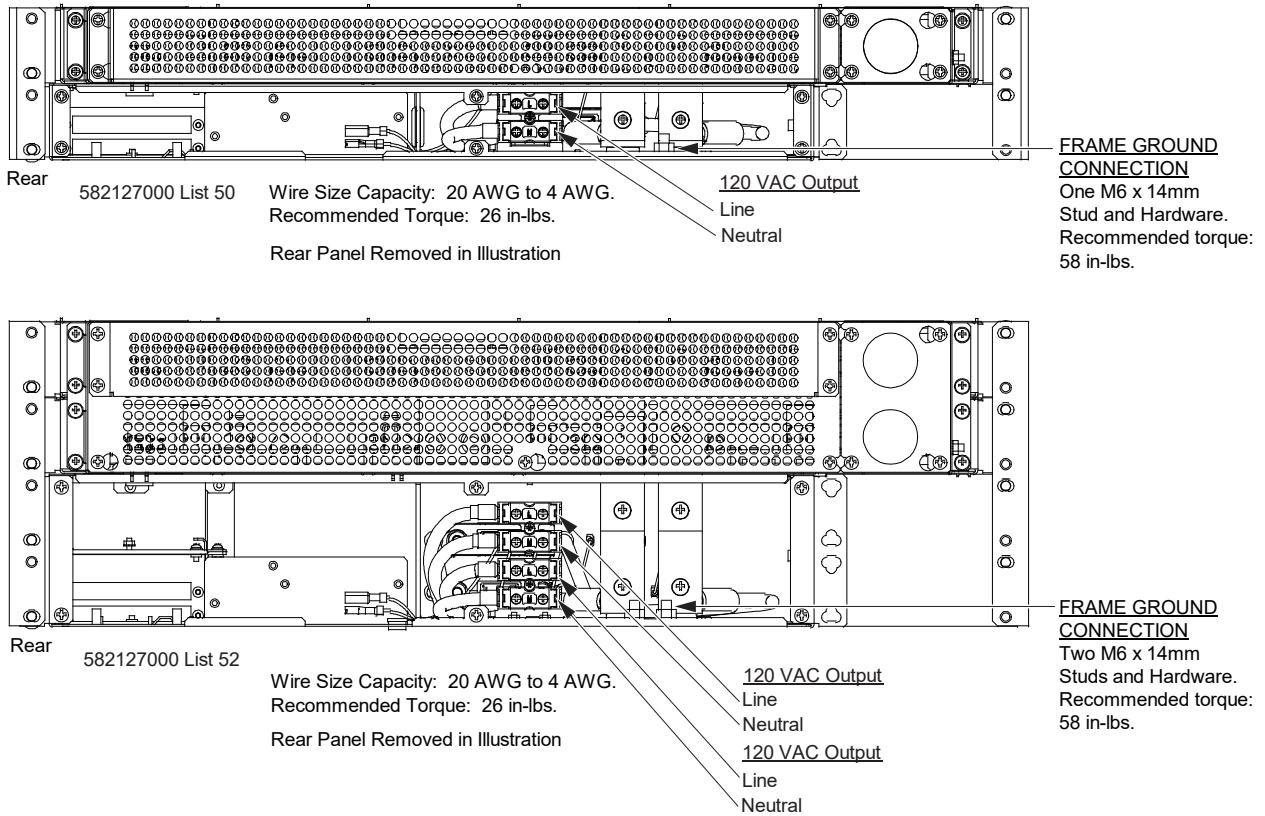
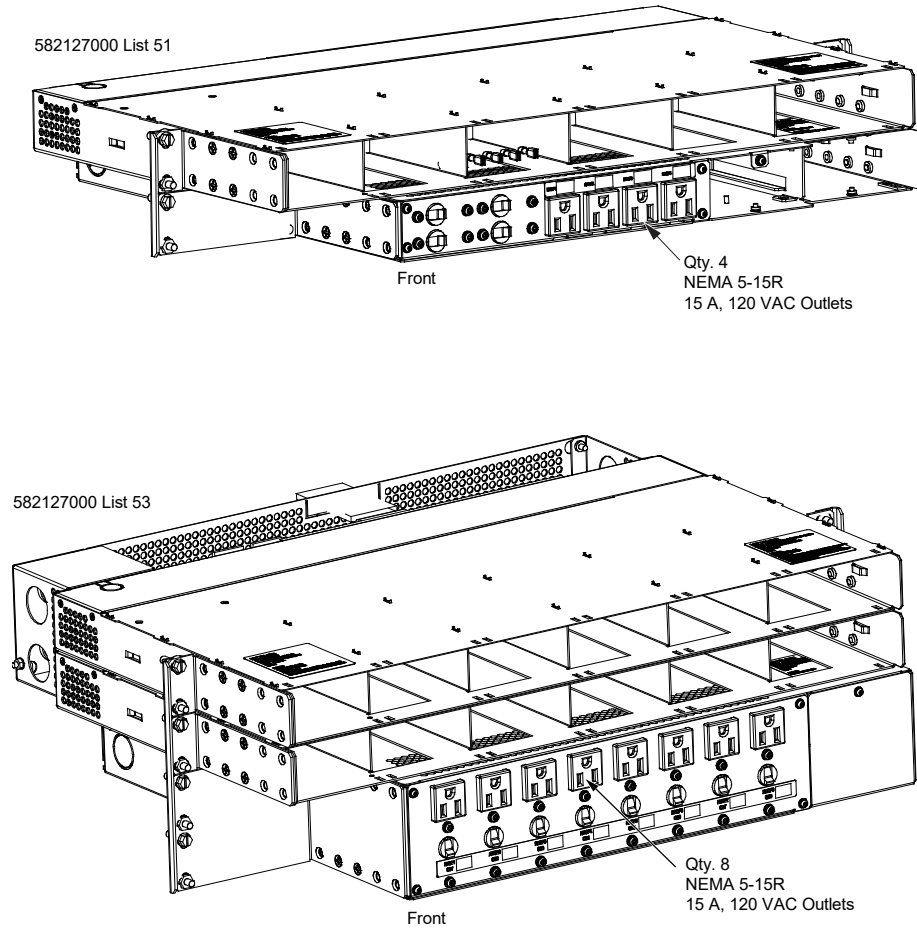


Figure 5.22 Nominal 120 VAC Output Connections, Lists 51, 53 (NEMA Output)



5.9 External Alarm, Reference, Monitoring, and Control Connections

5.9.1 Circuit Card Locations

Refer to Figure 5.23.

Figure 5.23 Circuit Card Locations (Main Bay)

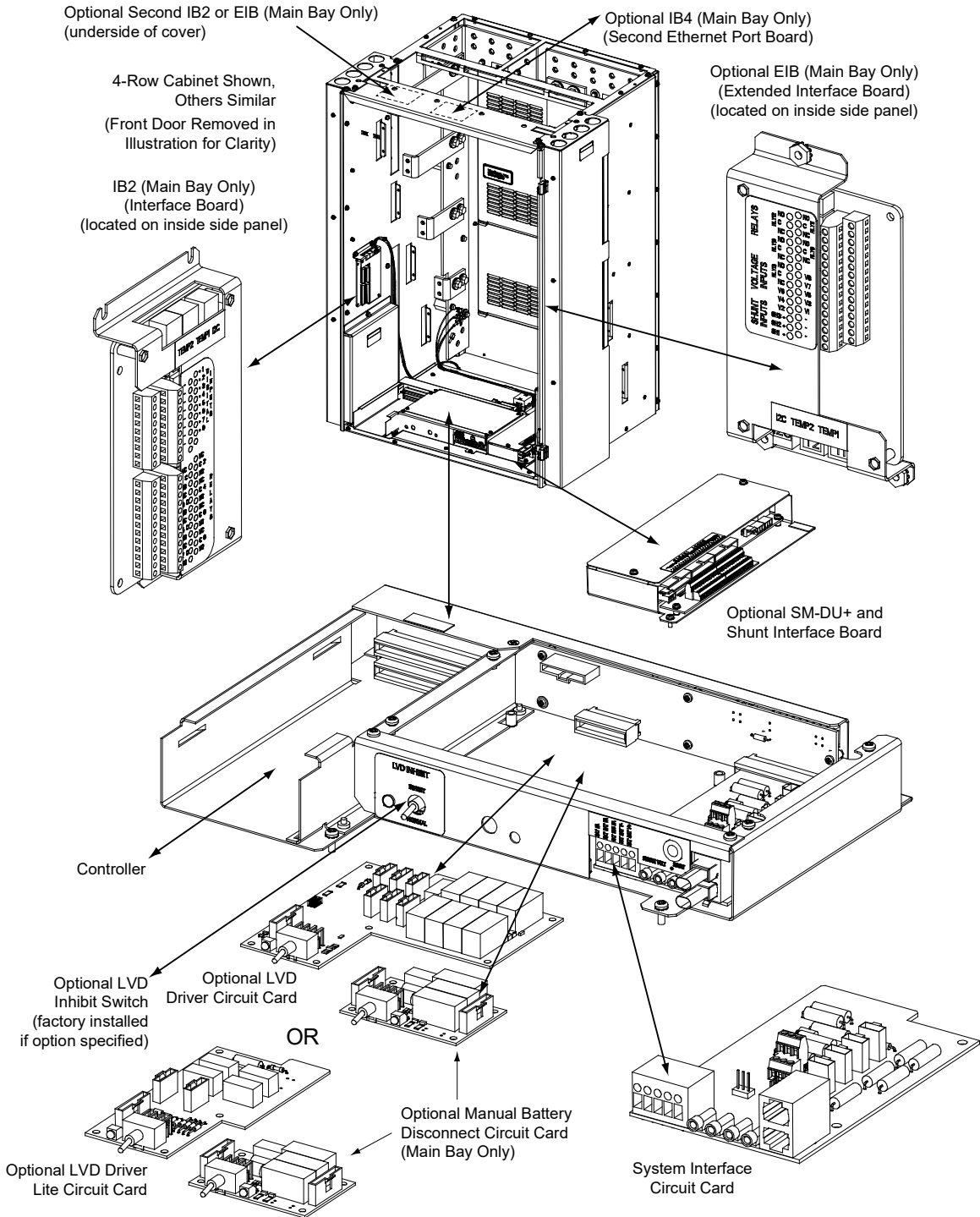
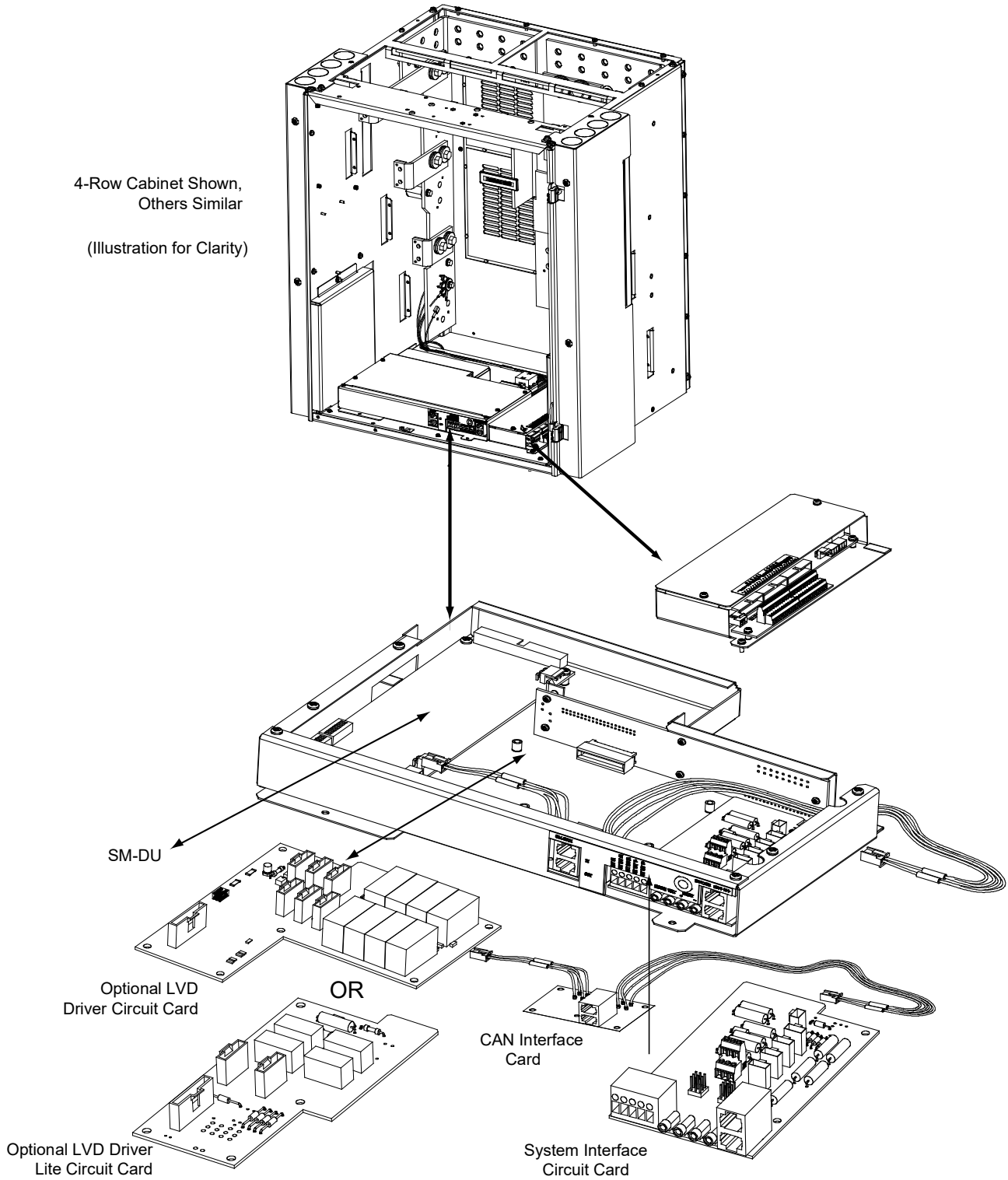


Figure 5.23 Circuit Card Locations (Supplementary Bay)



5.9.2 System Interface Circuit Card

The System Interface Circuit Card provides connections for the following. Refer to Figure 5.24 and Figure 5.32.

- **Battery Tray FA Signal:** This input is used to provide a battery tray fuse alarm (FA) on the controller due to a tripped battery disconnect breaker on a battery tray in the power system rack. Application of system voltage to pin TB1-1 activates this alarm. The lead should be protected at the source with an in-line fusible resistor. The source should be originated from the system side of the disconnect device, not the battery side. If used with List 93 or List 95 battery tray option this connection is applied in the factory.
- **External Battery FA Signal (circuit card installed in Main Bay only):** This input is used to provide an external battery fuse alarm (FA) on the controller due to a tripped battery disconnect device (fuse, breaker or contactor) external to the power system rack. Application of system voltage to pin TB1-2 activates this alarm. The lead should be protected at the source with an in-line fusible resistor. The source should be originated from the system side of the disconnect device, not the battery side.
- **External System FA Signal (circuit card installed in Main Bay only):** This input is used to provide an external system fuse alarm (FA) on the controller due to a tripped distribution device (fuse or breaker) on the system output external to the power system distribution cabinet. Application of system voltage to pin TB1-3 activates this alarm. The lead should be protected at the source with an in-line fusible resistor. This input is not to be used for any voltage bus (such as converter output) other than the system bus.
- **External Battery Monitoring (circuit card installed in Main Bay only):** If the jumper J10 is set to External (see Figure 4.2), connect TB1-4 and TB1-5 to the desired battery voltage sensing point. Observe proper polarity per the Figure 4.2. The hot sense lead should be protected at the source with an in-line fuse or fusible resistor.
- **RS-485 (used for communication with SM modules) (Main Bay Only)**

(Also used when an NCU configuration is furnished that enables NCU capability to receive status information sent from Fiamm SoNick [Sodium Nickel] batteries. Connect leads from the Fiamm SoNick batteries to the RS-485 terminals. See Figure 5.24. Refer to the battery manufacturer documentation and the NCU controller manual UM1M830BNA for details.)
- **RS-232 (used for communication with a DPU) (Main Bay Only)**
- **Bay Voltage Monitoring Test Points:** Provide system bus voltage measurement for an external meter. The leads are protected against fault with 10kohm series resistors in each lead.
- **Bay Load Shunt Monitoring Test Points:** Provide for measurement of the system load shunt in the bay. See below for shunt ratings. The leads are protected against fault with 10kohm series resistors in each lead.

List 21, 1-Row Distribution Cabinet: 800A / 25mV (32A per mV)

List 22, 2-Row Distribution Cabinet: 2000A / 25mV (80A per mV)

List 23, 3-Row Distribution Cabinet: 2500A / 25mV (100A per mV)

List 24, 4-Row Distribution Cabinet: 2500A / 25mV (100A per mV)

Figure 5.24 System Interface Circuit Card Connections

(Main Bay Only)

* When an NCU configuration is furnished that enables NCU capability to receive status information sent from Fiamm SoNick [Sodium Nickel] batteries. Connect leads from the Fiamm SoNick batteries to the RS-485 terminals. Refer to the battery manufacturer documentation and the NCU controller manual UM1M830BNA for details.

TB2 (Main Bay Only)

RS485 Connection*

TB2 1A: RS485+
TB2 2A: RS485-

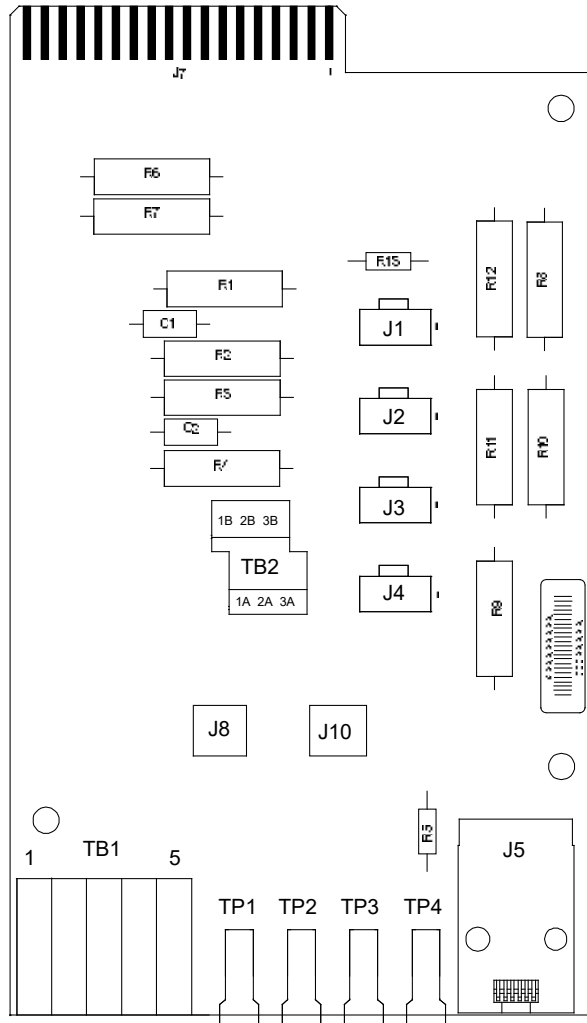
RS232 Connection

TB2 1B: CGND
TB2 2B: TXD232
TB2 3B:RXD232

TB2 3A: Internally used by system.

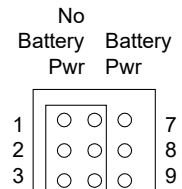
TB2

Wire Size Capacity: 16-26 AWG.
Recommended Torque: 2.0 in-lbs.



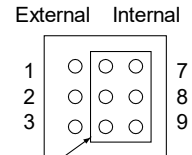
J1, J2, J3, J4
Distribution Panels FA Inputs

J8 (Main Bay Only)
Selects to power Controller from "Battery Power" or not.



Shorting Jumper

J10 (Main Bay Only)
Battery Monitoring External / Internal (see TB1-4 and TB1-5 for external monitoring points)



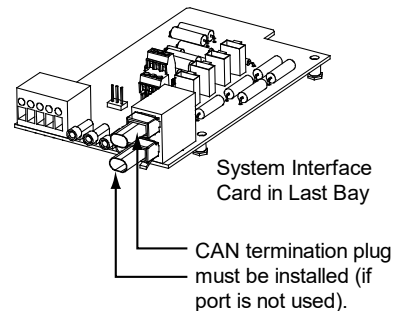
Shorting Jumper

J5
CAN2 (top)
CAN1 (bottom)

- TB1-1: Battery Tray FA
- TB1-2: External Battery FA
- TB1-3: External System FA
- TB1-4: External Battery Monitoring (-)
- TB1-5: External Battery Monitoring (+)
- TP1 (+) and TP2 (-)
Bay Voltage Monitoring
- TP3 (+) and TP4 (-)
Bay Load Shunt Monitoring

TB1

TB1-2, TB1-3, TB1-4, TB1-5 Main Bay Only.
Wire Size Capacity: 22-12 AWG.
Recommended Torque: 3.0 in-lbs.
FA Signals: System voltage applied to the terminal turns in an alarm.



System Interface Card in Last Bay

CAN termination plug must be installed (if port is not used).

NOTE:

See **Figure 5.32** for Bay to Bay Communication Cable Connections.

5.9.3 IB2 (Controller Interface Board) Connections (if required) (Main Bay Only)



NOTE! The system may have one (1) or two (2) IB2 boards installed. The first IB2 is standard while the second IB2 is optional.

Each IB2 (Controller Interface Board) provides connection points for digital inputs, programmable relay outputs, and temperature probes. The IB2 interface boards are mounted inside the distribution cabinet. Refer to Figure 5.23.

Digital Inputs and Programmable Relay Outputs

Digital input and relay output leads are connected to screw-type terminal blocks located on each IB2. Recommended torque for these connections is 2.2 in-lbs. Refer to Figure 5.25 for terminal locations. Refer to Table 5.3 and Table 5.4 for pin-out information.

Digital Inputs

Connect up to eight (8) digital inputs to each IB2. Note that you must supply both paths for the digital input (either a positive or negative signal and the opposite polarity return path). Observe proper polarity. Refer to Figure 5.25 for terminal locations and Table 5.3 for pin-out information.



NOTE! First IB2 Board only: -48V is factory wired to the Digital Input #8 (-) terminal for your convenience and function predefined for ESTOP. Customer-furnished system ground applied to terminal Digital Input #8 (+) activates the ESTOP function. See "ESTOP Function" on page 116.

The digital inputs can be programmed to provide an alarm when the signal is applied (HIGH) or removed (LOW). Refer to the NCU Instructions (UM1M830BNA) for programming information.

Digital Input Ratings: Refer to the following.

- a) Maximum Voltage Rating: 60V DC.
- b) Active High: > 19V DC.
- c) Active Low: < 1V DC.

The digital inputs may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.

ESTOP Function

If an ESTOP switch is wired to the IB2-1 Controller Interface Board, customer-furnished system ground applied to terminal DI8+ activates the ESTOP function. The ESTOP function shuts down and locks out the rectifiers, shuts down and locks out the optional -48 VDC to +24 VDC converters or optional -48 VDC to -58 VDC converters, shuts down and locks out the inverters (if equipped with optional inverter system), and opens the optional low voltage disconnect (LVD) contactors (battery and load type). If the system has battery connected and does not contain a battery LVD or the controller power option is set to Battery Pwr (jumper J8 on the system interface board is set to Battery Pwr), the controller will remain operational. If the system does not contain battery or load LVD(s) and has battery connected, the loads will be sustained by the battery voltage.

For Systems NOT Containing a Battery LVD: When the ESTOP signal is removed, LVD contactors (battery and load type) will close after the "LVD Reconnect Delay" has elapsed (customer configurable via the controller) if battery voltage is present on the bus. Rectifiers, optional -48 VDC to +24 VDC converters or optional -48 VDC to -58 VDC converters, and inverters (if equipped with optional inverter system) will remain off. The rectifiers and inverters (if equipped with optional inverter system) will restart when the input power is removed and restored after 30 seconds or more (until the LEDs on the modules extinguish). To restart the -48 VDC to +24 VDC converters or -48 VDC to -58 VDC converters: remove the converter, wait 30 seconds or more (until the LEDs on the converter extinguish), then re-insert the converter.

For Systems Containing a Battery LVD: When the ESTOP signal is removed, LVD contactors (battery and load type) will remain open. Rectifiers, optional -48 VDC to +24 VDC converters or optional -48 VDC to -58 VDC converters, and inverters (if equipped with optional inverter system) will remain off. The rectifiers will restart when the input power is removed and restored after 30 seconds or more (until the LEDs on the modules extinguish). When the rectifiers restart, LVD contactors (battery and load type) will close and the -48 VDC to +24 VDC converters or -48 VDC to -58 VDC converters and inverters (if equipped with optional inverter system) will restart.



NOTE! *If a customer-furnished method to disconnect the input power to the system is not provided, the rectifiers will stay locked OFF until the input power is recycled. If the ESTOP signal is removed without recycling the input power, the rectifiers will remain off and have a local alarm visible on the module. The ESTOP alarm from the controller will extinguish. The controller will not issue an alarm for this condition.*

Programmable Relay Outputs

Each IB2 provides eight (8) programmable alarm relays with dry Form-C contacts. Connect up to eight (8) relay outputs to each IB2. Refer to Figure 5.25 for terminal locations and Table 5.4 for pin-out information.



NOTE! *The relay assigned to “Critical Summary” alarm (Relay 1 on first IB2 by default) will operate in the “Fail Safe Mode”. “Fail Safe Mode” means Relay 1 is de-energized during an alarm condition, opening the contacts between the C and NO terminals, and closing the contacts between the C and NC terminals.*

The remaining 7 relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.

Refer to the NCU Instructions (UM1M830BNA) for programming information.

Relay Ratings: Refer to the following:

- a) Steady State : 0.5A @ 60V DC; 1.0A @ 30V DC.
- b) Peak : 3A @ 30V DC.

The relays may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.

Temperature Probes



NOTE! *Each temperature probe consists of two or three pieces that plug together to make a complete probe. See SAG582127000 for part numbers and descriptions.*

Temperature probes can be connected to each IB2 (Controller Interface Board) and/or EIB (Controller Extended Interface Board) mounted inside the distribution cabinet. See Figure 5.25 and Figure 5.27.

Each IB2 and EIB board allows for the connection of two (2) temperature probes. Any combination of the temperature probes can be programmed to monitor ambient temperature and/or battery temperature. A temperature probe set to monitor battery temperature can also be used for the rectifier battery charge temperature compensation feature, or the battery charge temperature compensation feature can be programmed to use the average or highest value of all battery temperature probes. The battery charge temperature compensation feature allows the controller to automatically increase or decrease the output voltage of the system to maintain battery float current as battery temperature decreases or increases, respectively. Battery life can be extended when an optimum charge voltage to the battery with respect to temperature is maintained. A temperature probe set to monitor battery temperature can also be used for the BTRM (Battery Thermal Runaway Management) feature. The BTRM feature lowers output voltage when a high temperature condition exists to control against battery thermal runaway.

The temperature sensor end of the probe contains a tab with a 5/16” clearance hole for mounting.

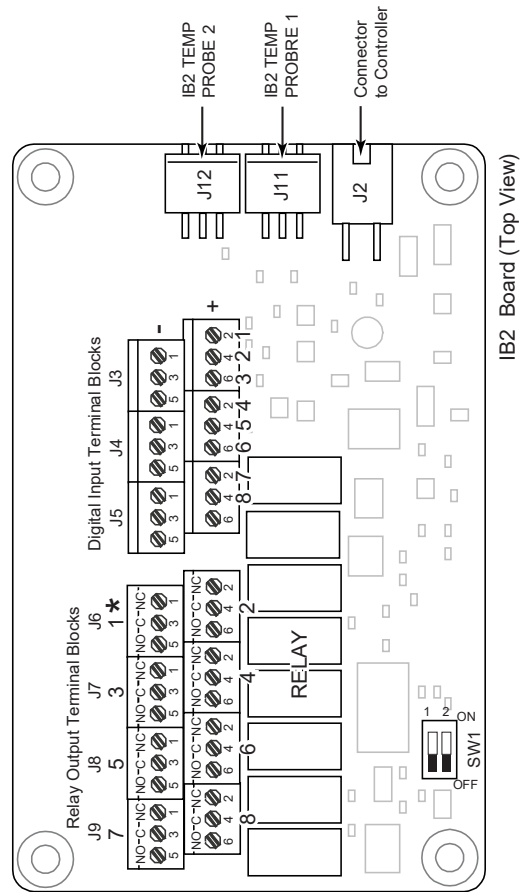
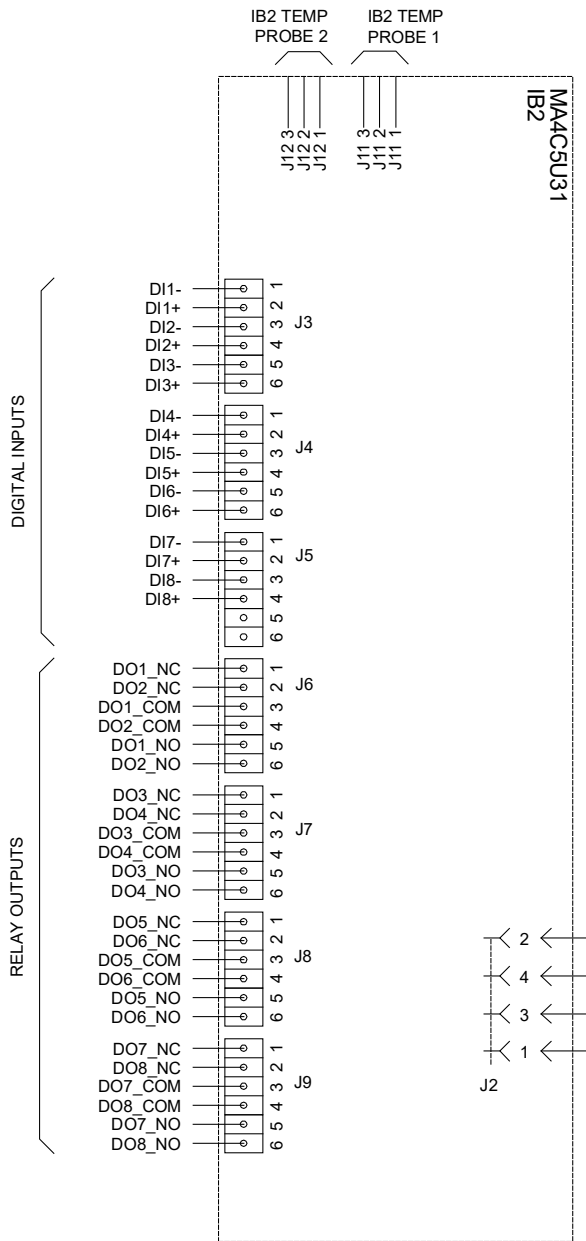
A temperature probe programmed to monitor battery temperature should be mounted on the negative post of a battery cell to sense battery temperature. A temperature probe used for battery charge temperature compensation and/or BTRM (Battery Thermal Runaway Management) should also be mounted on the negative post of a battery cell. A temperature probe programmed to monitor ambient temperature should be mounted in a convenient location, away from direct sources of heat or cold.

5.9.4 IB2 (Controller Interface Board) Connections when the Inverter System is Located in a Supplemental Bay

When the inverter system is factory installed in the supplemental bay, two insulated wires labelled DI7 and DI8 are routed from the inverter system into the distribution cabinet and are not terminated. Connect these wires to the IB2-1 DI7+ and IB2-1 DI8+ terminals respectively in the main bay. Tie the short jumper between IB2-1 DI7- and IB2-1 DI8- in the main bay. Refer to Figure 5.25 for terminal locations. These connections provide alarming and ESTOP function for the inverter system.

Figure 5.25 IB2-1 and IB2-2 (Interface Board) Connections

Schematic Diagram of IB2 Board



J3-J9:
Wire Size Capacity: 16-26 AWG.
Recommended Torque: 2.2 in-lbs.

* The relay assigned to "Critical Summary" alarm (Relay 1 on first IB2 by default) will operate in the "Fail Safe Mode". "Fail Safe Mode" means Relay 1 is de-energized during an alarm condition, opening the contacts between the C and NO terminals, and closing the contacts between the C and NC terminals.

The remaining seven (7) relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.

Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific relay labeling.

Not all I/O points are available for customer connection (some are used for factory system connections).

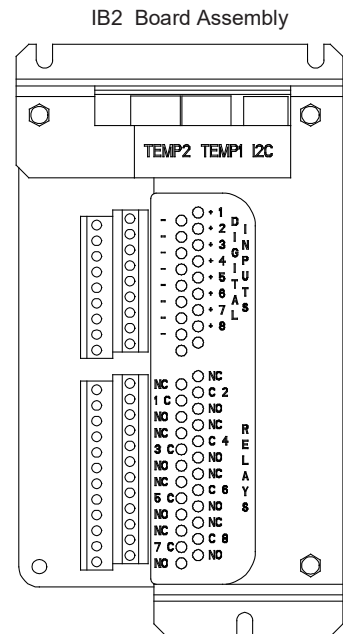


Table 5.3 Programmable Digital Inputs – IB2 Board

Programmable Digital Input	IB2 Pin No.		Factory Wiring	Default Digital Input Function	Customer Defined Digital Input Function		
1	J3-2	+	The digital inputs may be preprogrammed for specific functions and have factory wiring connected. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.	The digital inputs may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.			
	J3-1	-					
2	J3-4	+					
	J3-3	-					
3	J3-6	+					
	J3-5	-					
4	J4-2	+					
	J4-1	-					
5	J4-4	+					
	J4-3	-					
6	J4-6	+					
	J4-5	-					
7	J5-2	+					
	J5-1	-					
8	J5-4	+	(to customer ESTOP switch)	ESTOP			
	J5-3	-	-48 VDC				
--	J5-5		not used	not used	not used		
--	J5-6						



NOTE! -48V is factory wired to the Digital Input #8 (-) terminal for your convenience and function predefined for ESTOP. Customer-furnished system ground applied to terminal Digital Input #8 (+) activates the ESTOP function. See "ESTOP Function" on page 116.

Table 5.4 Programmable Relay Outputs – IB2 Board

Programmable Relay Output		IB2 Pin No.	Alarms Assigned to this Relay (Default)	Alarms Assigned to this Relay (Custom)
1	NO	J6-5	The relays may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.	
	COM	J6-3		
	NC	J6-1		
2	NO	J6-6		
	COM	J6-4		
	NC	J6-2		
3	NO	J7-5		
	COM	J7-3		
	NC	J7-1		
4	NO	J7-6		
	COM	J7-4		
	NC	J7-2		
5	NO	J8-5		
	COM	J8-3		
	NC	J8-1		
6	NO	J8-6		
	COM	J8-4		
	NC	J8-2		
7	NO	J9-5		
	COM	J9-3		
	NC	J9-1		
8	NO	J9-6		
	COM	J9-4		
	NC	J9-2		



NOTE! The relay assigned to “Critical Summary” alarm (relay 1 on first IB2 by default) will operate in the “Fail Safe Mode”. “Fail Safe Mode” means Relay 1 is de-energized during an alarm condition, opening the contacts between the C and NO terminals, and closing the contacts between the C and NC terminals.

The remaining 7 relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.

Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific relay labeling.

5.9.5 Optional EIB (Controller Extended Interface Board) Connections (if required) (Main Bay Only)



NOTE! The system may have one (1) or two (2) EIB boards installed.

Each optional EIB (Controller Extended Interface Board) provides additional connection points for voltage and current inputs, programmable relay outputs, and temperature probes. The EIB extended interface board is mounted inside the distribution cabinet. Refer to Figure 5.23.

Current Inputs, Voltage Inputs, and Programmable Relay Outputs

Current input, voltage input, and relay output leads are connected to screw-type terminal blocks located on each optional EIB. Recommended torque for these connections is 2.2 in-lbs. Refer to Figure 5.27 for terminal locations. Refer to Table 5.5, Table 5.6, and Table 5.7 for pin-out information.

Current Inputs

Connect up to three (3) shunt inputs to the EIB. Observe proper polarity. Refer to Figure 5.27 for terminal locations and Table 5.5 for pin-out information.

Refer to the NCU Instructions (UM1M830BNA) and program the shunt input parameters.



NOTE! The shunt needs to be installed in the hot (-48V) bus. Connect the plus side of the shunt to the positive shunt input on the EIB. Connect the negative side of the shunt to the negative shunt input on the EIB.

Voltage Inputs for Battery Block and Battery Midpoint Monitoring

The controller can monitor battery blocks (12V blocks) or midpoint battery voltage of battery strings connected to the EIB. Each EIB provides a total of eight (8) DC voltage inputs for these connections. An alarm is issued when either battery block voltage or battery midpoint voltage is abnormal. Refer to Figure 5.27 for terminal locations and Table 5.6 for pin-out information.

Refer to Figure 5.26 for connection details. Refer to the NCU Instructions (UM1M830BNA) and program the following parameters.

- **Battery Block Monitoring**

Voltage Type: Set to “48 (Block 4)”. This selects the EIB to monitor up to two (2) 48V battery strings with four (4) 12V blocks per string.

BlockVDiff(12V): This menu item appears if “48 (Block 4)” is selected above. Set to the alarm threshold for battery block monitoring per site requirements. The controller issues an alarm when any block voltage of any battery string has an abnormal value. The alarm is issued when the difference between any block voltage and a reference voltage is greater than the value of the block voltage difference setting.

Block In-Use: Set to the number of 12V battery blocks being used.

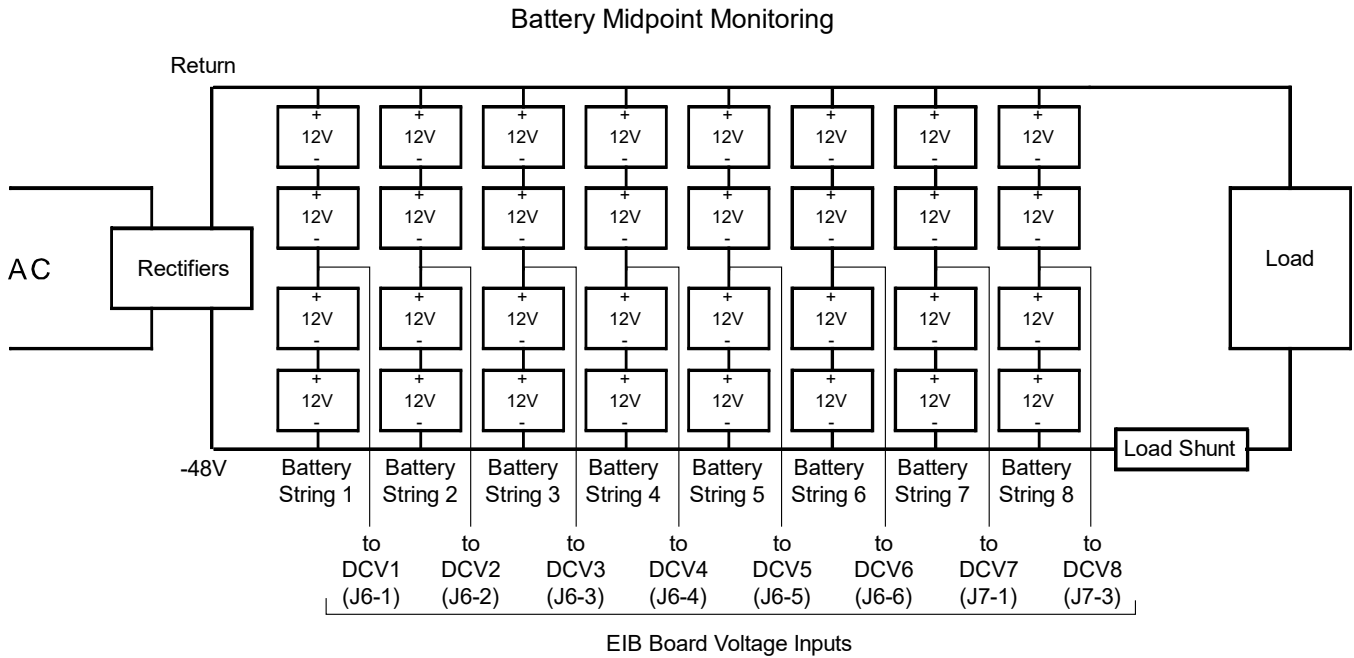
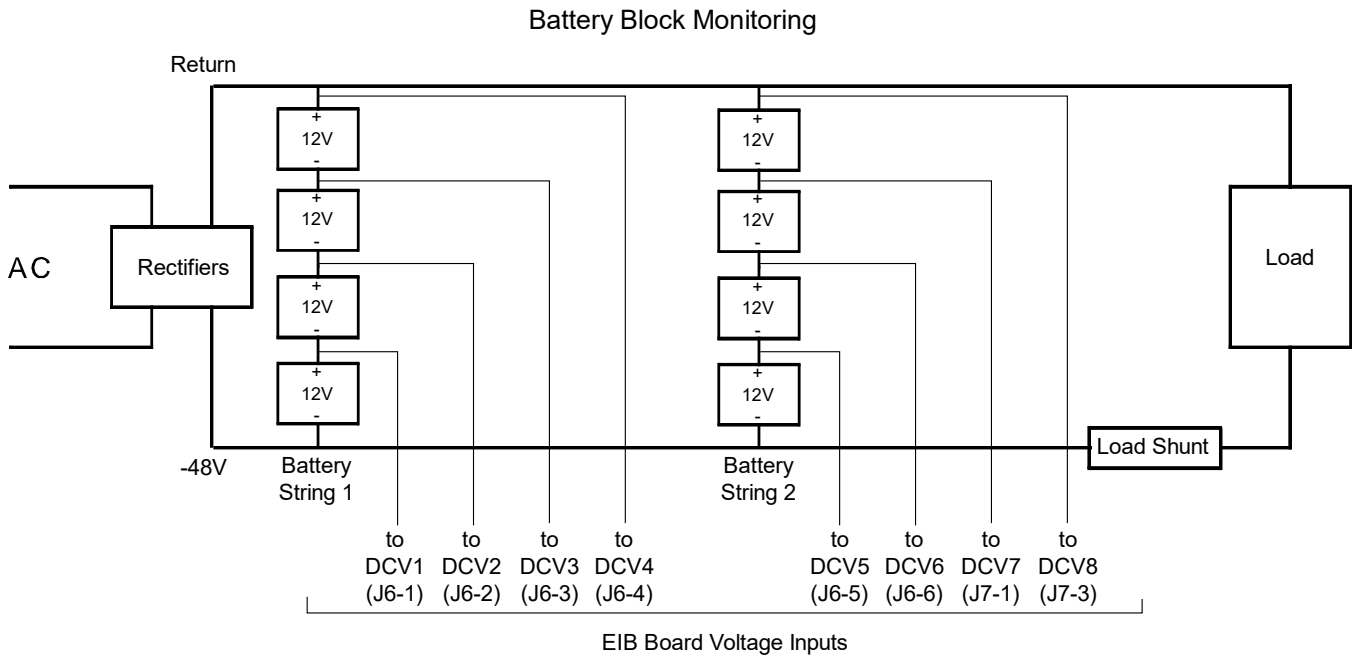
- **Midpoint Monitoring**

Voltage Type: Set to “Midpoint”. This selects the EIB to monitor the midpoint voltage of up to eight (8) battery strings.

BlockVDiff(Mid): This menu item appears if “Midpoint” is selected above. Set to the alarm threshold for battery midpoint monitoring per site requirements. The controller issues an alarm when any battery midpoint voltage of any battery string has an abnormal value. The alarm is issued when the difference between any battery midpoint voltage and a reference voltage is greater than the value of the block voltage difference setting.

Block In-Use: Set to number of 12V battery blocks being used.

Figure 5.26 Sample Battery Block or Battery Midpoint Monitoring Connections



Programmable Relay Outputs

Each EIB provides five (5) programmable alarm relays with dry Form-C contacts. Connect up to five (5) relay outputs to the EIB. Refer to Figure 5.27 for terminal locations and Table 5.6 for pin-out information.

Refer to the NCU Instructions (UM1M830BNA) for programming information.

Relay Ratings: Refer to the following:

- a) Steady State : 0.5A @ 60V DC; 1.0A @ 30V DC.
- b) Peak : 3A @ 30V DC.

The relays may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.

Temperature Probes

Temperature probes can be connected to the optional EIB (Controller Extended Interface Board) mounted inside the distribution cabinet. Refer to "Temperature Probes" on page 117.

Figure 5.27 EIB-1 and EIB-2 (Extended Interface Board) Connections

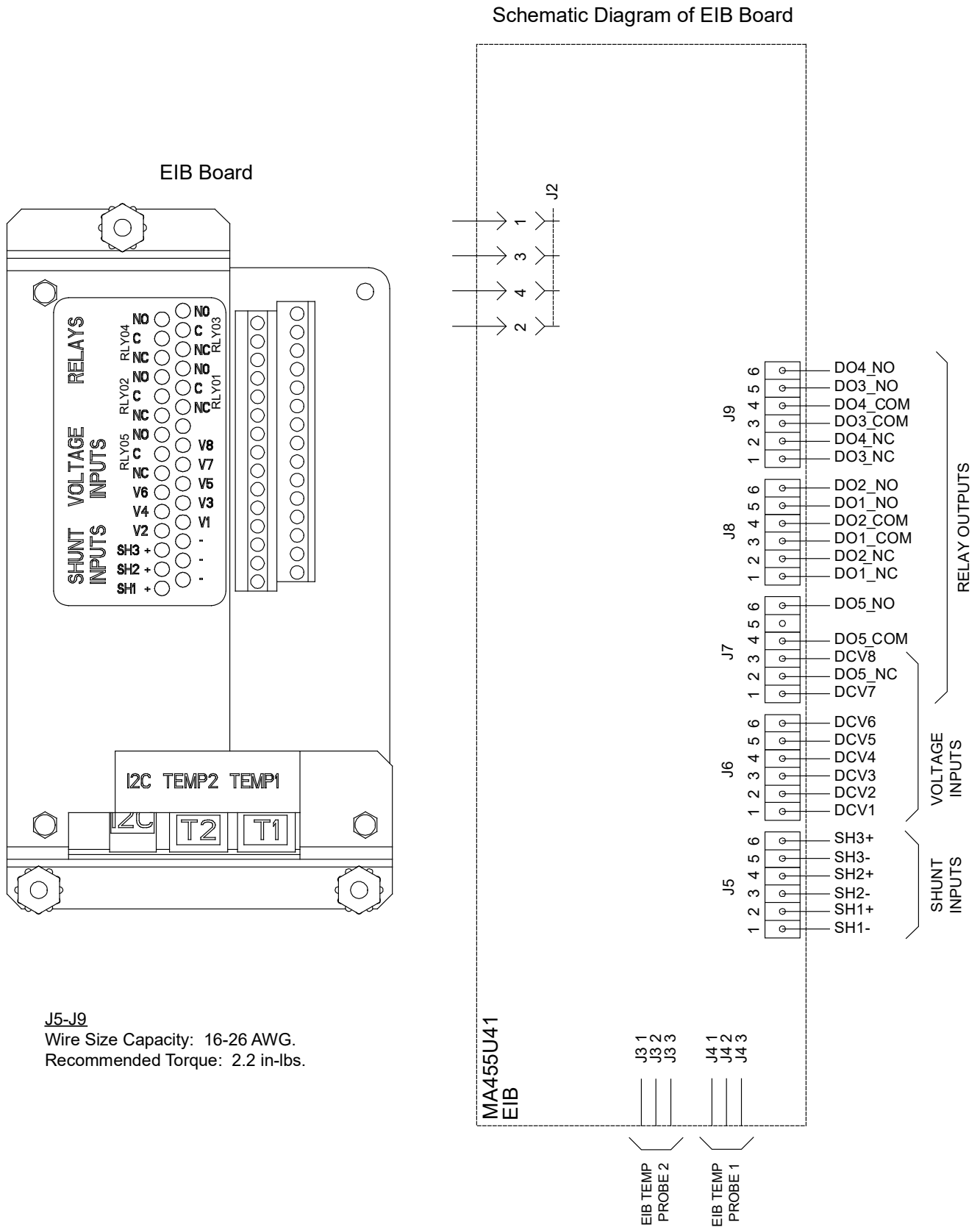


Table 5.5 Shunt Inputs – EIB

Shunt Input	EIB Pin No.		Factory Wiring	Default Function	Customer Defined Function
Sh1	J5-2	+	--	none	
	J5-1	-	--		
Sh2	J5-4	+	--	none	
	J5-3	-	--		
Sh3	J5-6	+	--	none	
	J5-5	-	--		

Table 5.6 Voltage Inputs – EIB

Voltage Input	EIB Pin No.	Default Function
1	J6-1	Battery Block Monitoring
2	J6-2	
3	J6-3	
4	J6-4	
5	J6-5	
6	J6-6	
7	J7-1	
8	J7-3	

Table 5.7 Programmable Relay Outputs – EIB

Programmable Relay Output		EIB Pin No.	Alarms Assigned to this Relay (Default)	Alarms Assigned to this Relay (Custom)
9	NO	J8-5	The relays may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.	
	COM	J8-3		
	NC	J8-1		
10	NO	J8-6		
	COM	J8-4		
	NC	J8-2		
11	NO	J9-5		
	COM	J9-3		
	NC	J9-1		
12	NO	J9-6		
	COM	J9-4		
	NC	J9-2		
13	NO	J7-6		
	COM	J7-4		
	NC	J7-2		



NOTE! The relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.

Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific relay labeling.

5.9.6 Optional SM-DU+ and Shunt Interface Board

The optional SM-DU+ and Shunt Interface Board provides connections for up to twenty-five (25) shunt inputs. Inputs are factory connected to any distribution positions/devices containing shunts. Refer to Figure 5.28.

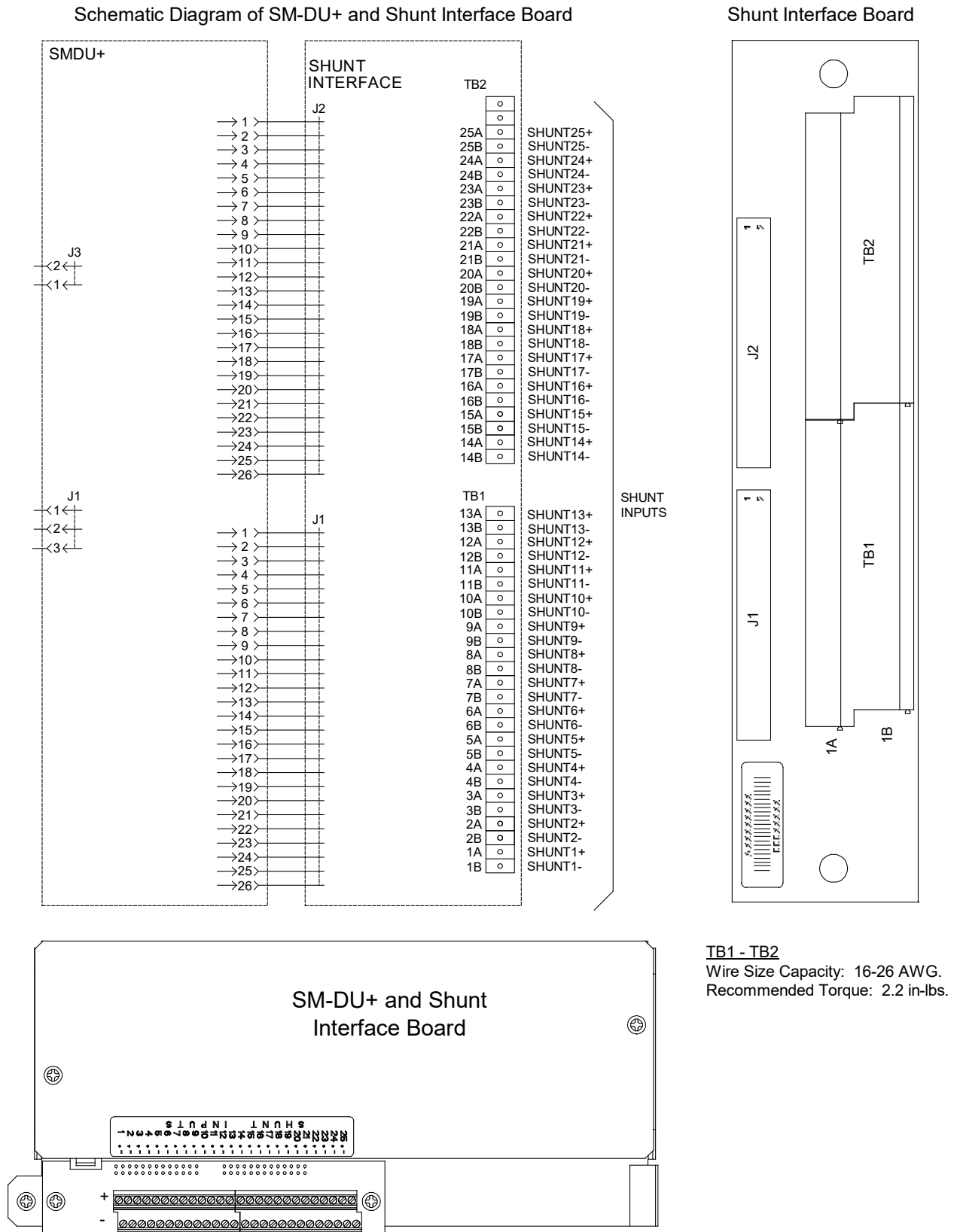
Procedure

Current Inputs: Connect up to twenty-five (25) shunt inputs to the Shunt Interface Board. Observe proper polarity. Note that some inputs may be factory connected, depending on distribution devices installed. Refer to the NCU Instructions (UM1M830BNA) for programming information for the unused inputs.



NOTE! The shunt needs to be installed in the hot (-48V) bus. Connect the plus side of the shunt to the positive shunt input on the SM-DU+. Connect the negative side of the shunt to the negative shunt input on the SM-DU+.

Figure 5.28 SM-DU+ and Shunt Interface Board Connections



5.9.7 Connecting a Device or System to the Controller's CAN Bus (if required)

A supporting device or system may be connected to the Controller's CAN Port. Refer to Figure 5.24 for location. Refer to Table 5.8 for pin-outs. Refer also to the external device's or system's instruction manual.

General Procedure

1. Remove the CAN termination plug from the bottom CAN connector on the System Interface circuit card of the last bay (see Figure 5.24 for location). Connect the device or system to the bottom CAN connector on the System Interface circuit card of the last bay. Refer to Table 5.8 for pin-outs. Ensure that the last device on the controller's CAN bus has a CAN termination plug. Refer also to the external device's or system's instruction manual.

2. Reboot the Controller

Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.

Web Menu Navigation: Go to Advantage Settings Menu / SW Maintenance Tab / Reboot Controller button.

Optional SM-Temp Module Procedure

The analog output of the SM-Temp Module may be connected to a controller's temperature port input. In lieu of connecting the analog output of the SM-TEMP module to a temperature port input, the SM-TEMP module can simply be connected at the end of the Controller's CAN Bus (for system's equipped with an ACU+, requires ACU+ version 3.02 or later). Refer to the SM-Temp Module Instructions (UM547490) for details.

Connecting the SM-Temp Module to the Controller's CAN Bus

1. Remove the CAN termination plug from the bottom CAN connector on the System Interface circuit card of the last bay. Connect the SM-Temp Module CAN bus to the bottom CAN connector on the System Interface circuit card of the last bay, using separately ordered SM-Temp CAN bus interface cable (P/N 562868). Refer to Table 5.8 for pin-outs. Ensure the last SM-Temp Module (or if only one) has a CAN termination strap as shown in the SM-Temp Module Instructions (UM547490).

Table 5.8 CAN Connections

Pin Number	Controller CAN Port (RJ-45)	Function	SM-Temp Module CAN Port Pin Number
1		CAN L	TB1-5 (CAN L)
2		CAN H	TB1-3 (CAN H)
3		--	--
4		--	--
5		--	--
6		--	--
7		--	--
8		--	--

5.10 Controller Ethernet Connection (if required)

The controller provides a Web Interface via an Ethernet connection to a TCP/IP network. This interface can be accessed locally on a computer or remotely through a network. An RJ-45 10BaseT jack is provided on the front of the controller for connection into a customer's network. This jack has a standard Ethernet pin configuration scheme, twisted pair. Refer to Figure 5.29 for location and Table 5.9 for pin outs. Use shielded Ethernet cable (grounded at both ends). Note that the controller's RJ-45 jack is connected to chassis ground. Refer to the NCU Instructions (UM1M830BNA) for operational details.



NOTE! You can access the Web pages of the power system locally by using a "crossover" or "straight" cable connected directly between your PC and the controller.



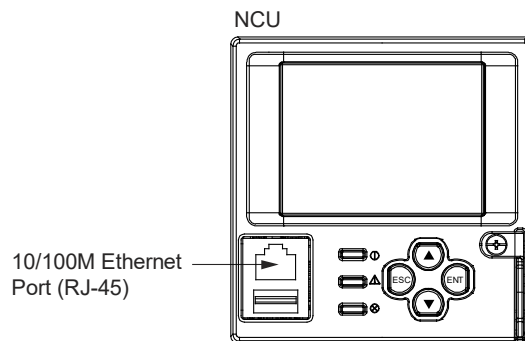
WARNING! The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly **MUST NOT** be metallically connected to the interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Revision 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

The intra-building port (RJ-45) of the equipment or subassembly must use shielded intra-building cabling/wiring that is grounded at both ends.

Table 5.9 Controller RJ-45 Ethernet Port Pin Configuration

Port Pin Number	Name	Definition
1	Tx+	Write Signal +
2	Tx-	Write Signal -
3	Rx+	Read Signal +
4	--	No connection
5	--	No connection
6	Rx-	Read Signal -
7	--	No connection
8	--	No connection

Figure 5.29 Controller Ethernet Port



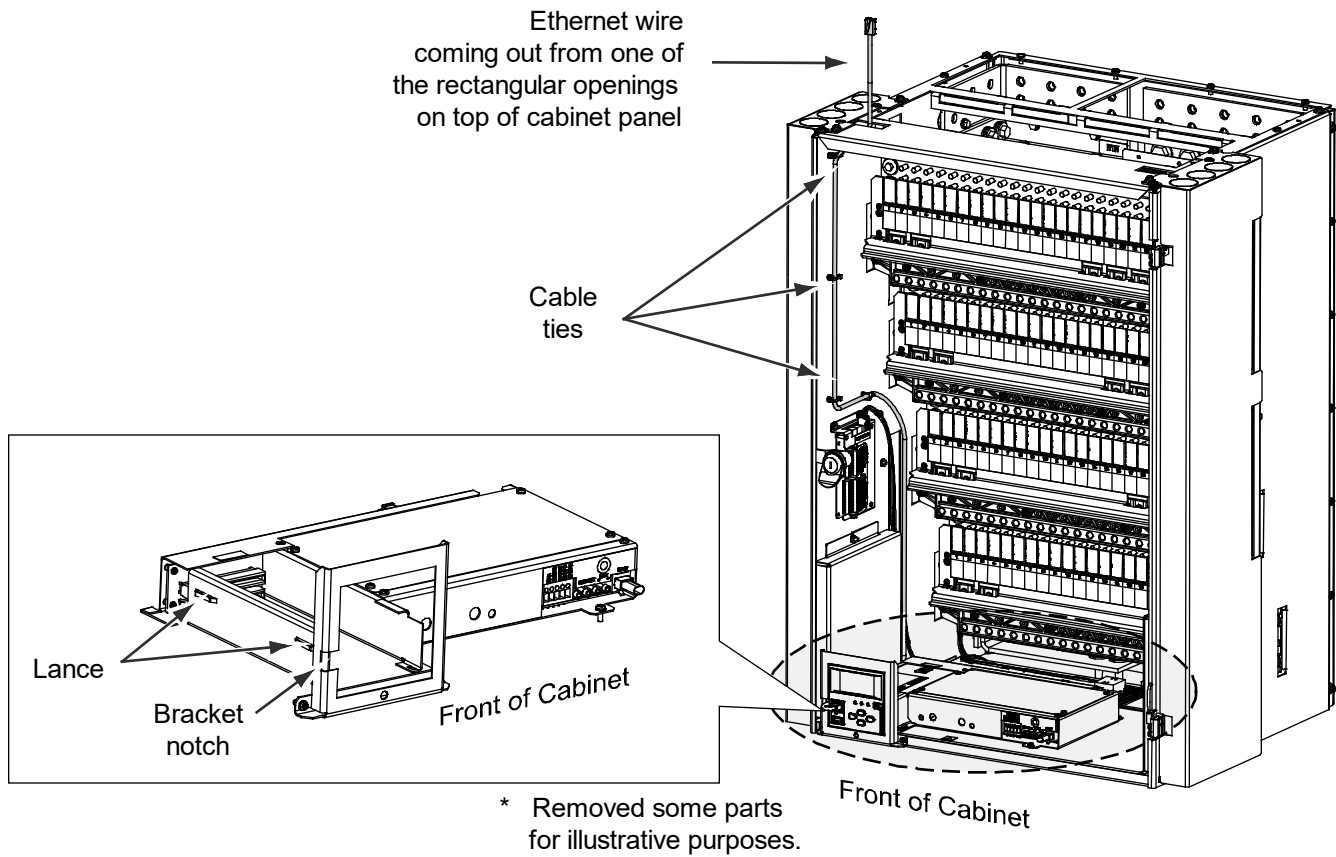
NOTE! NCU ONLY: If your system has an IB4 board, **DO NOT** connect your Local Area Network (LAN) to the NCU front Ethernet port. See "NCU Controller Second Ethernet Port Connection (if IB4 board furnished)" on page 132.

Ethernet Connection through the Power System

The Ethernet cable can be routed from the notch on the left side of the bracket. It goes through the lances on the chassis, then goes up to be bundled with the harness and all other customer alarm and signal cables.

The existing cable ties can also be used to secure the Ethernet cable as it goes up to the top panel.

Figure 5.30 Network Connection through Power System



NCU Controller Second Ethernet Port Connection (if IB4 board furnished)

Your system may be furnished with an IB4 board connected to the NCU backplane via a factory furnished and connected cable. The IB4 board provides a second Ethernet port. The Ethernet port located on the NCU Controller's front panel can ONLY be used to connect a computer directly to the NCU. The Ethernet port located on the IB4 board can be used to connect the NCU to your Local Area Network (LAN).



NOTE! If your system has an IB4 board, DO NOT connect your Local Area Network (LAN) to the NCU front Ethernet port.

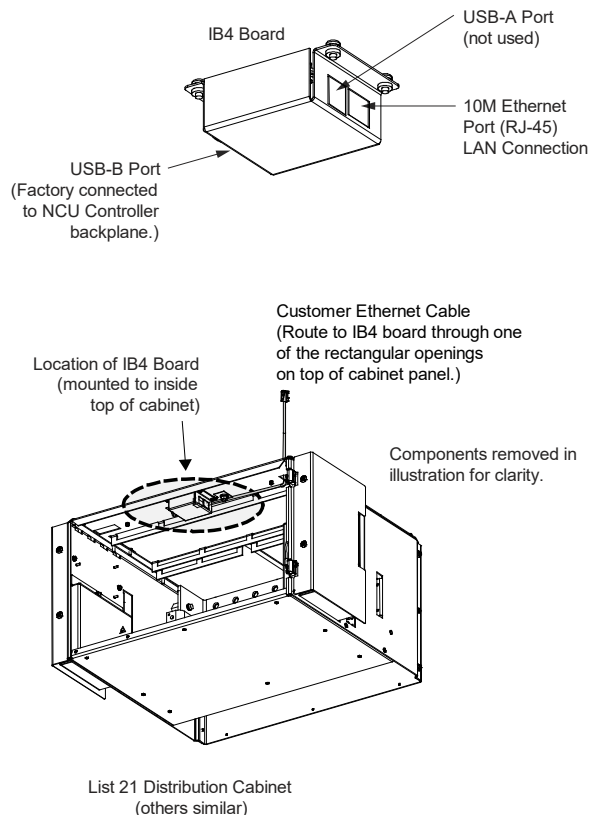
An RJ-45 10BaseT jack is provided on the IB4 board for connection into a customer's network. This jack has a standard Ethernet pin configuration scheme, twisted pair. Refer to Figure 5.31 for location and Table 5.9 for pin outs. Use shielded Ethernet cable (grounded at both ends). Note that the IB4 board's RJ-45 jack is connected to chassis ground. Refer to the NCU Instructions (UM1M830BNA) for operational details.



WARNING! The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallicly connected to the interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Revision 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallicly to OSP wiring.

The intra-building port (RJ-45) of the equipment or subassembly must use shielded intra-building cabling/wiring that is grounded at both ends.

Figure 5.31 IB4 Board NCU Controller Second Ethernet Port



5.11 Bay-to-Bay Communications Cable Connections

The bays are interconnected using standard CAT5 communications cables. Supplemental bays are provided with a 25' cable. Refer to Figure 5.32 for a bay-to-bay cable diagram. A system installed in a relay rack is shown in the illustration. The procedure for a system installed in an enclosure is similar.



NOTE! Maximum combined length of the CAT5 communications cables is 328' (100m) per industry standards.

Procedure – Two Bay System

1. For each bay in the power system, open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Remove the terminating plug from the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay and place in the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card in the 1st Supplemental Bay.
3. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card installed in the 1st Supplemental Bay.
4. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 1st Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 1st Supplemental Bay.
5. For each bay in the power system, close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack) or close the system's enclosure door.
6. Reboot the Controller

Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.

Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.

Procedure – Three Bay System

1. For each bay in the power system, open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Remove the terminating plug from the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay and place in the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card in the last bay.
3. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card installed in the 1st Supplemental Bay.
4. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 1st Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 1st Supplemental Bay.
5. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 2nd Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 2nd Supplemental Bay.
6. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card installed in the 1st Supplemental Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card in the 2nd Supplemental Bay.

7. For each bay in the power system, close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack) or close the system's enclosure door.
8. Reboot the Controller
Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.
Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.

Procedure – Four Bay System

1. For each bay in the power system, open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Remove the terminating plug from the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay and place in the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card in the last bay.
3. Remove the terminating plug from the top connector (CAN2) on the System Interface Circuit Card installed in the Main Bay and place in the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the last bay.
4. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card installed in the 1st Supplemental Bay.
5. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 1st Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 1st Supplemental Bay.
6. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 2nd Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 2nd Supplemental Bay.
7. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card installed in the 1st Supplemental Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card in the 2nd Supplemental Bay.
8. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card installed in the 2nd Supplemental Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card in the 3rd Supplemental Bay.
9. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the top connector (CAN2) on the System Interface Circuit Card installed in the Main Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 3rd Supplemental Bay.
10. For each bay in the power system, close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack) or close the system's enclosure door.
11. Reboot the Controller
Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.
Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.



NOTE! If the multi-bay plant is equipped with more than seventy-two (72) rectifier slots (for 1R483500E3 or 1R484000E rectifiers) or more than sixty (60) rectifier slots (for 1R483500E rectifiers), connect the CAT5 cable from CAN2 of the main bay to (RECT_CAN IN) of the bay with the 73rd rectifier slot (for 1R483500E3 or 1R484000E rectifiers) or the bay with the 61st slot (for 1R483500E rectifiers). **CAN1** from Main Bay has to connect to all supplemental bays **SM_CAN** and will be used for **RECT_CAN** until the maximum rectifies have been used. **CAN2** from Main Bay is only used for **RECT_CAN** after (72) rectifier slots (for 1R483500e3 or 1R484000e rectifiers) or after (60) rectifier slots (for 1R483500e rectifiers) have been used.

Procedure – Five Bay System

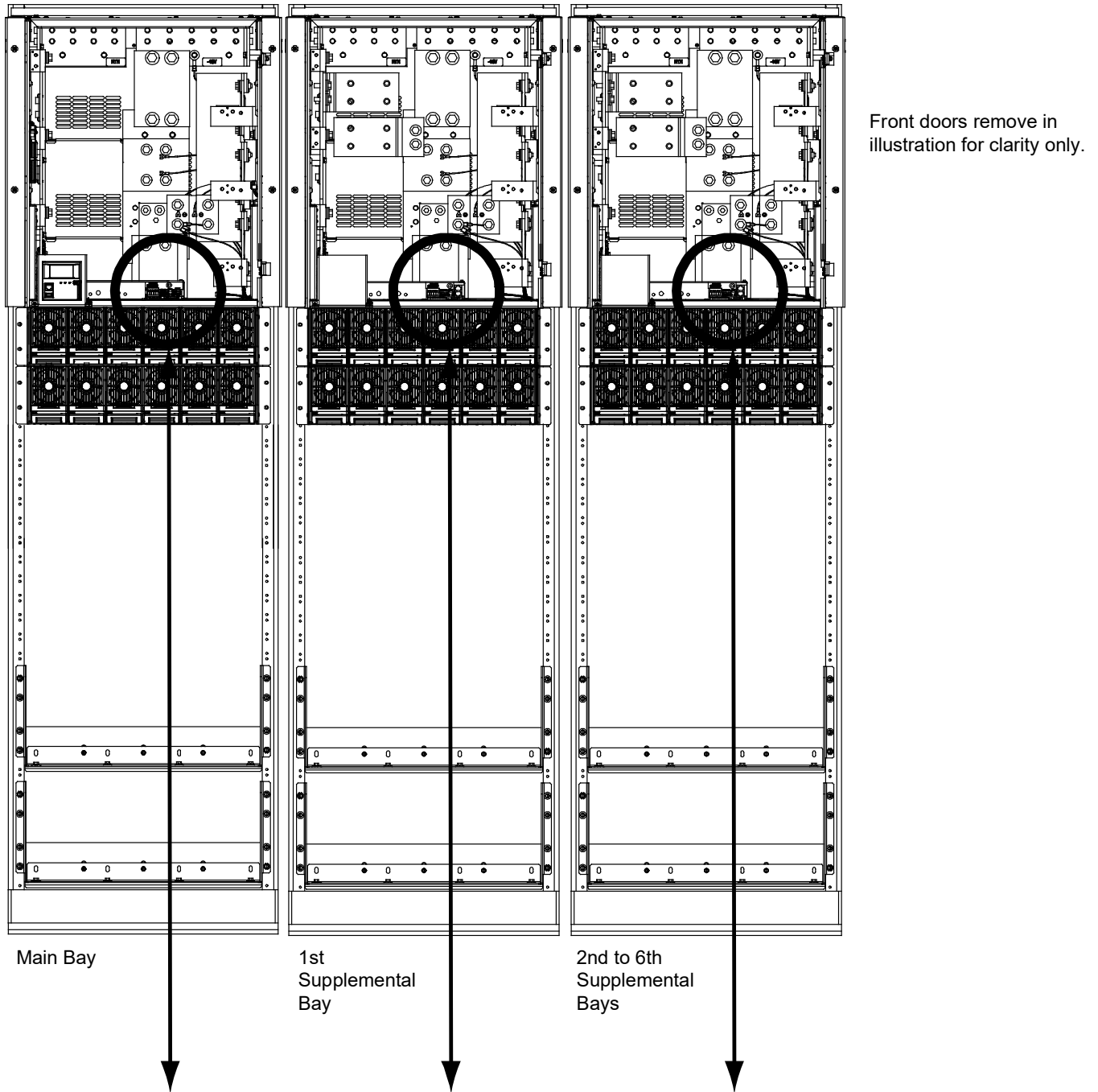
1. For each bay in the power system, open the distribution cabinet's front door by turning the latch in the counterclockwise position (system's in a relay rack), or open the system's enclosure door.
2. Remove the terminating plug from the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay and place in the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card in the last bay.
3. Remove the terminating plug from the top connector (CAN2) on the System Interface Circuit Card installed in the Main Bay and place in the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the last bay.
4. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (CAN1) on the System Interface Circuit Card installed in the Main Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card installed in the 1st Supplemental Bay.
5. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 1st Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 1st Supplemental Bay.
6. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card in the 2nd Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 2nd Supplemental Bay.
7. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card installed in the 1st Supplemental Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card in the 2nd Supplemental Bay.
8. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card installed in the 2nd Supplemental Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card in the 3rd Supplemental Bay.
9. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (SM_CAN OUT) on the CAN Interface Circuit Card installed in the 3rd Supplemental Bay to the top connector (SM_CAN IN) on the CAN Interface Circuit Card in the 4th Supplemental Bay.
10. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the bottom connector (RECT_CAN OUT) on the System Interface Circuit Card installed in the 3rd Supplemental Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card in the 4th Supplemental Bay.
11. Using a standard CAT5 communications cable (provided with each supplemental bay) connect the top connector (CAN2) on the System Interface Circuit Card installed in the Main Bay to the top connector (RECT_CAN IN) on the System Interface Circuit Card installed in the 3rd Supplemental Bay.
12. For each bay in the power system, close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack) or close the system's enclosure door.
13. Reboot the Controller

Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.

Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.

NOTE! If the multi-bay plant is equipped with more than seventy-two (72) rectifier slots (for 1R483500E3 or 1R484000E rectifiers) or more than sixty (60) rectifier slots (for 1R483500E rectifiers), connect the CAT5 cable from CAN2 of the main bay to (RECT_CAN IN) of the bay with the 73rd rectifier slot (for 1R483500E3 or 1R484000E rectifiers) or the bay with the 61st slot (for 1R483500E rectifiers). **CAN1** from Main Bay has to connect to all supplemental bays **SM_CAN** and will be used for **RECT_CAN** until the maximum rectifies have been used. **CAN2** from Main Bay is only used for **RECT_CAN** after (72) rectifier slots (for 1R483500e3 or 1R484000e rectifiers) or after (60) rectifier slots (for 1R483500e rectifiers) have been used.

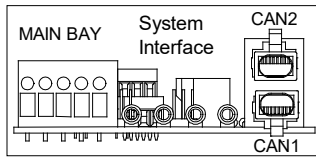
Figure 5.32 Bay-to-Bay Communications Cable Connections (cont'd on next page)



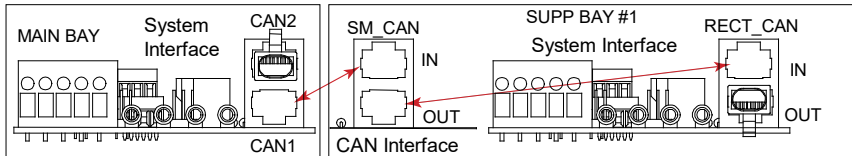
(Continued on next page)

Figure 5.32 Bay-to-Bay Communications Cable Connections (cont'd from previous page)

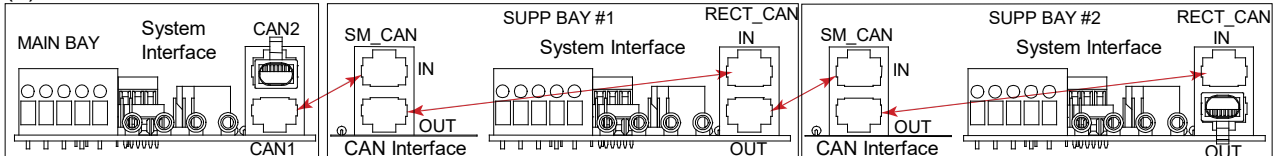
(1) BAY SYSTEM



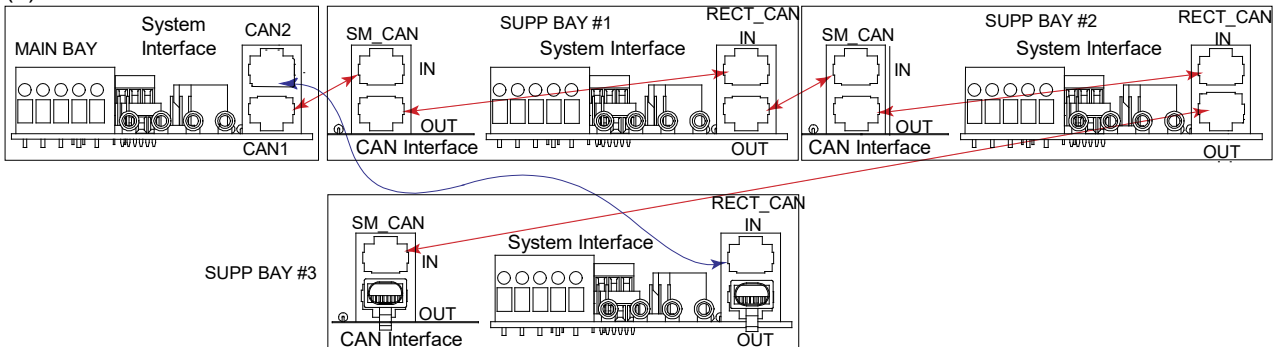
(2) BAY SYSTEM



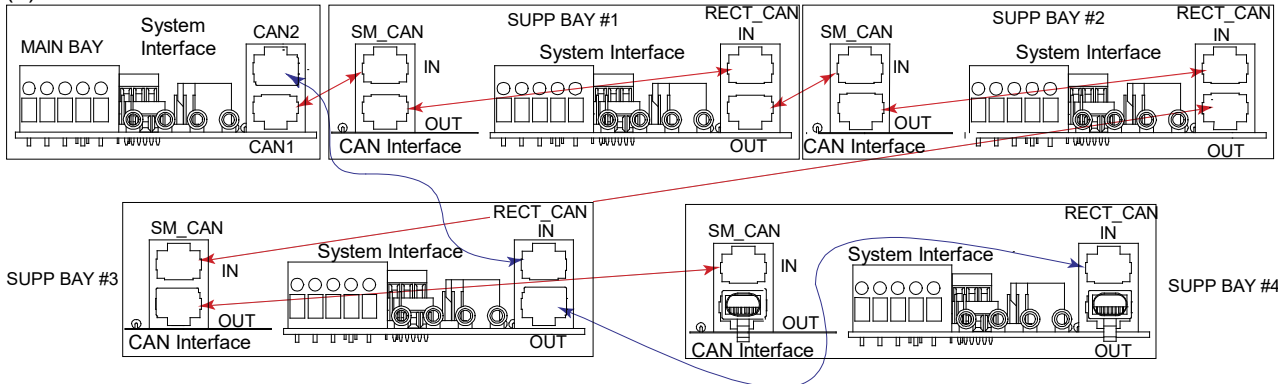
(3) BAY SYSTEM



(4) BAY SYSTEM



(5) BAY SYSTEM



NOTE: Use standard CAT5 communications cables.

- Diagrams above are for typical configurations. CAN1 is used for all SM_CAN connections and for RECT_CAN connections up through and including the bay with the 72nd rectifier slot maximum (for 1R483500E3 or 1R484000E) or the 60th rectifier slot maximum (for 1R483500E). CAN2 of the Main Bay should be connected to RECT_CAN IN in the supplementary bay that has the 73rd rectifier slot (for 1R483500E3 or 1R484000E) or the 61st rectifier slot (for 1R48500E).

5.12 Installing Bay-to-Bay Busbars (582127000 List 1 with List 2 / List 3) (for system mounted in a relay rack)



NOTE! The current rating of the inter-bay bus bars is 2000 amps maximum. Rectifier placement, load and battery connections should be such that this maximum current is not exceeded.

Procedure

1. When 582127000 List 3 and/or List 2 is ordered, bay-to-bay busbars and hardware are provided for system power connections between distribution cabinets. Interconnect per Figure 5.33.

Figure 5.33 Installing Bay-to Bay Busbars (List 2 and 3 Only) (for system mounted in a relay rack) (cont'd on next page)

1. Remove center right (4-Row Cab.) or lower right (3-Row Cab.) Rear Access Cover from distribution cabinets (note that the complete rear cover is removed in the illustration for clarity only).
2. Attach Return Angle Brackets.
3. Attach -48V Angle Brackets.

4. Attach flat Return Interbay Busbars.
5. Attach flat -48V Interbay Busbars.
6. Attach Insulator Standoffs onto Return Interbay Busbars.

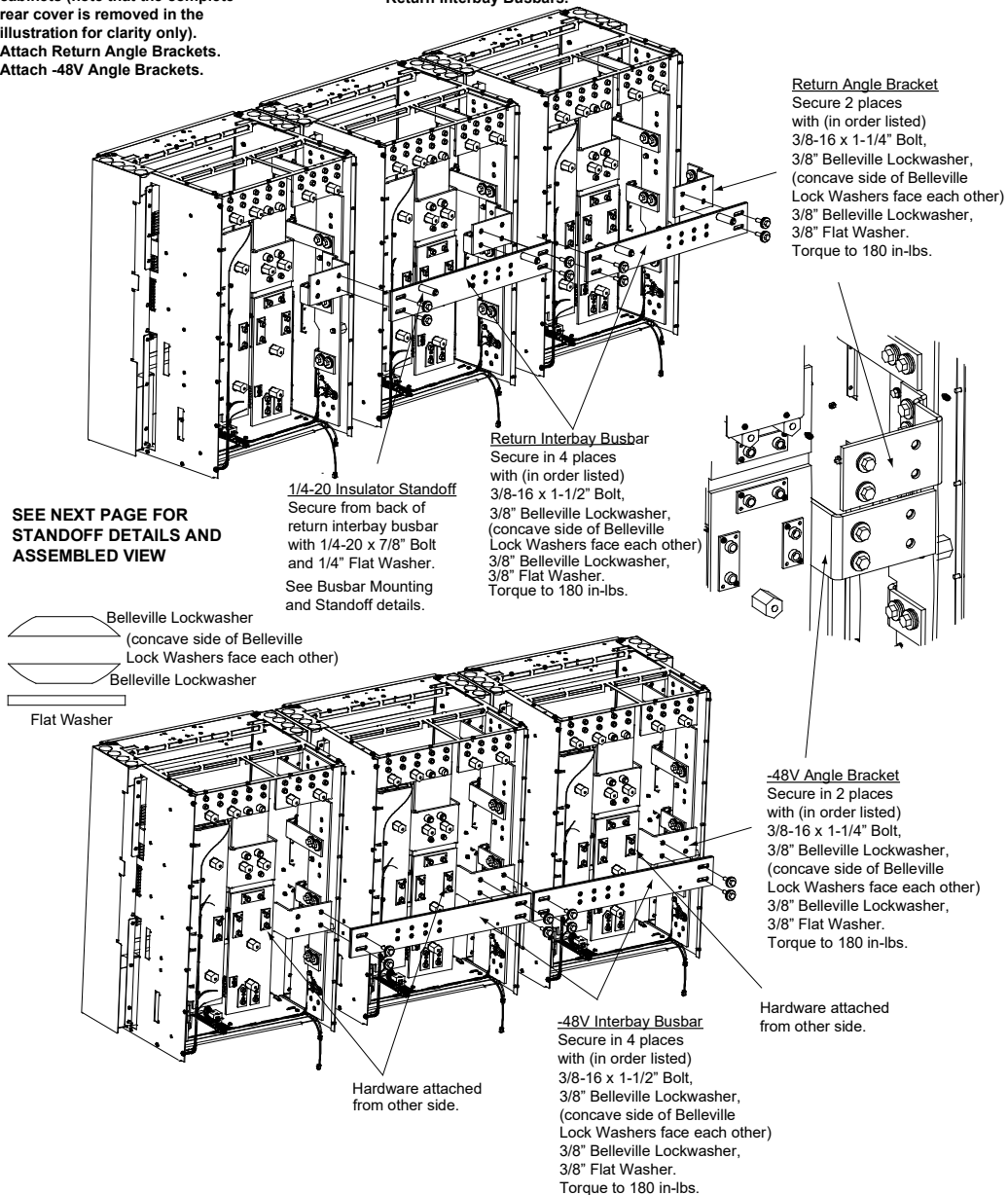
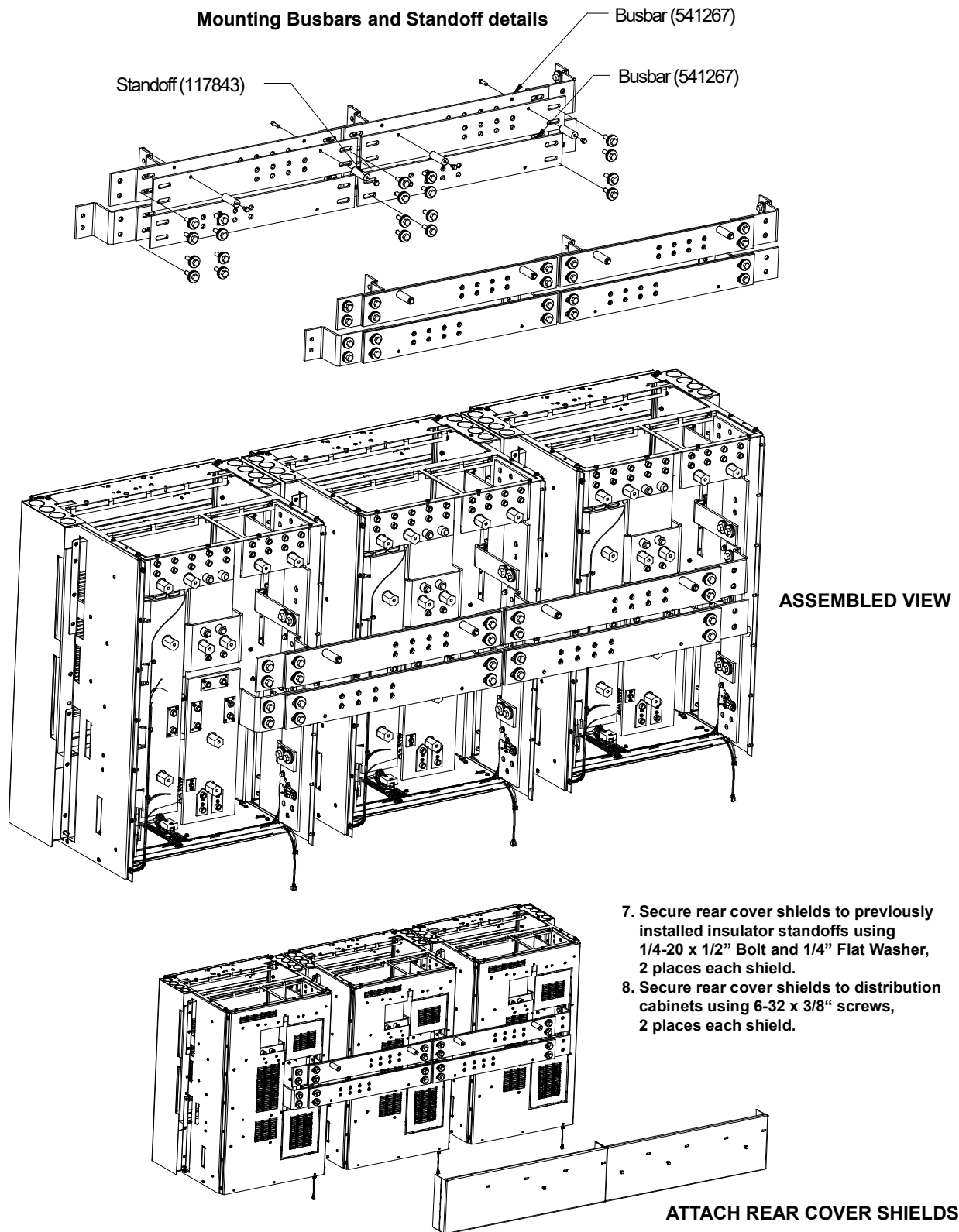


Figure 5.33 Installing Bay-to Bay Busbars (List 2 and 3 Only) (for system mounted in a relay rack) (cont'd from previous page)



5.13 Installing Bay-to-Bay Busbars (582127000 List 1 with List 7 / List 8) (for system mounted in an enclosure)



NOTE! The current rating of the inter-bay bus bars is 2000 amps maximum. Rectifier placement, load and battery connections should be such that this maximum current is not exceeded.

Procedure

1. When 582127000 List 8 and/or List 7 is ordered, bay-to-bay busbars and hardware are provided for system power connections between distribution cabinets. Interconnect per Figure 5.34.

Figure 5.34 Installing Bay-to-Bay Busbars (List 7 and 8 Only) (for system mounted in an enclosure) (cont'd on next page)

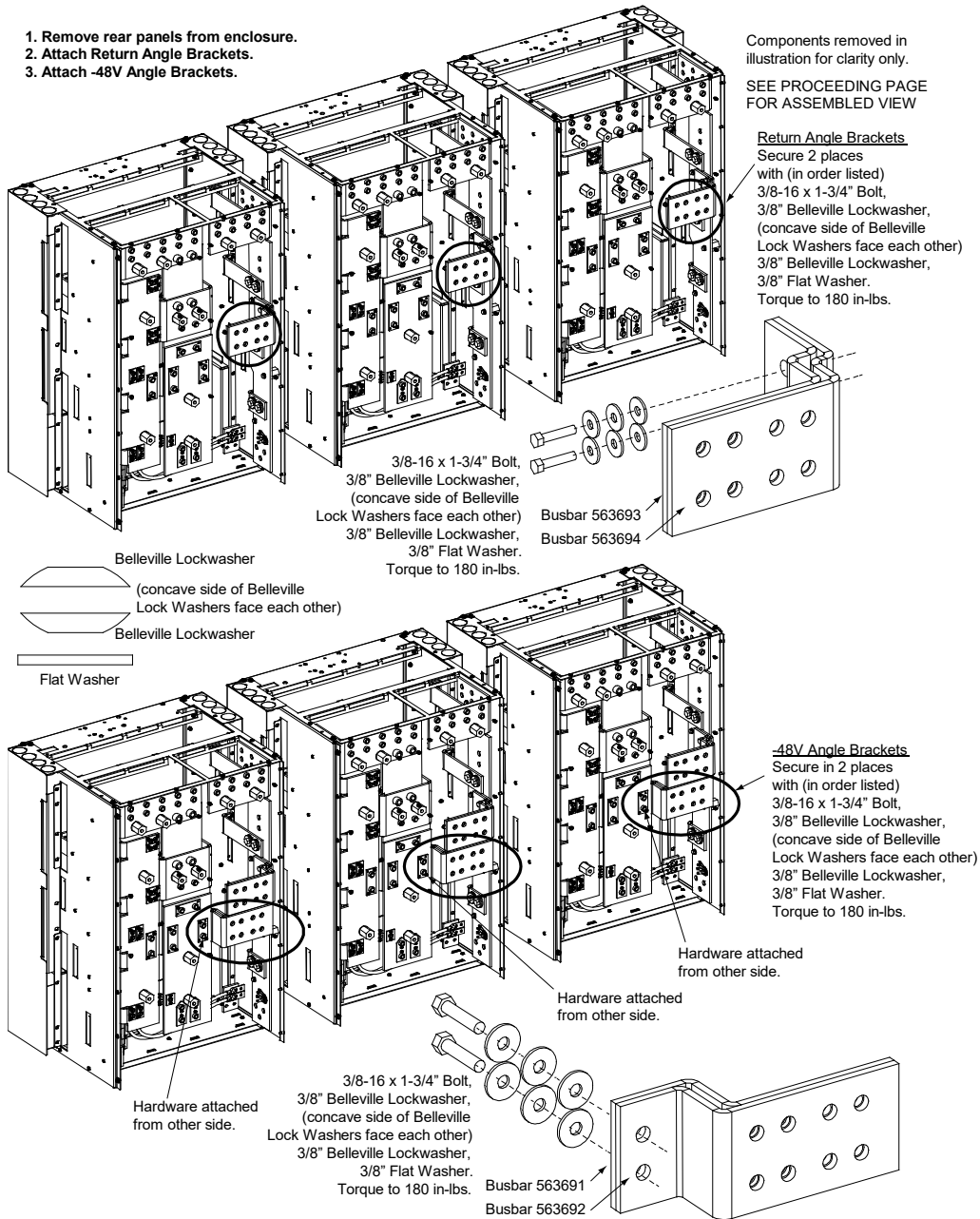


Figure 5.34 Installing Bay-to-Bay Busbars (List 7 and 8 Only) (for system mounted in an enclosure) (cont'd from previous page, cont'd on next page)

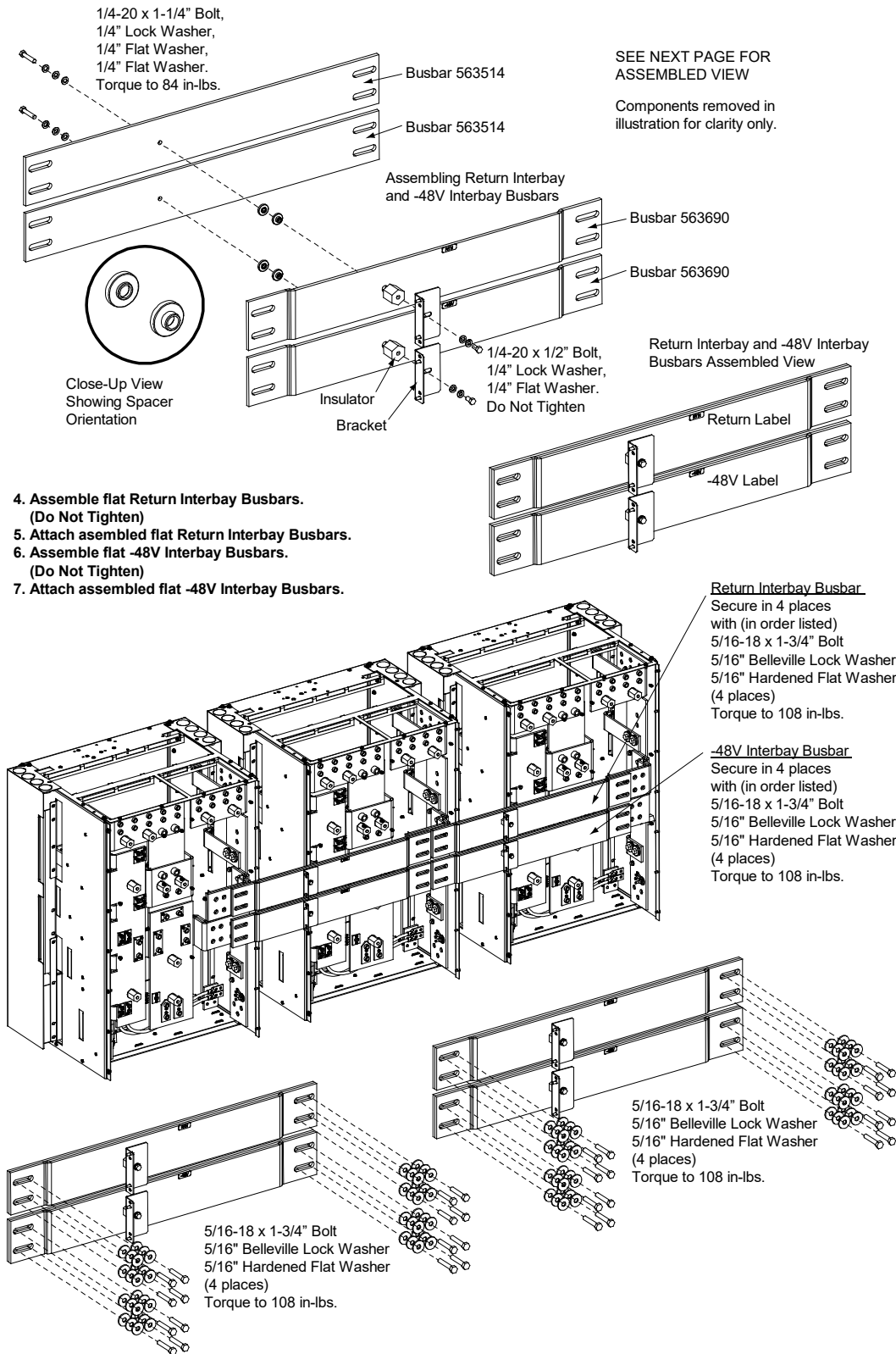
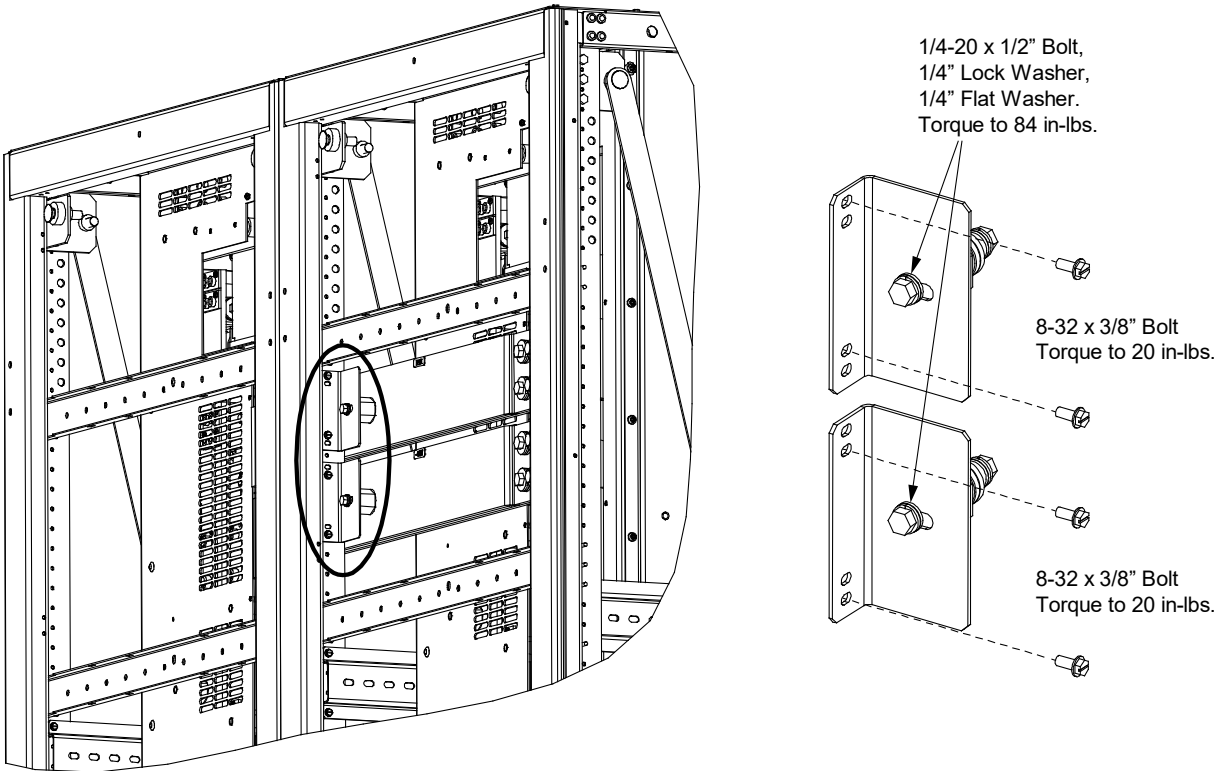
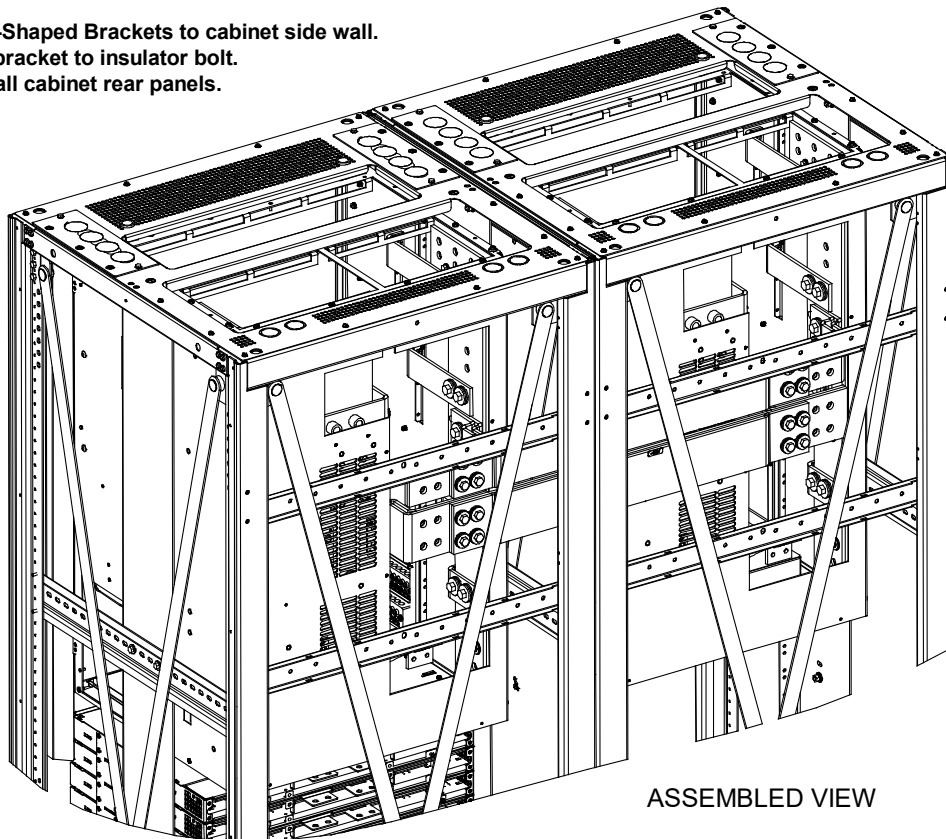


Figure 5.34 Installing Bay-to-Bay Busbars (List 7 and 8 Only) (for system mounted in an enclosure) (cont'd from previous page)



- 8. Attach L-Shaped Brackets to cabinet side wall.
- 9. Tighten bracket to insulator bolt.
- 10. Re-Install cabinet rear panels.

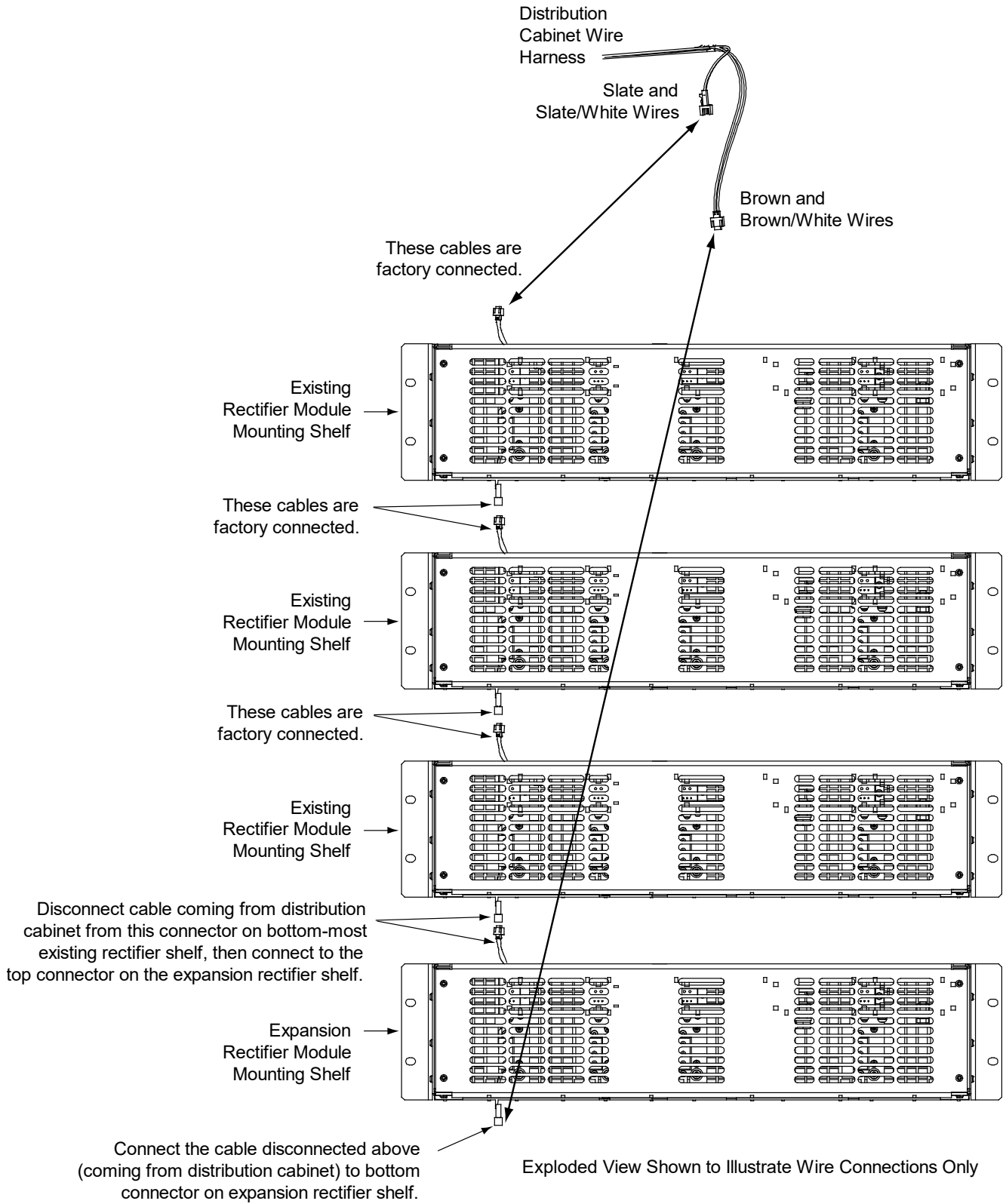


5.14 Control Bus Connections between Controller and Module Mounting Assemblies Spec. No. 588705000 and 588705500

Each Spec. No. 588705000 and 588705500 module mounting assembly in the system is daisy-chained to the controller. A Controller CAN Bus connector is located at the top of each shelf and another at the bottom of each shelf. These connectors are used to interconnect the shelves to the controller. Refer to Figure 5.35 for connector locations. These connections are factory made for shelves factory installed. The connection must be made if a rectifier field expansion shelf is installed as shown in Figure 5.35. For field expansion, refer to the procedure in Power System User Instructions UM582127000.

- The top connector of the top most module mounting assembly connects to the controller.
- The bottom connector of a shelf plugs into the top connector on the shelf below it.
- The bottom connector on the bottom most shelf must terminate back into the distribution cabinet.

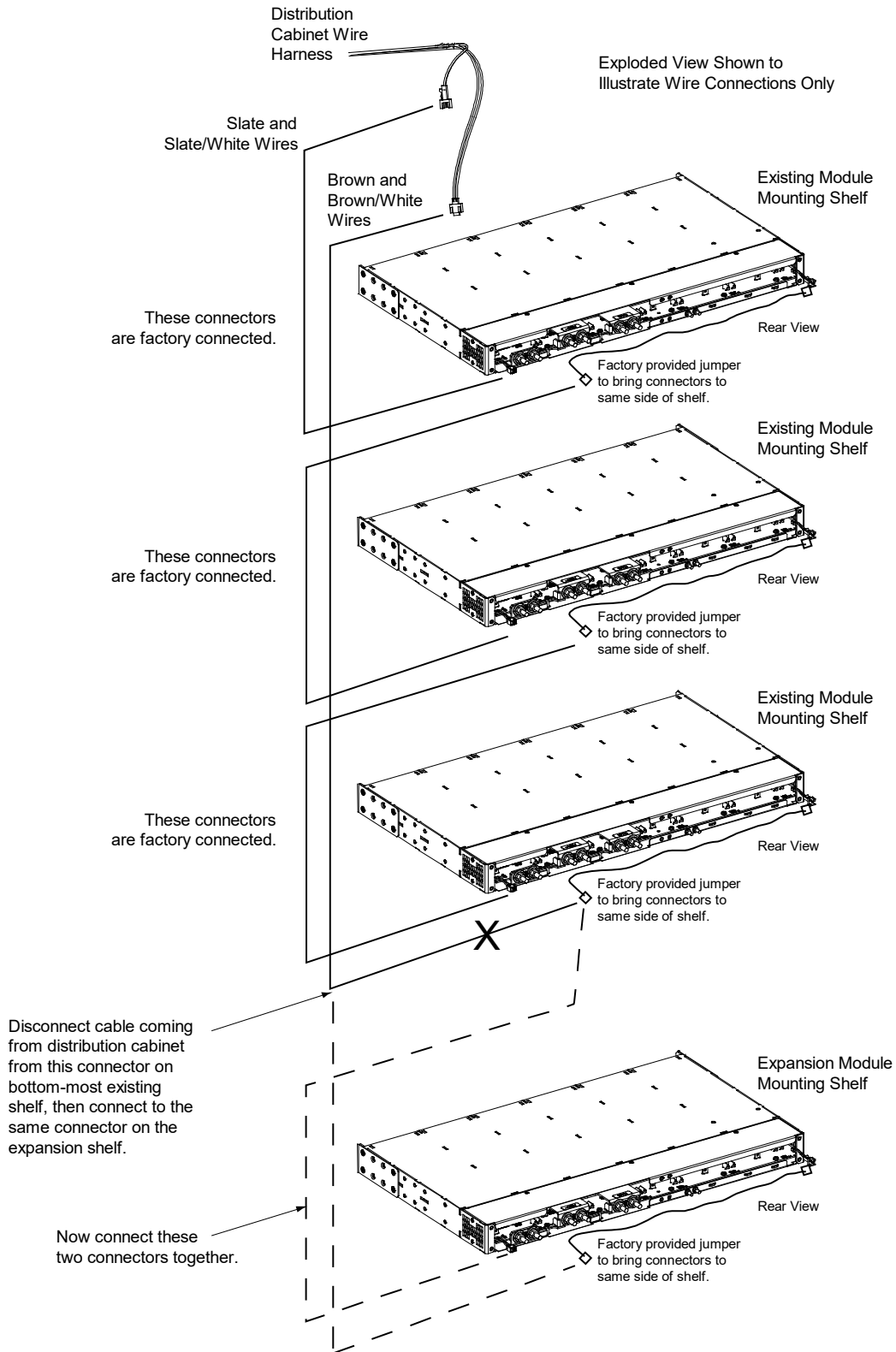
Figure 5.35 Control Bus Connections between Controller and Module Mounting Assemblies Spec. No. 588705000 and 588705500



5.15 Control Bus Connections between Controller and Module Mounting Assemblies Spec. No. 588705300

Each Spec. No. 588705300 module mounting assembly in the system is daisy-chained to the controller. Controller CAN Bus connectors are located at the left and right rear of each shelf. These connectors are used to interconnect the shelves to the controller and to other shelves. The right side connector is factory jumpered so both connectors can be accessed from the left side of the shelf. Refer to Figure 5.36 for connector locations and an interconnect diagram. These connections are factory made for shelves factory installed. The connection must be made if a rectifier field expansion shelf is installed as shown in Figure 5.36. For field expansion, refer to the procedure in Power System User Instructions UM582127000.

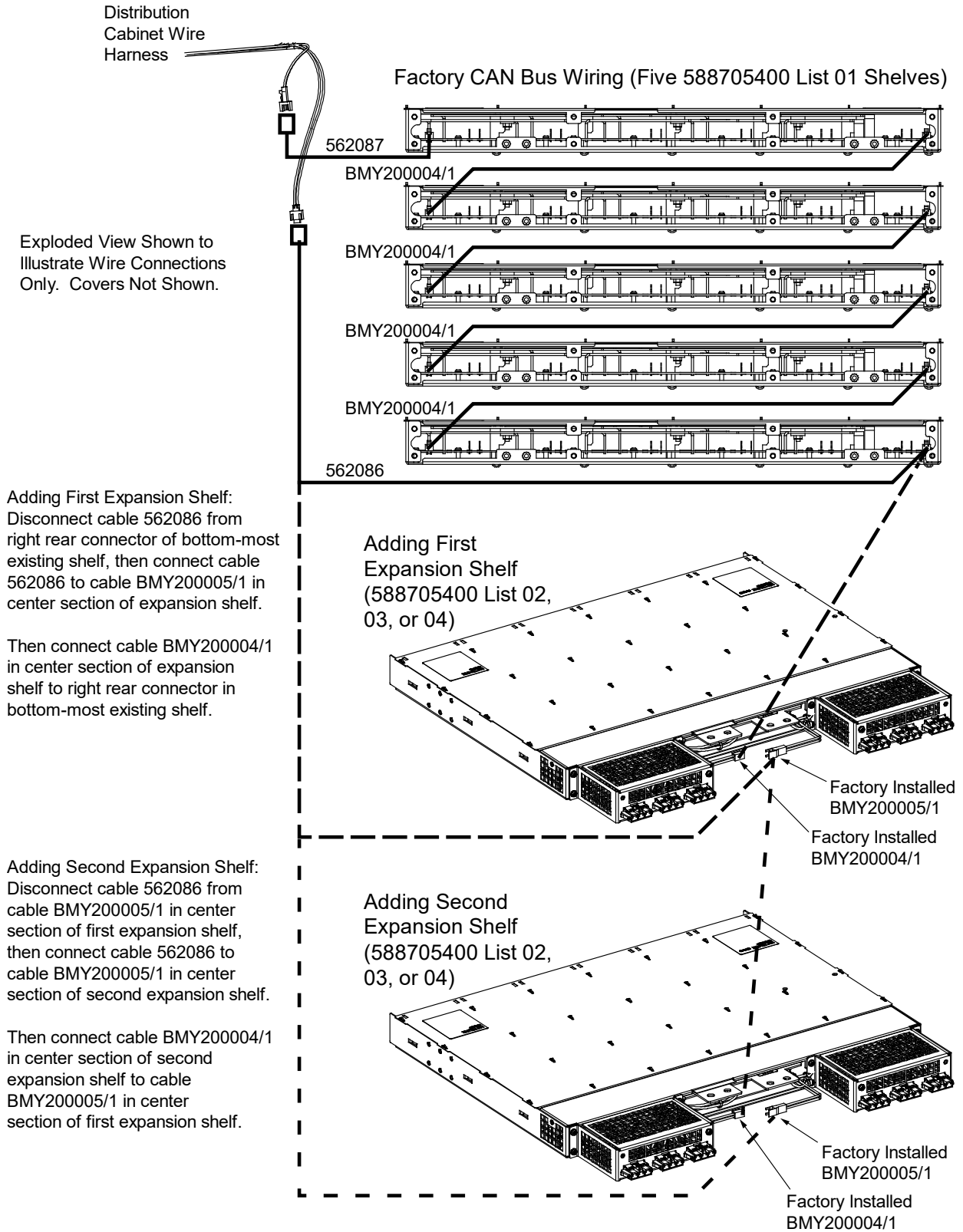
Figure 5.36 Control Bus Connections between Controller and Module Mounting Assemblies Spec. No. 588705300



5.16 Control Bus Connections between Controller and Module Mounting Assemblies Spec. No. 588705400

Each Spec. No. 588705400 module mounting assembly in the system is daisy-chained to the controller. Controller CAN Bus connectors are located at the left and right rear of each shelf. These connectors are used to interconnect the shelves to the controller and to other shelves. In expansion shelves, these connectors are factory jumpered so both connectors can be accessed from the center of the shelf. Refer to Figure 5.37 for connector locations and an interconnect diagram. These connections are factory made for shelves factory installed. The connection must be made if a rectifier field expansion shelf is installed as shown in Figure 5.37. For field expansion, refer to the procedure in Power System User Instructions UM582127000.

Figure 5.37 Control Bus Connections between Controller and Module Mounting Assemblies Spec. No. 588705400



5.17 Connecting Converter Output Cables 582127000 List 60



NOTE! These connections are factory made for shelves factory installed. The connection must be made if a field expansion shelf is installed.

Connecting List 60 Converter Output Cables to List DE, DF, DG, DH, DJ, or DK Distribution Panel

Procedure

1. A converter output cable is provided for each rectifier/converter shelf installed in the system, up to a maximum of four (4). Locate the output cables (labeled /+/-).
2. Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
3. Loosen the screws holding the plastic shield over the circuit breakers or fuseholders on the dual voltage distribution panel. Slide the shield upwards and remove.
4. Connect the output cables to the distribution bus panel subsystem (+24V) input terminals as shown in Figure 5.38. Apply electrical anti-oxidizing compound to lug mating surfaces before connecting. Mount two lugs back-to-back per mounting position if required. Torque as shown in Figure 5.38.
5. Continue with the next procedure.

Connecting List 60 Converter Output Cables to Module Mounting Assembly(s) Spec. No. 588705300

Procedure

1. Route the output cables installed in the previous procedure over the top of the distribution bus panel ground bar, toward the back of the cabinet, and down through the opening in the bottom of the distribution cabinet (between the cabinet main busbars).
2. Install the distribution panel shield removed in the previous procedure. To do so, position the shield and slide downwards on screws. Tighten screws.
3. Close the front door of the distribution cabinet.
4. Remove the rear cover from the rectifier/converter shelf(s).
5. Route the output cables previously connected to the distribution cabinet into the area at the rear of the module mounting assembly(s) Spec. No. 588705300.
6. Connect the output cables to the module mounting assembly(s) Spec. No. 588705300 +24V bus as shown in Figure 5.38. Apply electrical anti-oxidizing compound to lug mating surfaces before connecting. Torque as shown in Figure 5.38.
7. Reinstall the rectifier/converter shelf(s) rear cover.

Figure 5.38 Installing Converter Output Cables (cont'd on next page)

Dual Voltage Distribution Panel

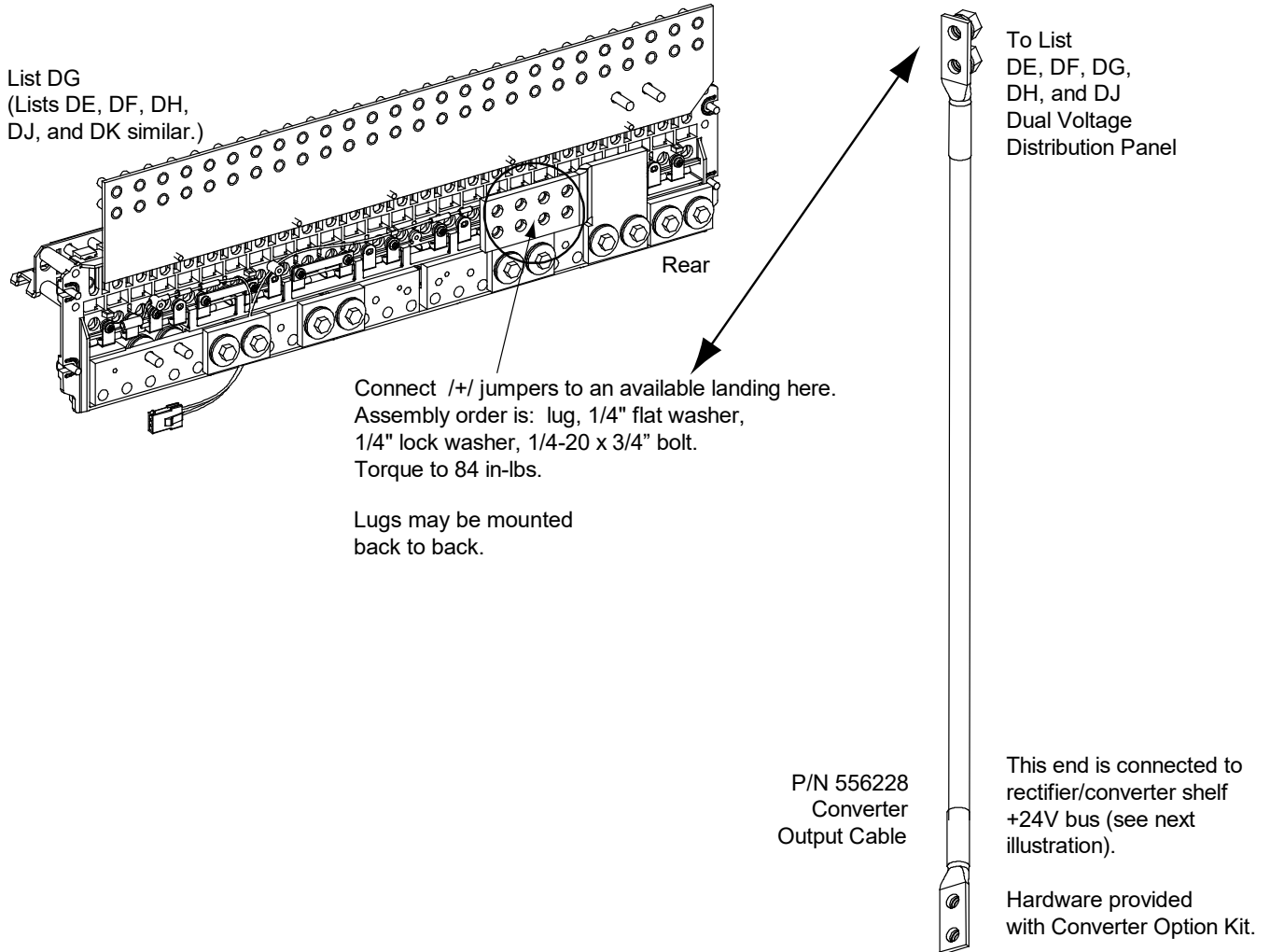
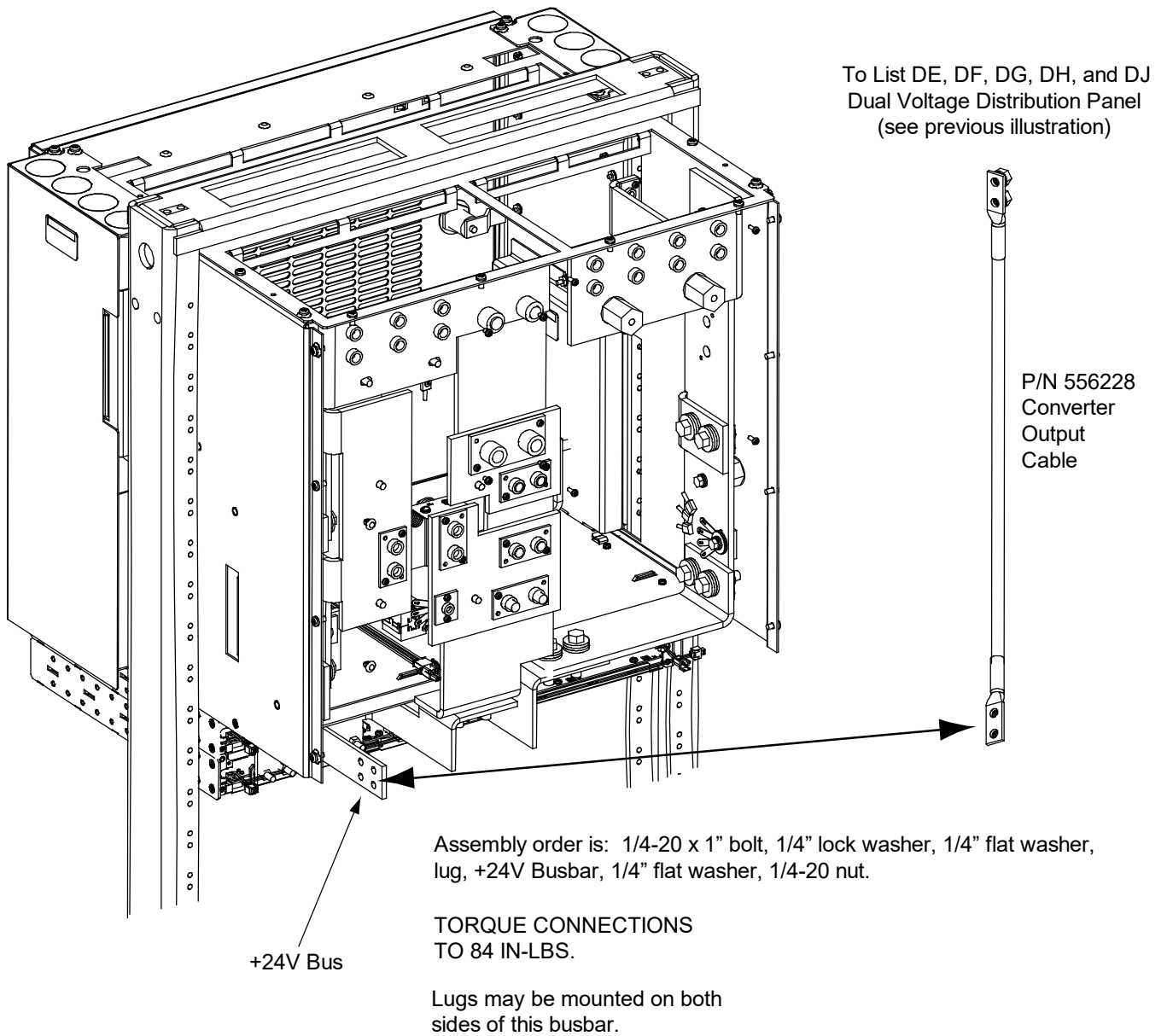


Figure 5.38 Installing Converter Output Cables (cont'd from previous page, cont'd on next page)



5.18 Connecting Converter Output Cables 582127000 List 62



NOTE! These connections are factory made for shelves factory installed. The connection must be made if a field expansion shelf is installed.

Connecting List 62 Converter Output Cables to List FE, FF, FG, FH, FJ, or FK Distribution Panel

Procedure

1. A converter output cable is provided for each rectifier/converter shelf installed in the system, up to a maximum of four (4). Locate the output cables (labeled /+/-).
2. Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
3. Loosen the screws holding the plastic shield over the circuit breakers or fuseholders on the dual voltage distribution panel. Slide the shield upwards and remove.
4. Connect the output cables to the distribution bus panel subsystem (-58V) input terminals as shown in Figure 5.39. Apply electrical anti-oxidizing compound to lug mating surfaces before connecting. Mount two lugs back-to-back per mounting position if required. Torque as shown in Figure 5.39.
5. Continue with the next procedure.

Connecting List 62 Converter Output Cables to Module Mounting Assembly(s) Spec. No. 588705300

Procedure

1. Route the output cables installed in the previous procedure over the top of the distribution bus panel ground bar, toward the back of the cabinet, and down through the opening in the bottom of the distribution cabinet (between the cabinet main busbars).
2. Install the distribution panel shield removed in the previous procedure. To do so, position the shield and slide downwards on screws. Tighten screws.
3. Close the front door of the distribution cabinet.
4. Remove the rear cover from the rectifier/converter shelf(s).
5. Route the output cables previously connected to the distribution cabinet into the area at the rear of the module mounting assembly(s) Spec. No. 588705300.
6. Connect the output cables to the module mounting assembly(s) Spec. No. 588705300 -58V bus as shown in Figure 5.39. Apply electrical anti-oxidizing compound to lug mating surfaces before connecting. Torque as shown in Figure 5.39.
7. Reinstall the rectifier/converter shelf(s) rear cover.

Figure 5.39 Installing Converter Output Cables (cont'd on next page)

Dual Voltage Distribution Panel

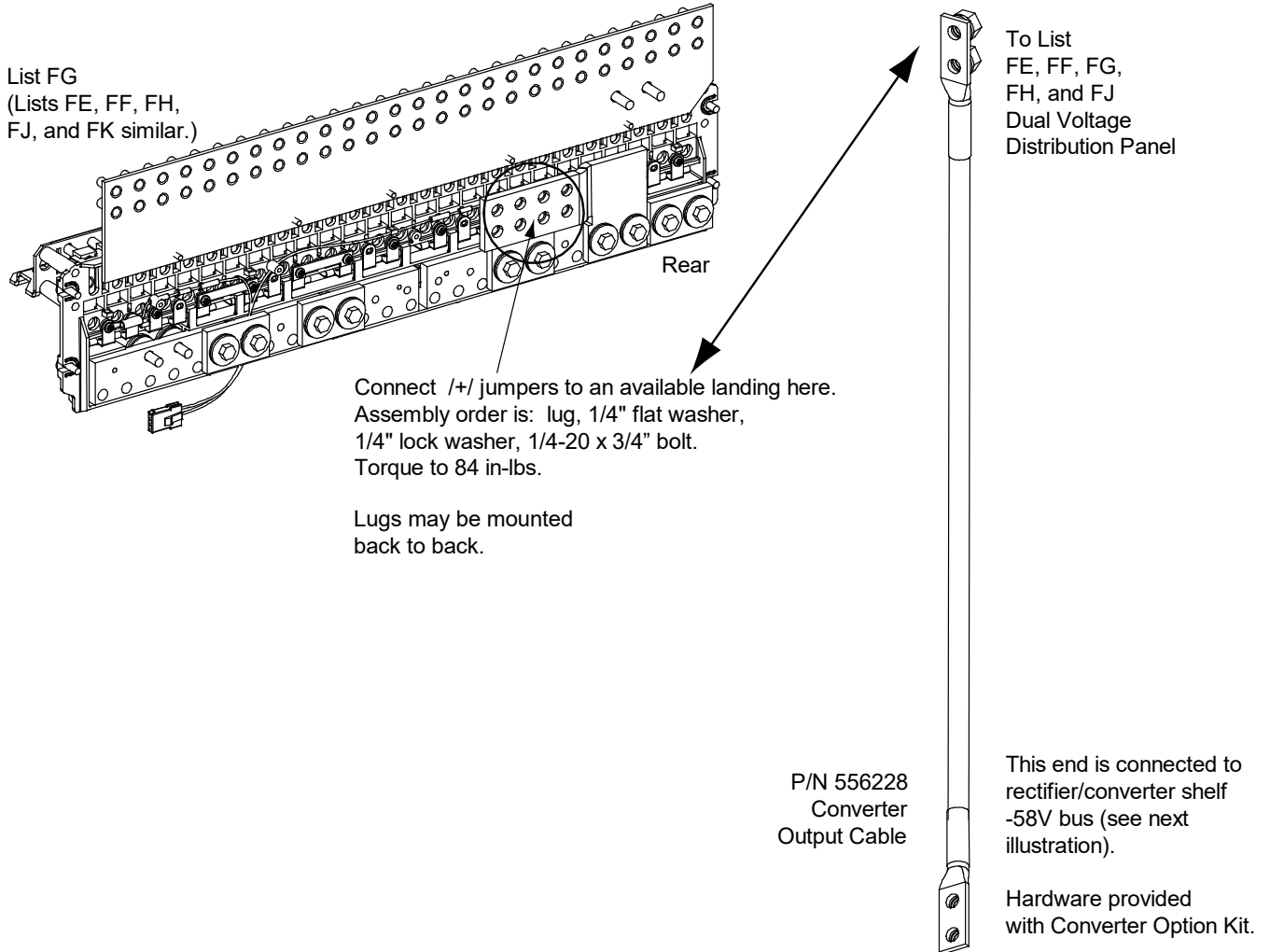
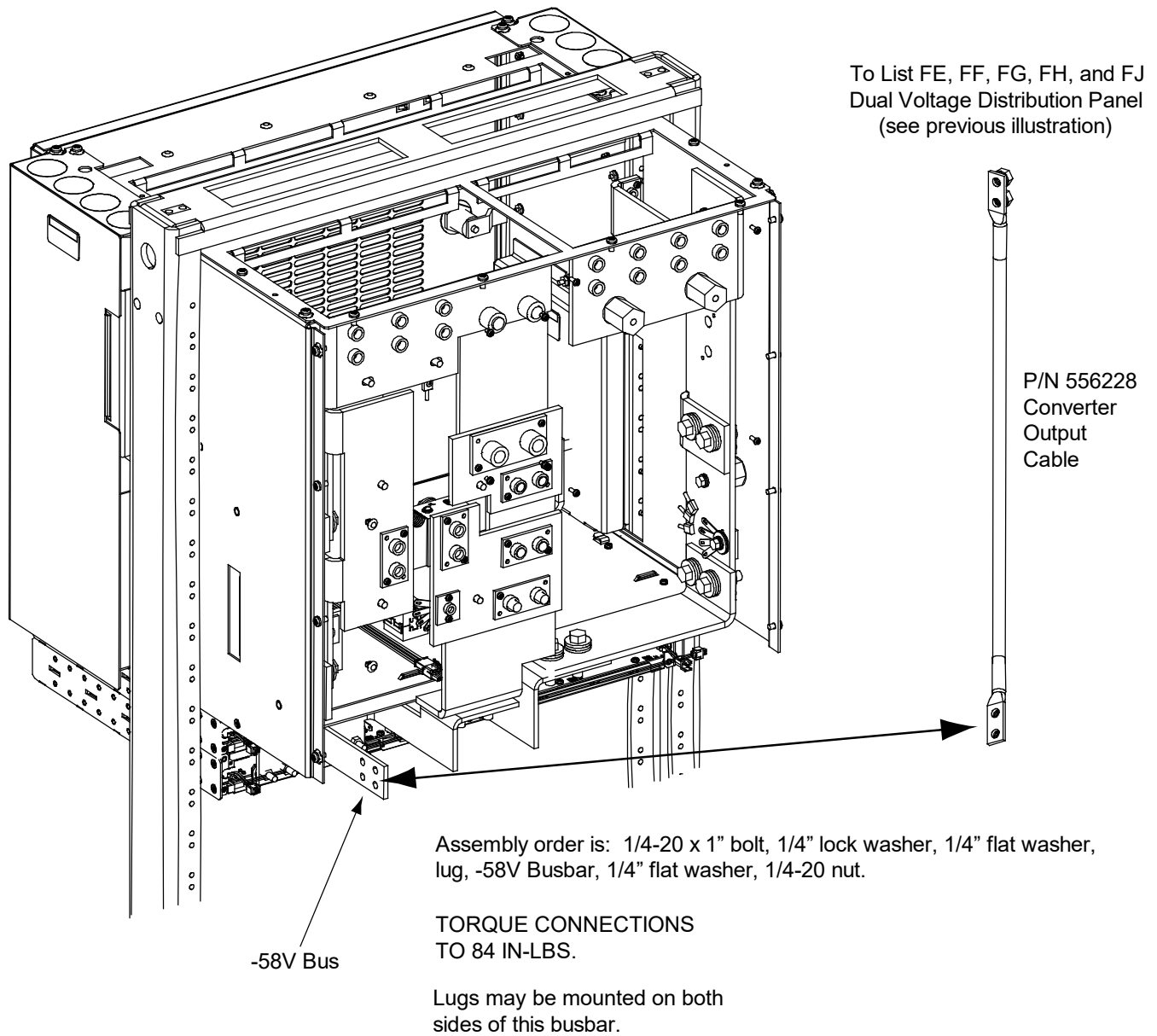


Figure 5.39 Installing Converter Output Cables (cont'd from previous page, cont'd on next page)



5.19 Load Connections

Loads are connected to the various distribution panels located inside the distribution cabinet(s), as detailed in this section.

5.19.1 Recommended Torques

- 72 in-lbs for 1/4-inch hardware (when using standard flat and lock washer).
- 300 in-lbs for 3/8-inch hardware (when using standard flat and lock washer).

5.19.2 Load Connections to Single Voltage Distribution Panels

Figure 5.40 List AC: -48V Distribution Panel (with Return Busbar) and List AD: -48V Distribution Panel (without Return Busbar), (4) GJ/218 Circuit Breaker Positions

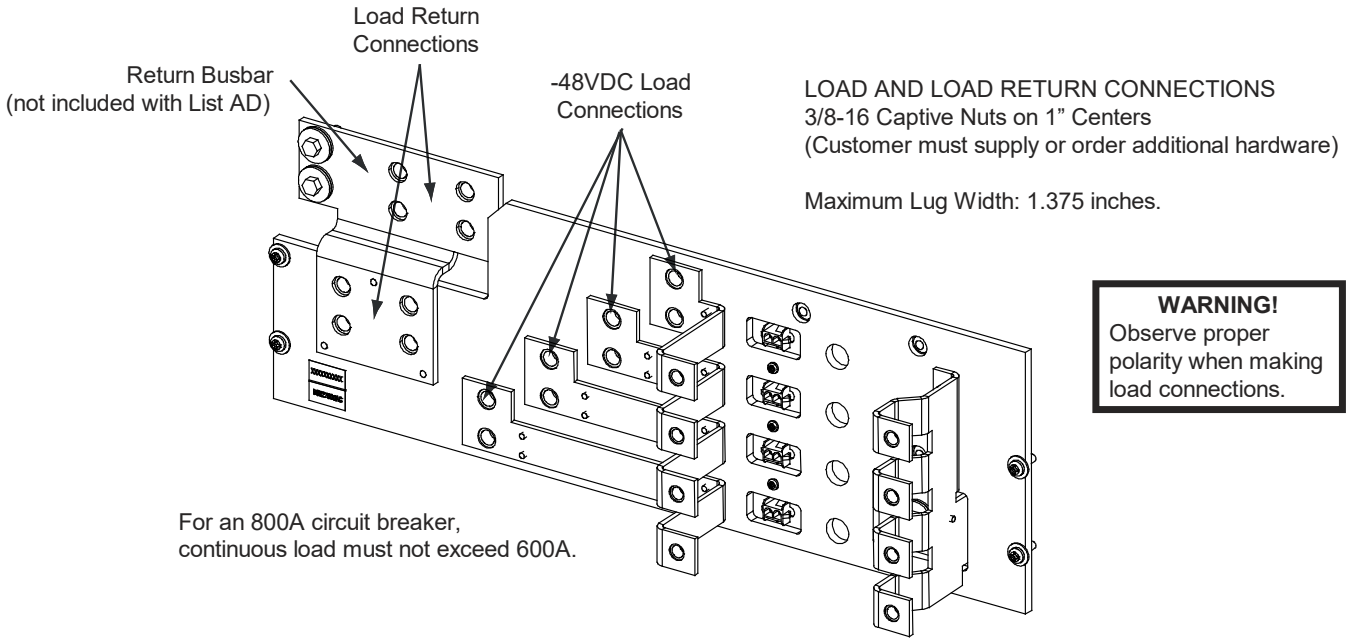


Figure 5.41 List AF: -48V Distribution Panel, (2) TPH Fuse Positions (with Shunts) (without Return Busbar)

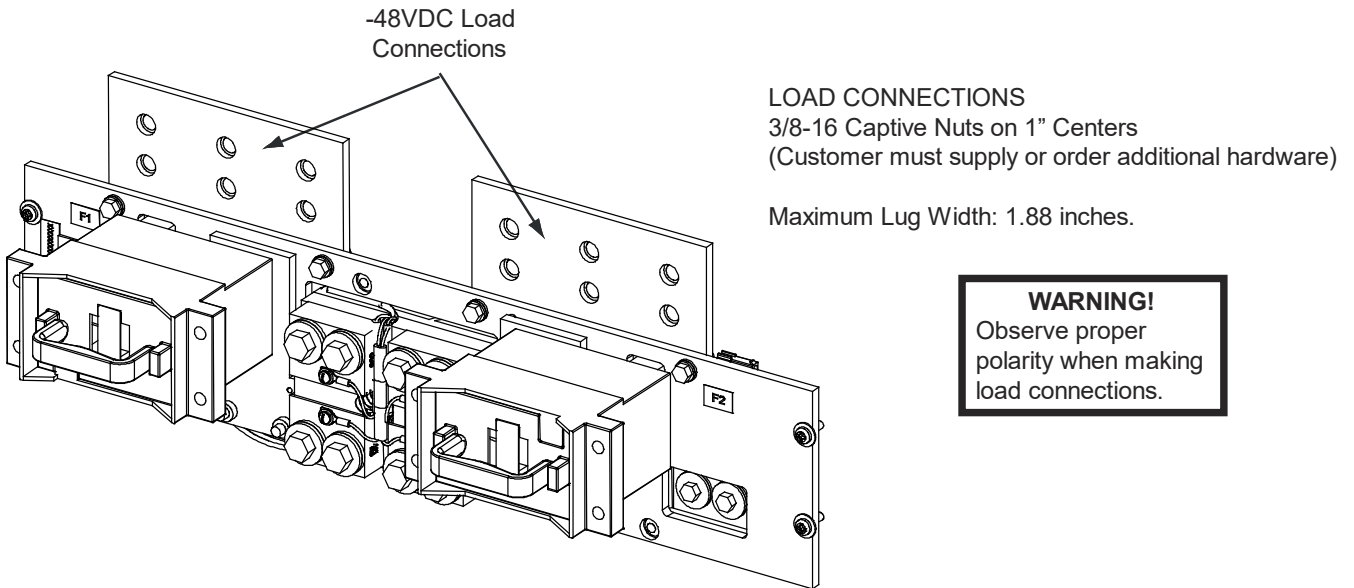


Figure 5.42 List AH: -48V Distribution Panel, (4) TPH Fuse Positions (with Shunts) (without Return Busbar)

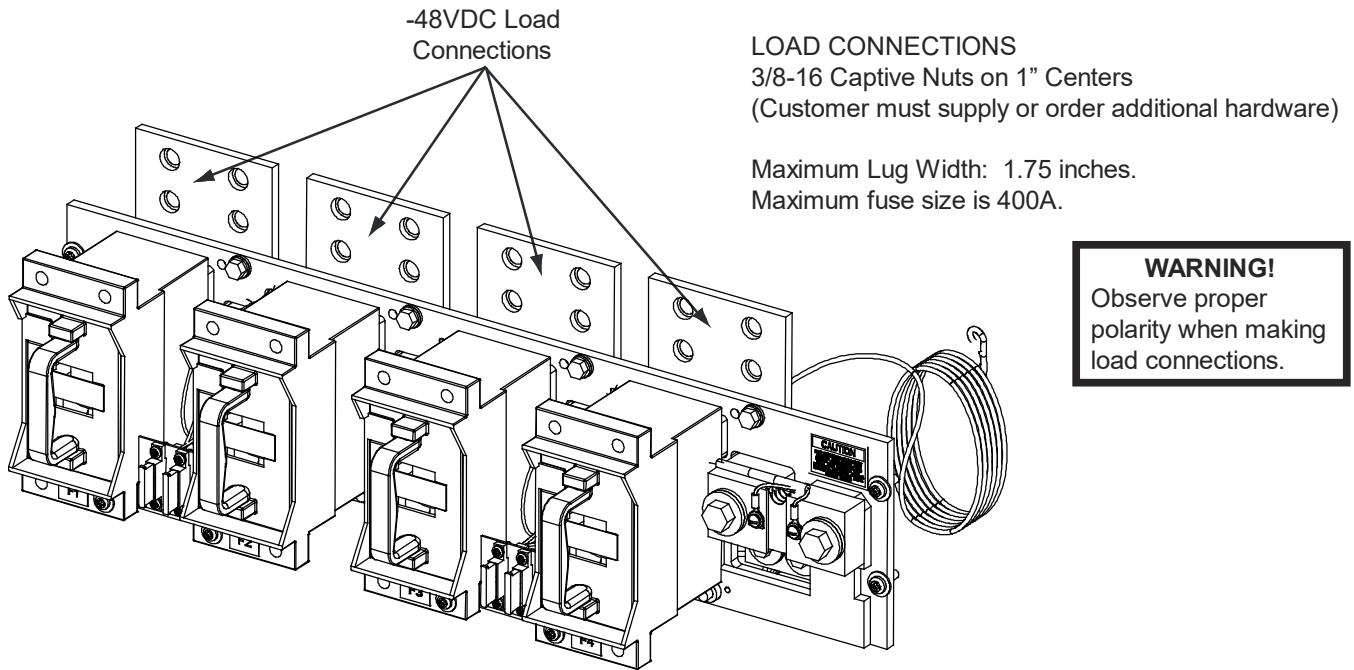
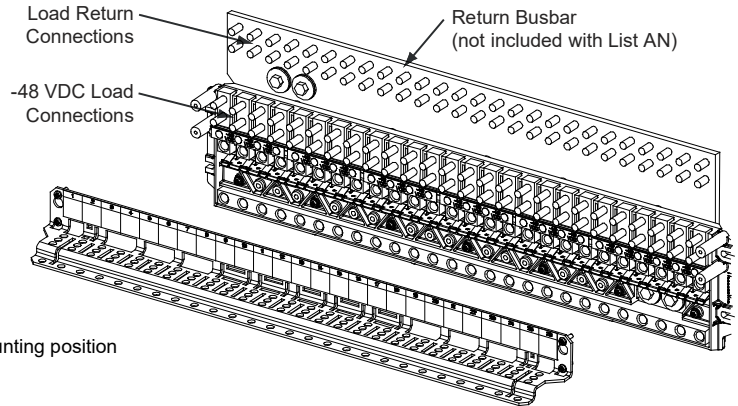


Figure 5.43 List AL and List AN: -48 VDC Distribution Panel, (26) Bullet/TPS/TLS Circuit Breaker/Fuse Positions

LOAD AND LOAD RETURN CONNECTIONS
 1/4-20 Studs on 5/8" Centers
 (Customer must supply or order additional hardware)

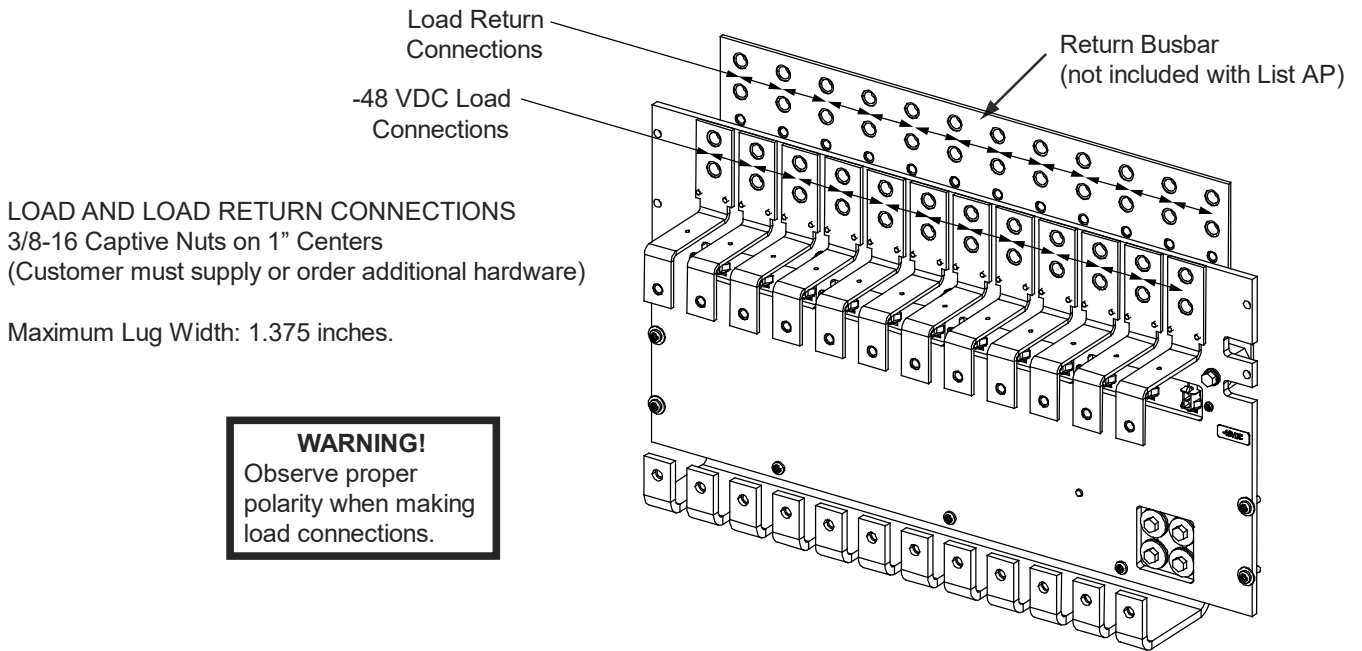
Maximum Lug Width: 0.625 inches.

WARNING!
 Observe proper polarity when making load connections.



Caution: A 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Figure 5.44 List AM and List AP: -48 VDC Distribution Panel, (12) GJ/218 Circuit Breaker Positions



5.19.3 Load Connections to Dual Voltage Distribution Panels

Figure 5.45 List DE: -48 VDC / +24 VDC Distribution Panel, (22) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (4) +24 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

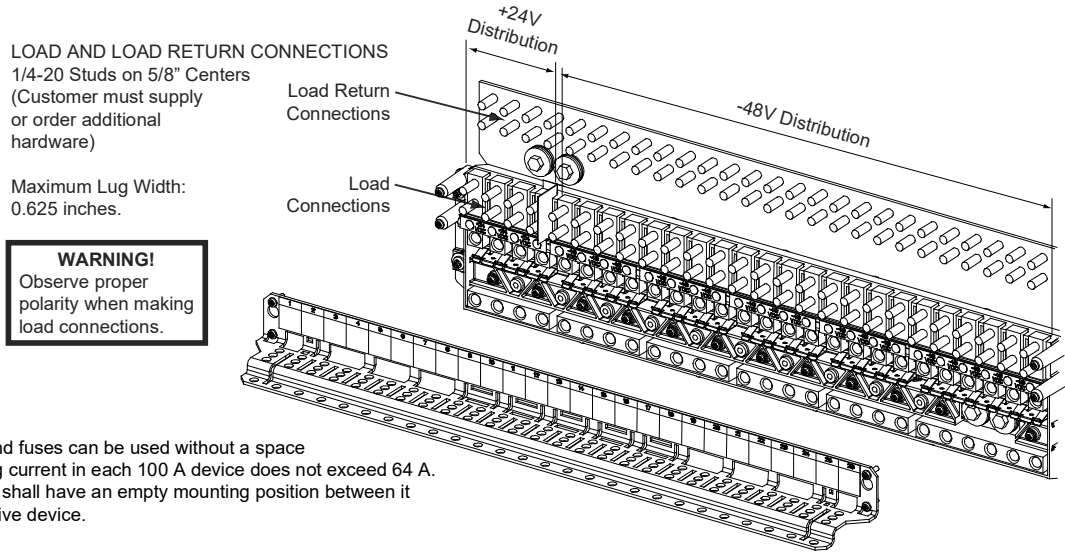


Figure 5.46 List DF: -48 VDC / +24 VDC Distribution Panel, (18) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (8) +24 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

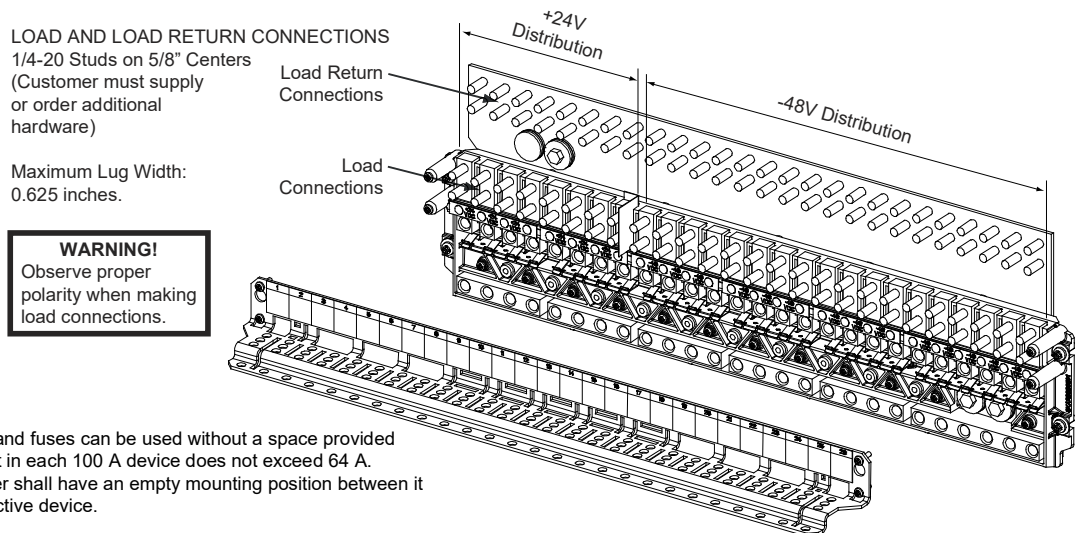
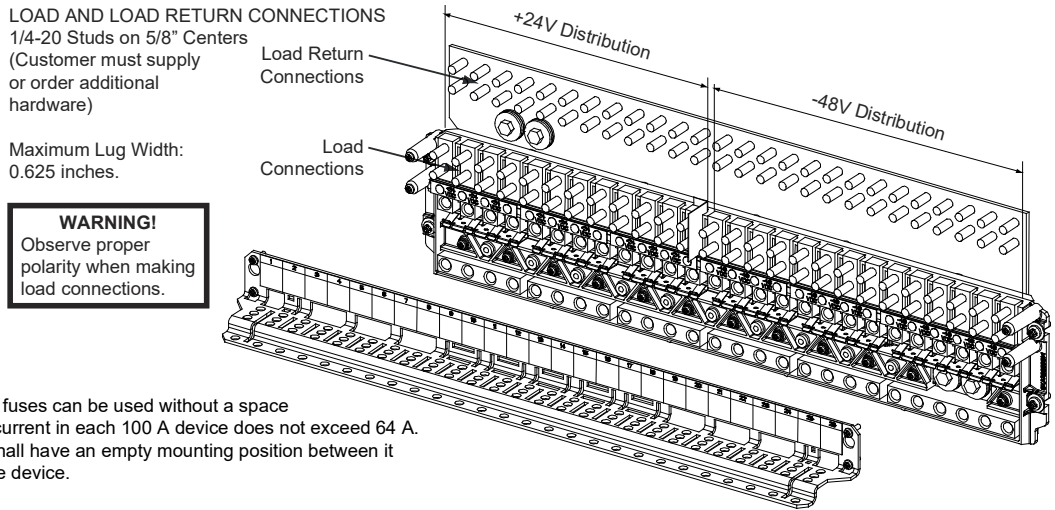
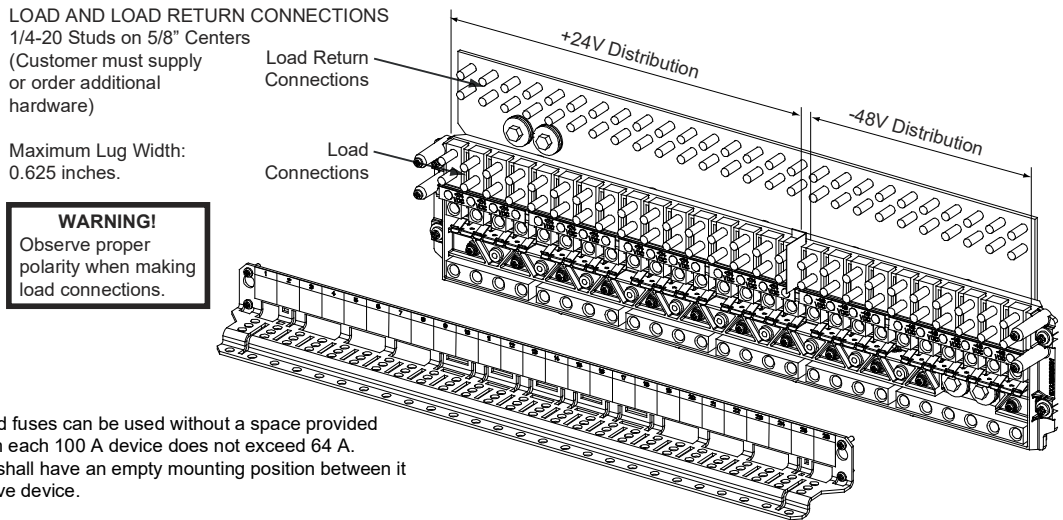


Figure 5.47 List DG: -48 VDC / +24 VDC Distribution Panel, (14) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (12) +24 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)



Caution: 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Figure 5.48 List DH: -48 VDC / +24 VDC Distribution Panel, (10) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (16) +24 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)



Caution: 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Figure 5.49 List DJ: -48 VDC / +24 VDC Distribution Panel, (6) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (20) +24 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

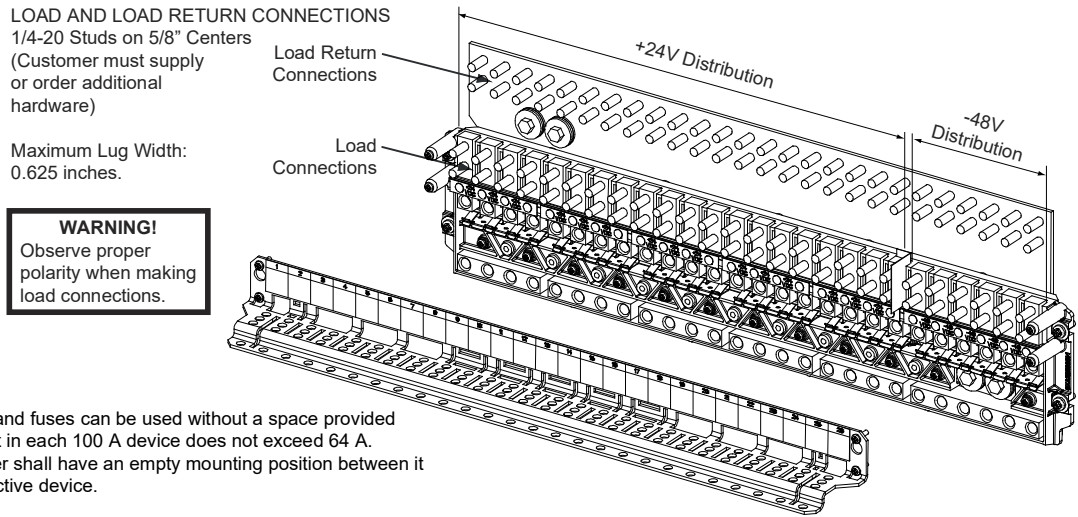


Figure 5.50 List DK: -48 VDC / +24 VDC Distribution Panel, (26) +24 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

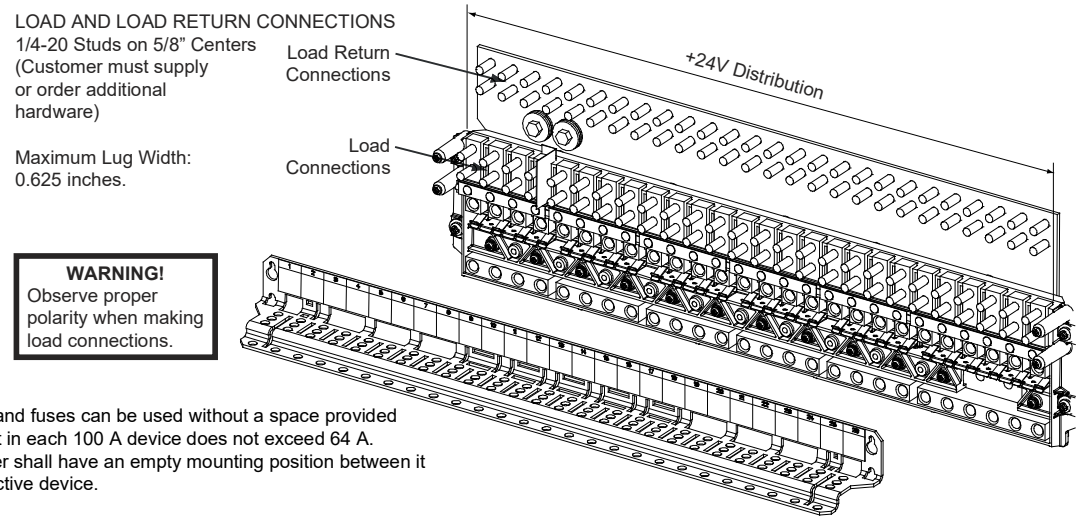
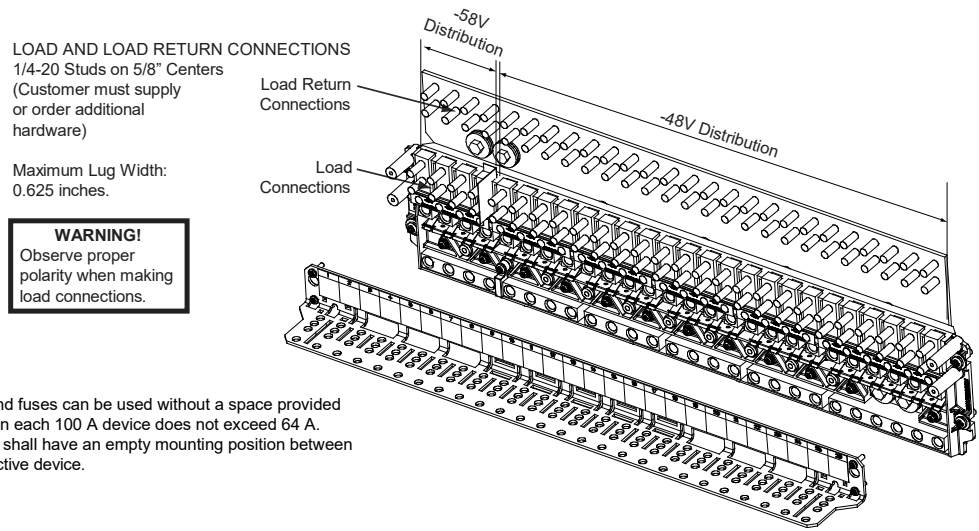
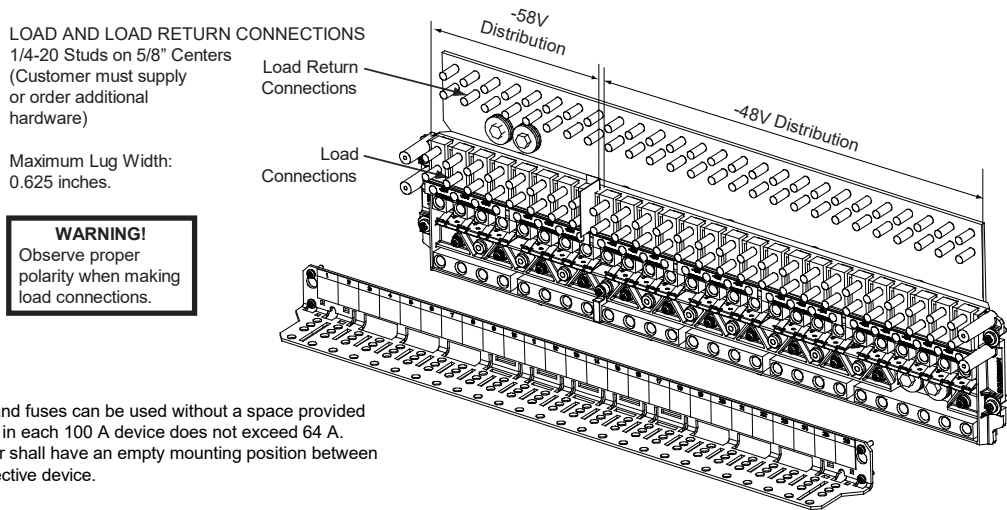


Figure 5.51 List FE: -48 VDC / -58 VDC Distribution Panel, (22) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (4) -58 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)



Caution: 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Figure 5.52 List FF: -48 VDC / -58 VDC Distribution Panel, (18) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (8) -58 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)



Caution: 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Figure 5.53 List FG: -48 VDC / -58 VDC Distribution Panel, (14) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (12) -58 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

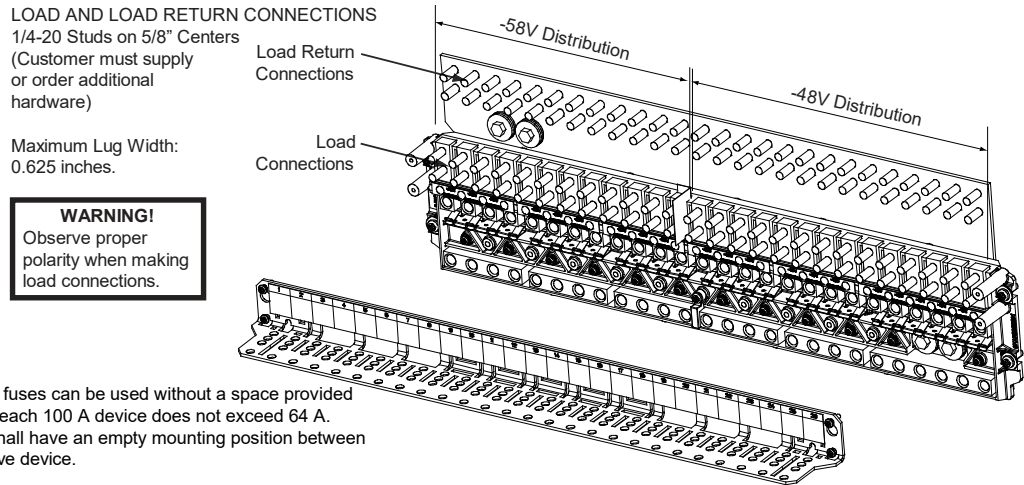


Figure 5.54 List FH: -48 VDC / -58 VDC Distribution Panel, (10) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (16) -58 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

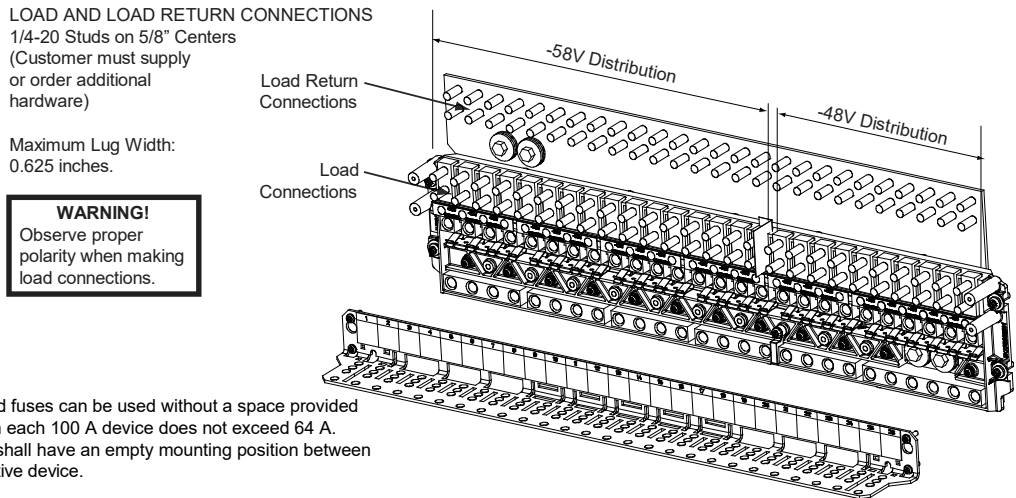
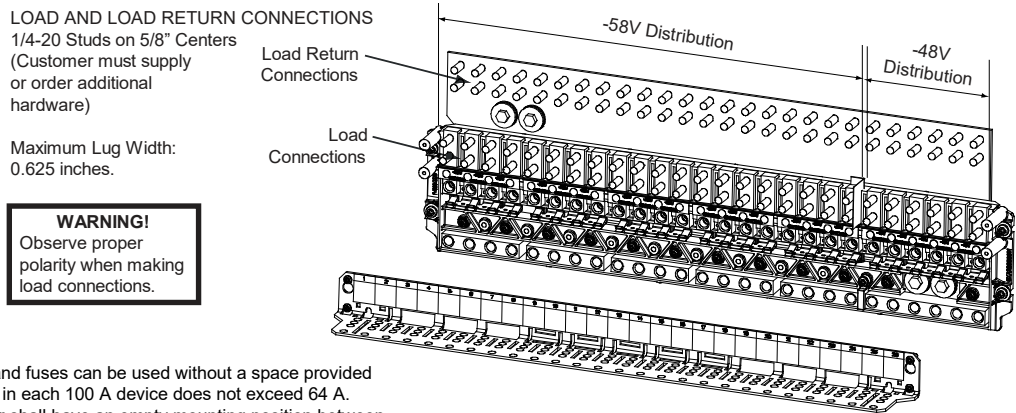


Figure 5.55 List FJ: -48 VDC / -58 VDC Distribution Panel, (6) -48 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (20) -58 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)



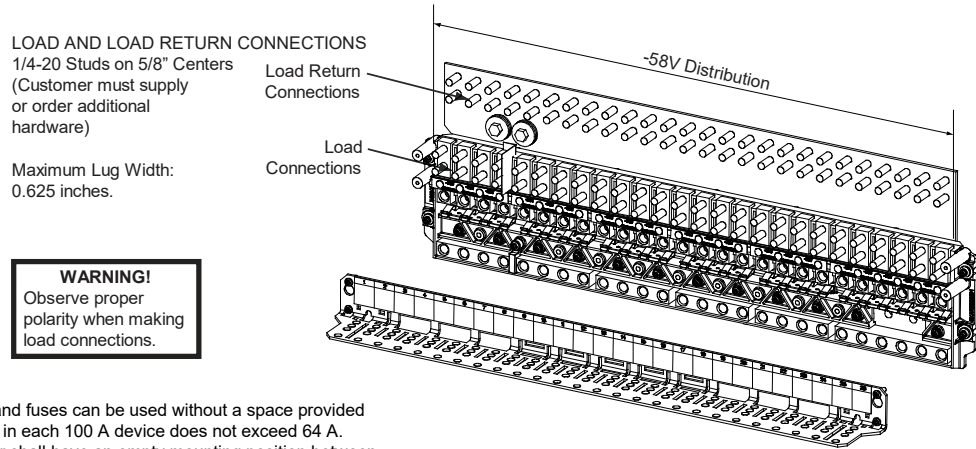
LOAD AND LOAD RETURN CONNECTIONS
 1/4-20 Studs on 5/8" Centers
 (Customer must supply or order additional hardware)

Maximum Lug Width:
 0.625 inches.

WARNING!
 Observe proper polarity when making load connections.

Caution: 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

Figure 5.56 List FK: -48 VDC / -58 VDC Distribution Panel, (26) -58 VDC Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)



LOAD AND LOAD RETURN CONNECTIONS
 1/4-20 Studs on 5/8" Centers
 (Customer must supply or order additional hardware)

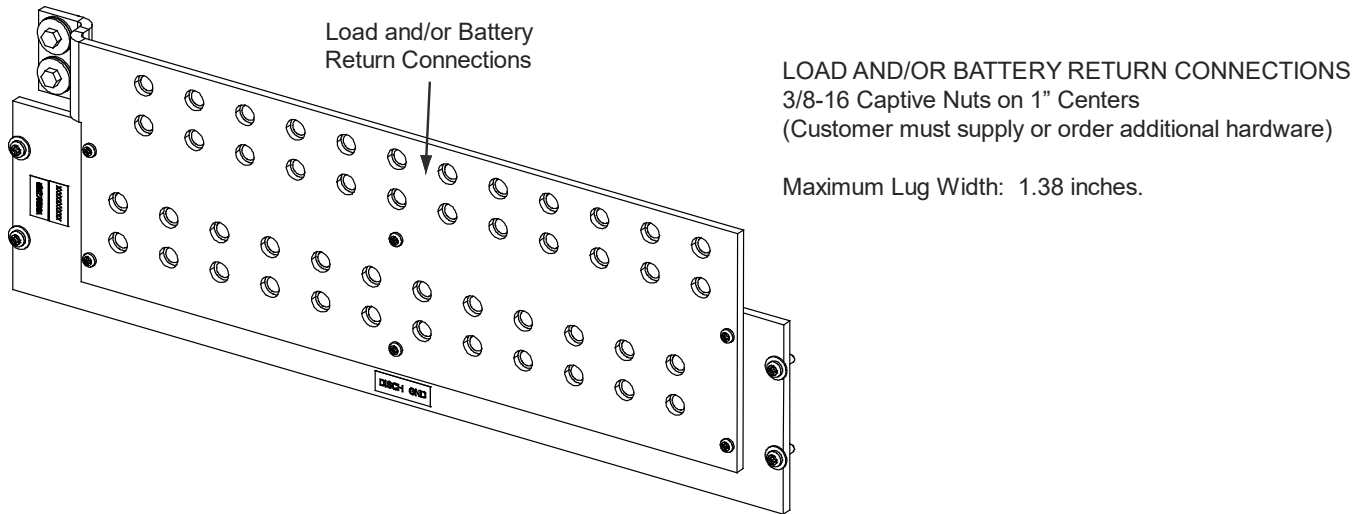
Maximum Lug Width:
 0.625 inches.

WARNING!
 Observe proper polarity when making load connections.

Caution: 100 A circuit breakers and fuses can be used without a space provided the continuous operating current in each 100 A device does not exceed 64 A. A 175 A or greater circuit breaker shall have an empty mounting position between it and any other overcurrent protective device.

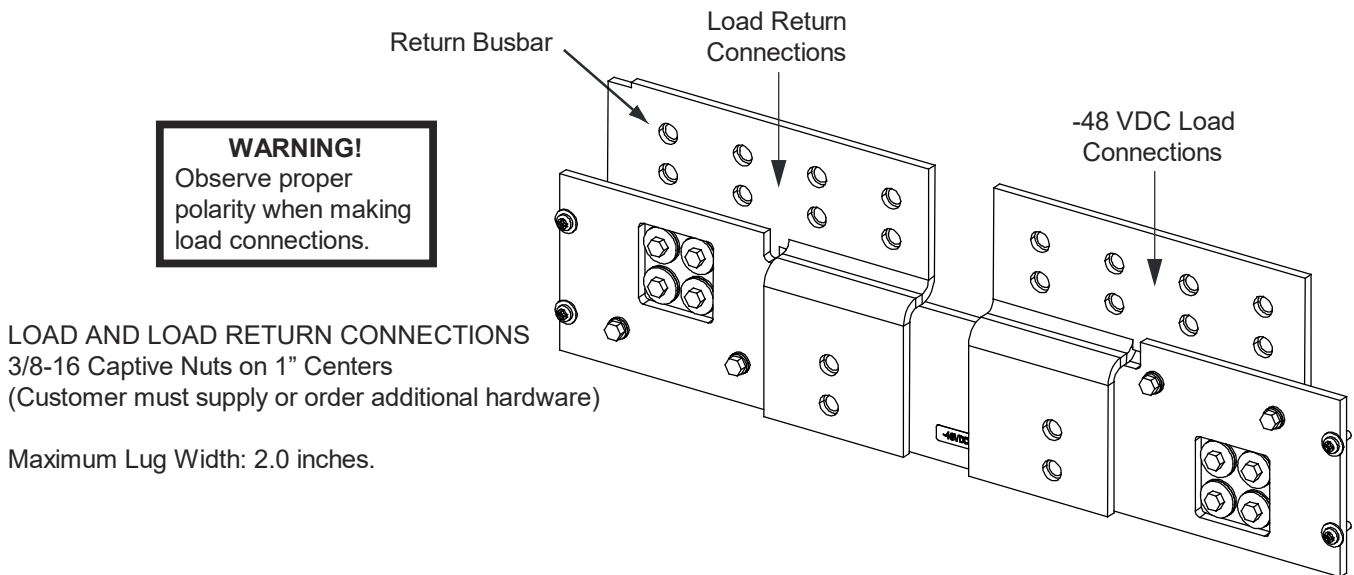
5.19.4 Load Connections to Return Bar

Figure 5.57 List GA: Return Bar Panel



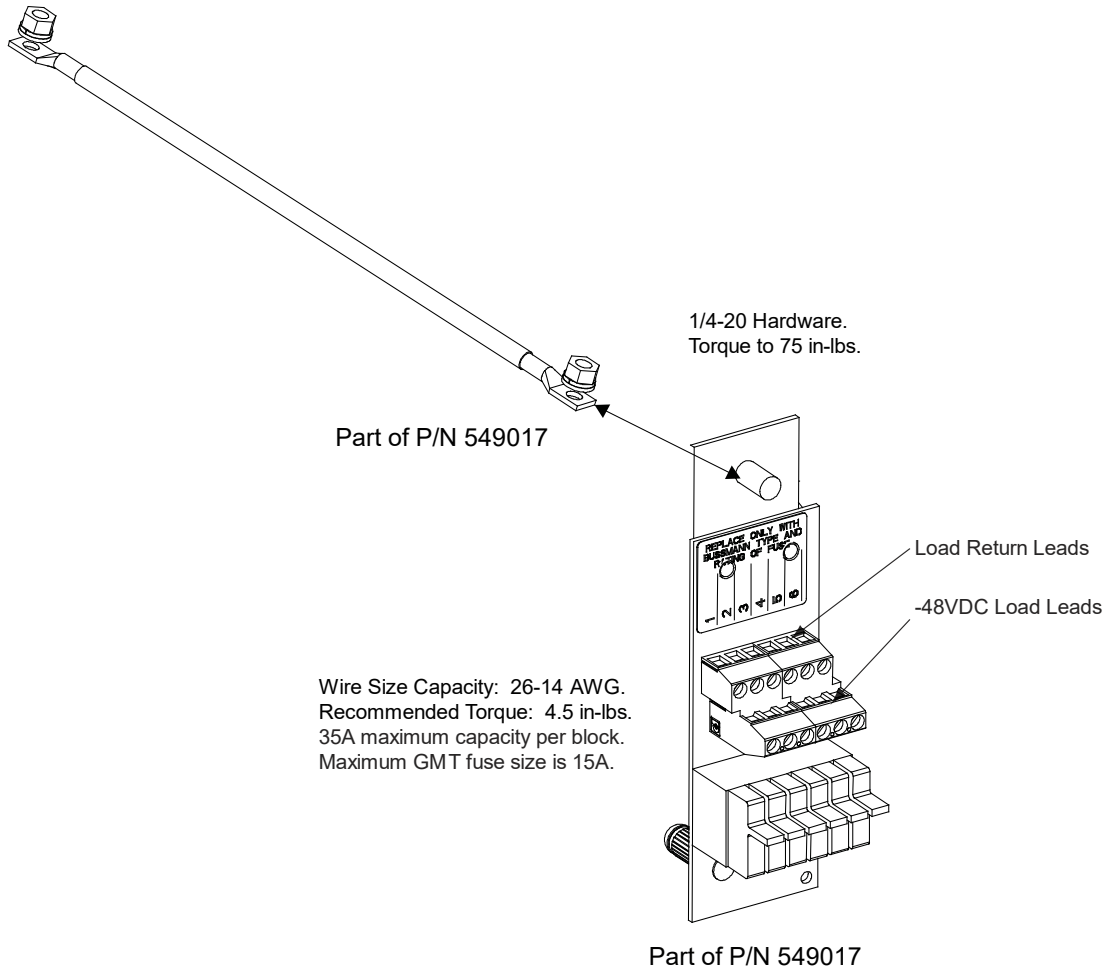
5.19.5 Load Connections to Bulk Output Panel

Figure 5.58 List EA: Bulk Output Panel



5.19.6 Load Connections to GMT Distribution Fuse Block

Figure 5.59 Optional Bullet Nose 6-Position GMT Distribution Fuse Block



5.20 Battery Connections

5.20.1 Important Safety Instructions



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.



WARNING! Observe proper polarity when making battery connections.

5.20.2 Recommended Torques

- 72 in-lbs for 1/4-inch hardware (when using standard flat and lock washer).
- 300 in-lbs for 3/8-inch hardware (when using standard flat and lock washer).
- 180 in-lbs for 3/8-inch hardware (when using a Belleville lock washer).

5.20.3 Battery Connections to Optional Battery Disconnect Distribution Panels



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Battery strings are connected to the various battery disconnect distribution panels (if furnished) located inside the distribution cabinet, as detailed in the illustrations in this section.

Figure 5.60 List BC: Battery Disconnect Distribution Panel (with Return Busbar) and List BD: Battery Disconnect Distribution Panel (without Return Busbar), (4) GJ/218 Circuit Breaker Battery Disconnect Positions

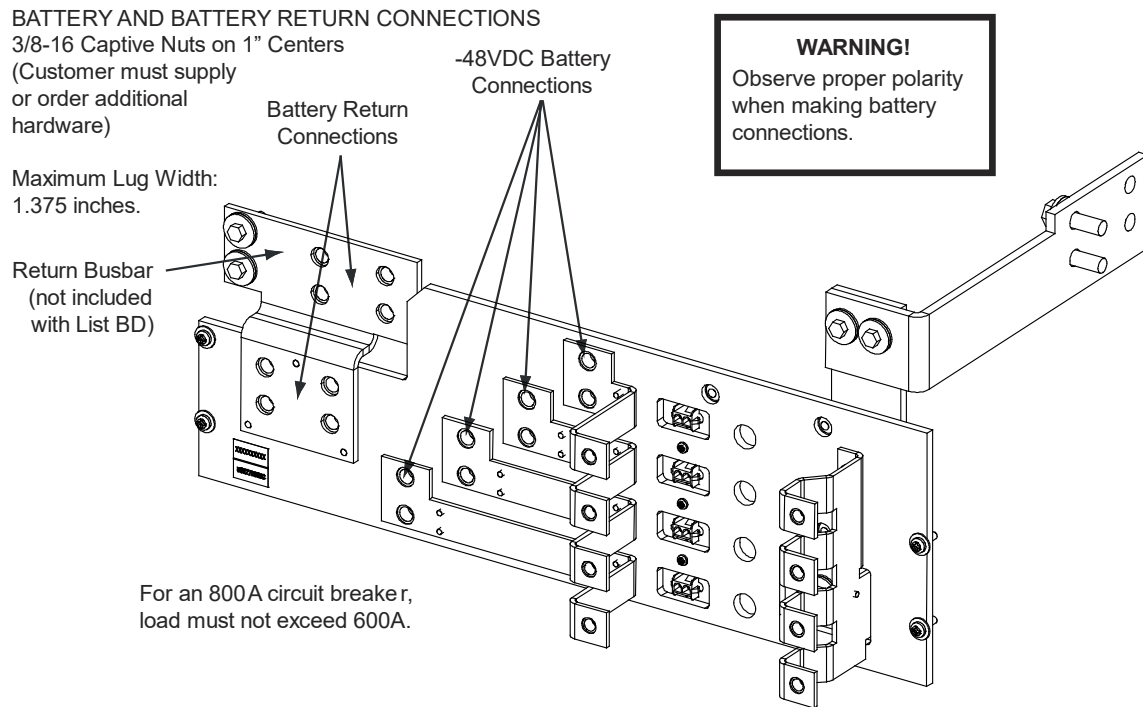


Figure 5.61 List BF: Battery Disconnect Distribution Panel, (2) TPH Fuse Battery Disconnect Positions (with Shunts) (without Return Busbar)

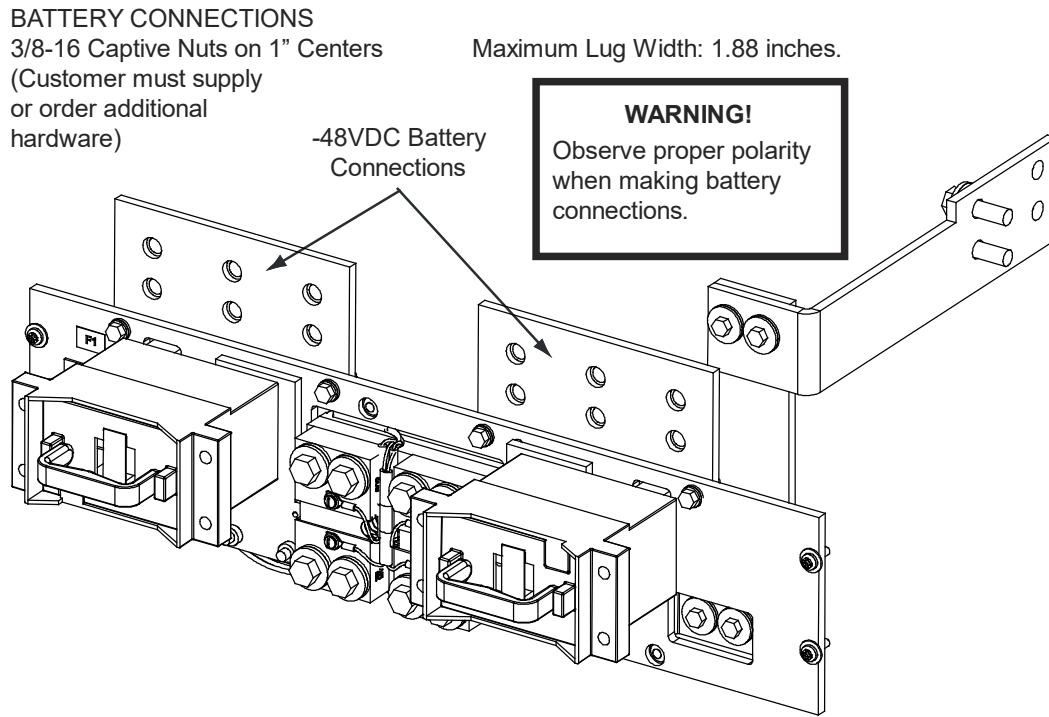
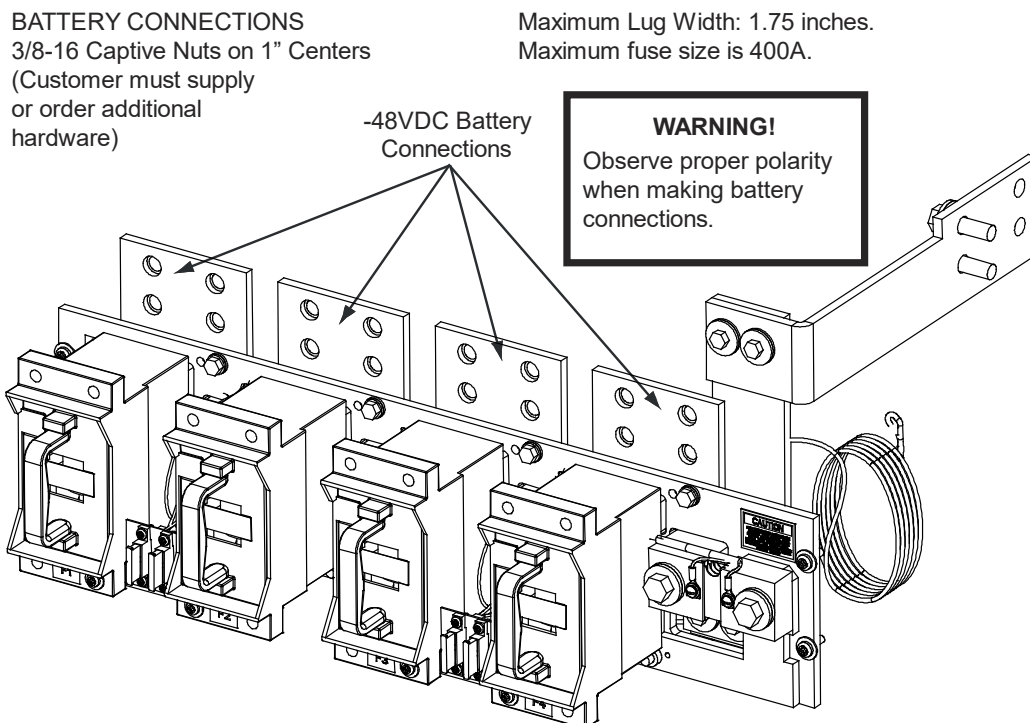


Figure 5.62 List BH: Battery Disconnect Distribution Panel, (4) TPH Fuse Battery Disconnect Positions (with Shunts) (without Return Busbar)



5.20.4 Battery Connections to Distribution Cabinet Battery Busbars (for system mounted in a relay rack or enclosure)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.



NOTE! These connections shall be used for making inter-bay power connections for List 5 supplemental bays (when the inter-bay bus bars are not used).

Battery may be connected to the battery busbars located in the distribution cabinet, as detailed in Figure 5.63, Figure 5.64, and Figure 5.65; depending on site requirements.

Figure 5.63 Battery Connections to Distribution Cabinet Battery Busbars (for system mounted in a relay rack)

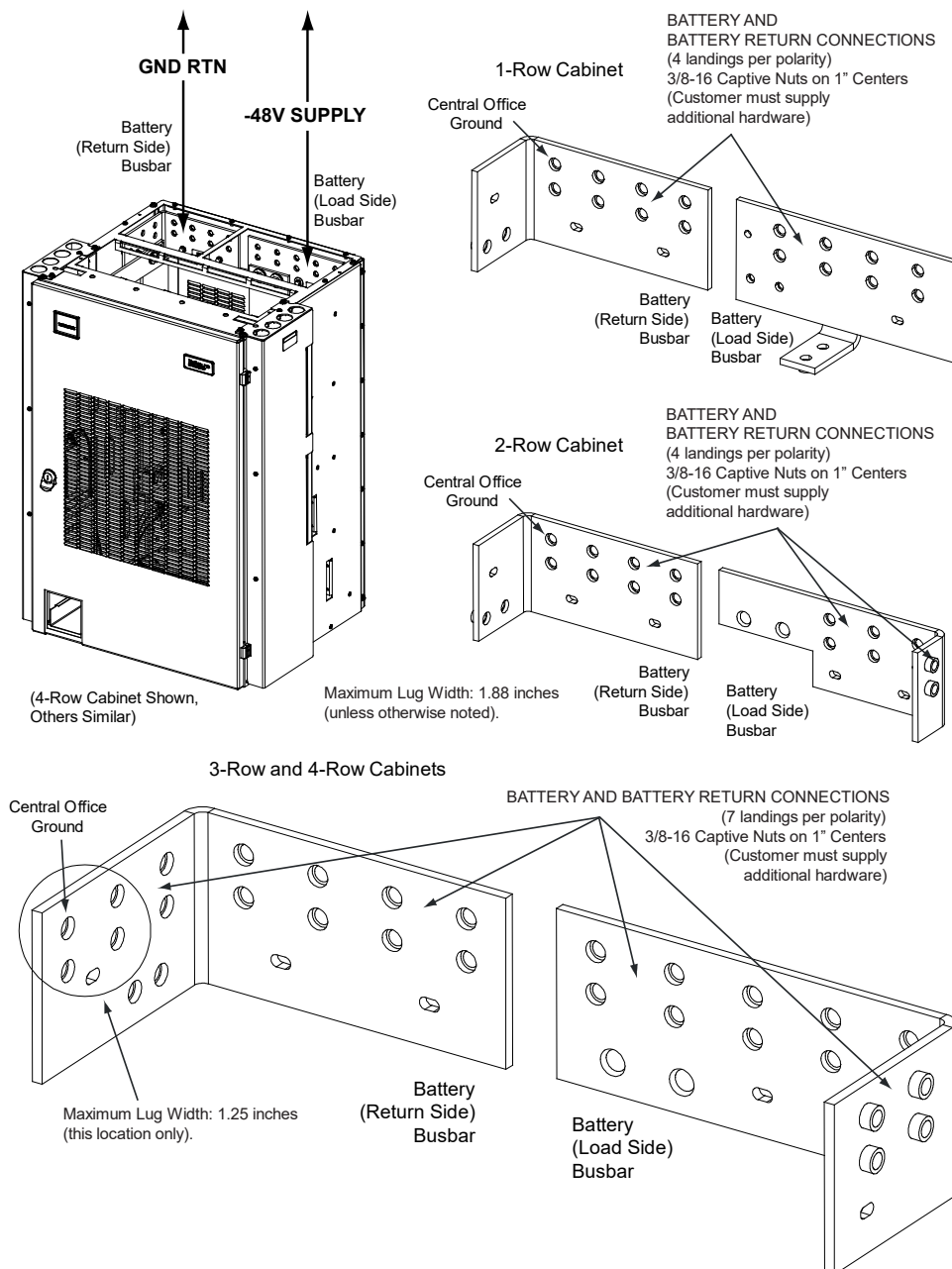
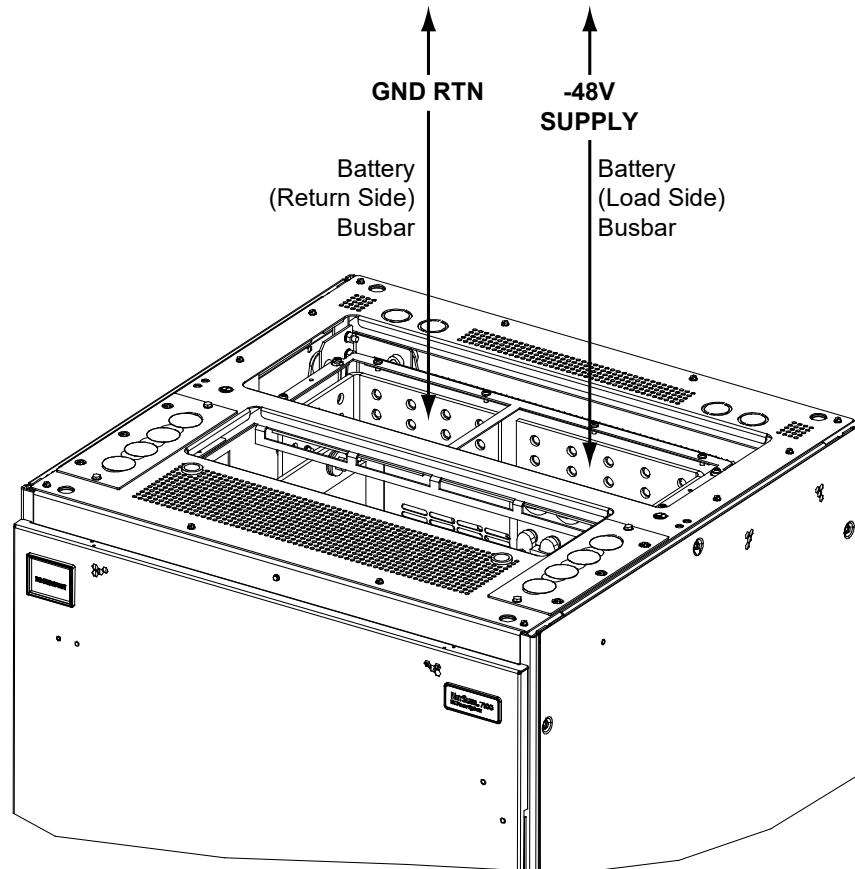
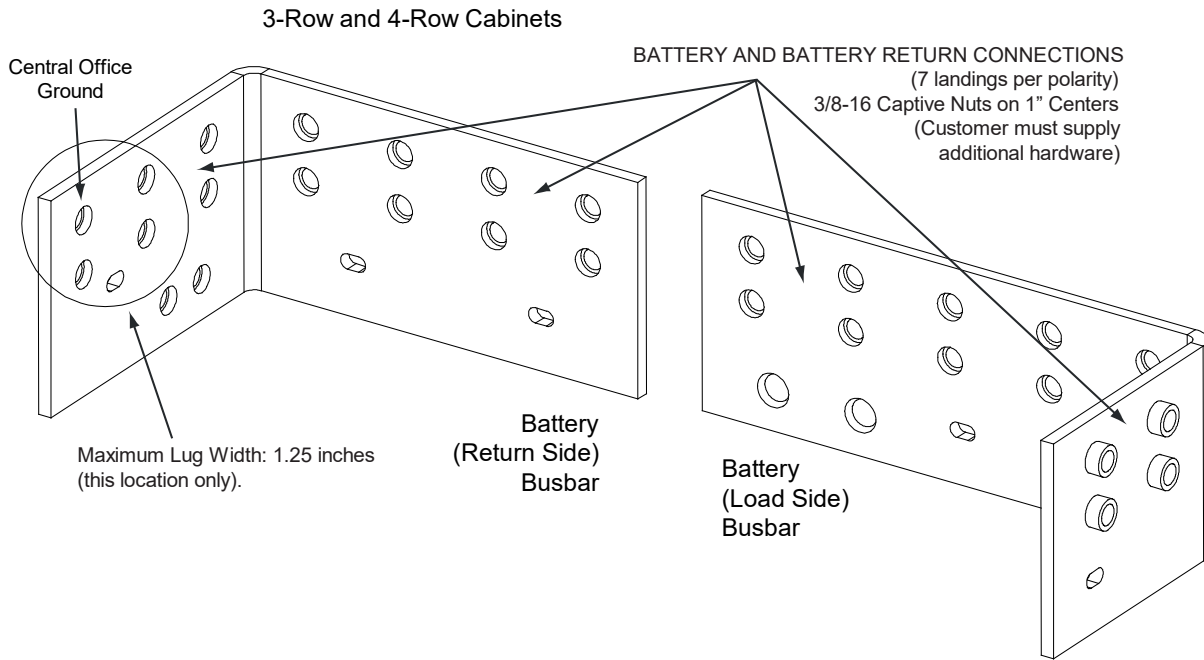
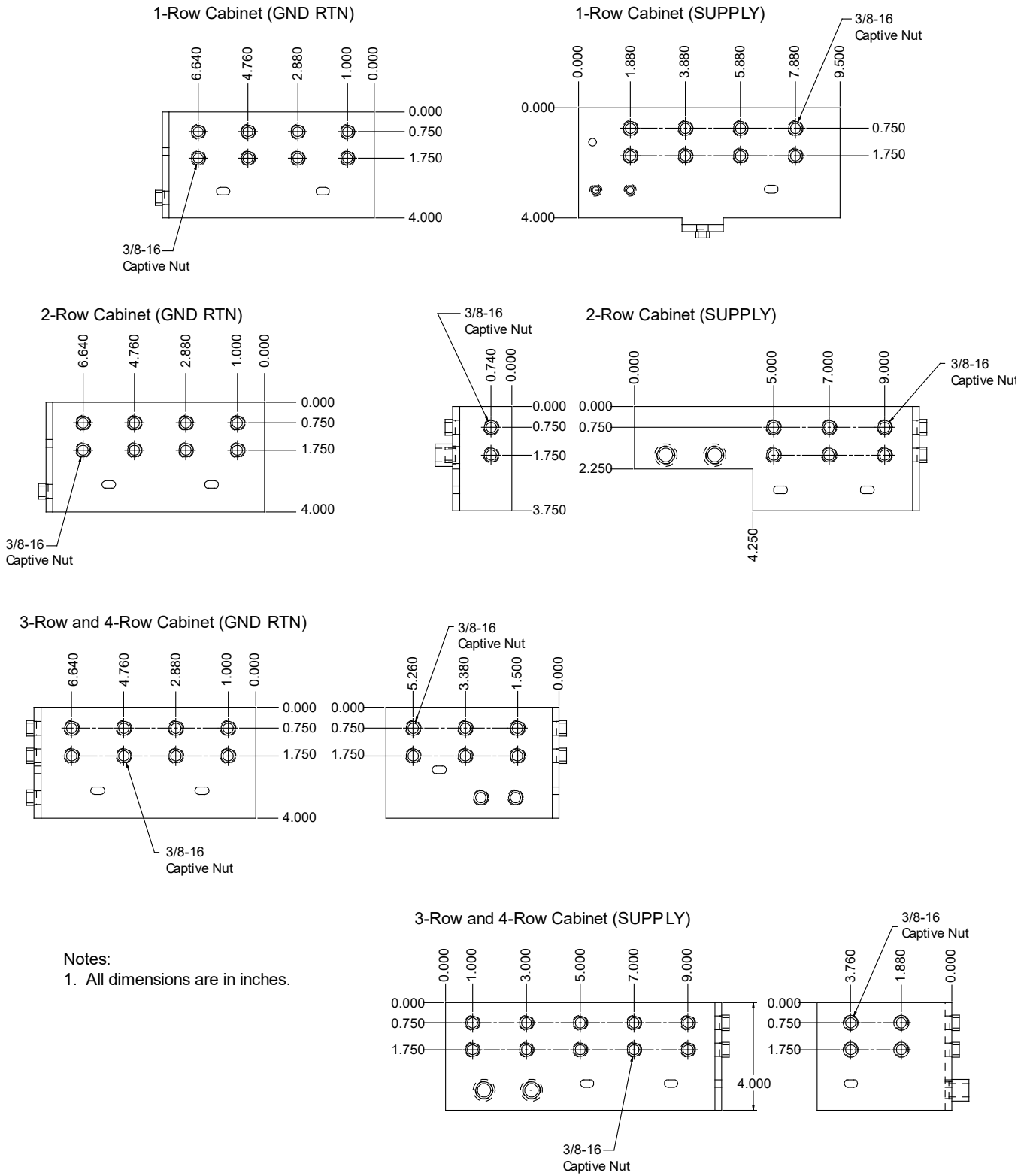


Figure 5.64 Battery Connections to Distribution Cabinet Battery Busbars (for system mounted in a enclosure)



Power System Installed in a Cabinet
(Front View)

Figure 5.65 Battery Busbar Dimensions



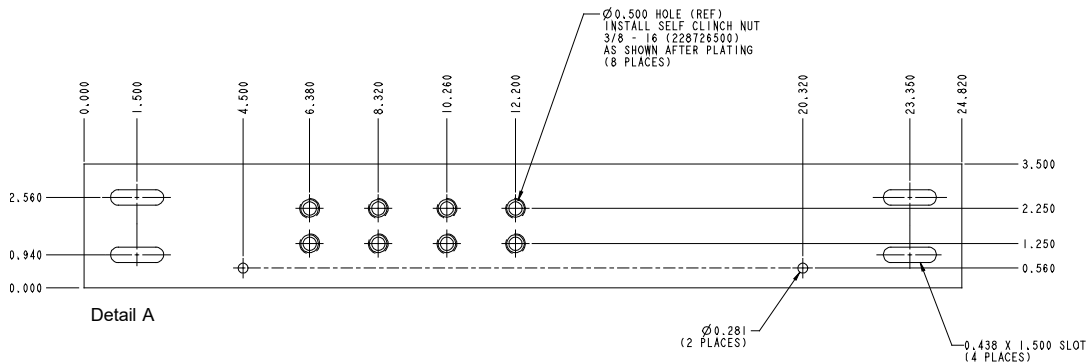
5.2.0.5 Battery Connections to Bay-to-Bay Rectifier Busbars (582127000 List 1 with List 2 / List 3) (for system mounted in a relay rack)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

IF THE SYSTEM DOES NOT CONTAIN A BATTERY SHUNT OR BATTERY DISCONNECT CONTACTOR, battery may be connected to the 582127000 List 2 and List 3 bay-to-bay rectifier busbars located on the rear of the distribution cabinets, as detailed in Figure 5.66, depending on site requirements.

Figure 5.66 Battery Connections to Bay-to-Bay Rectifier Busbars (for system mounted in a relay rack)

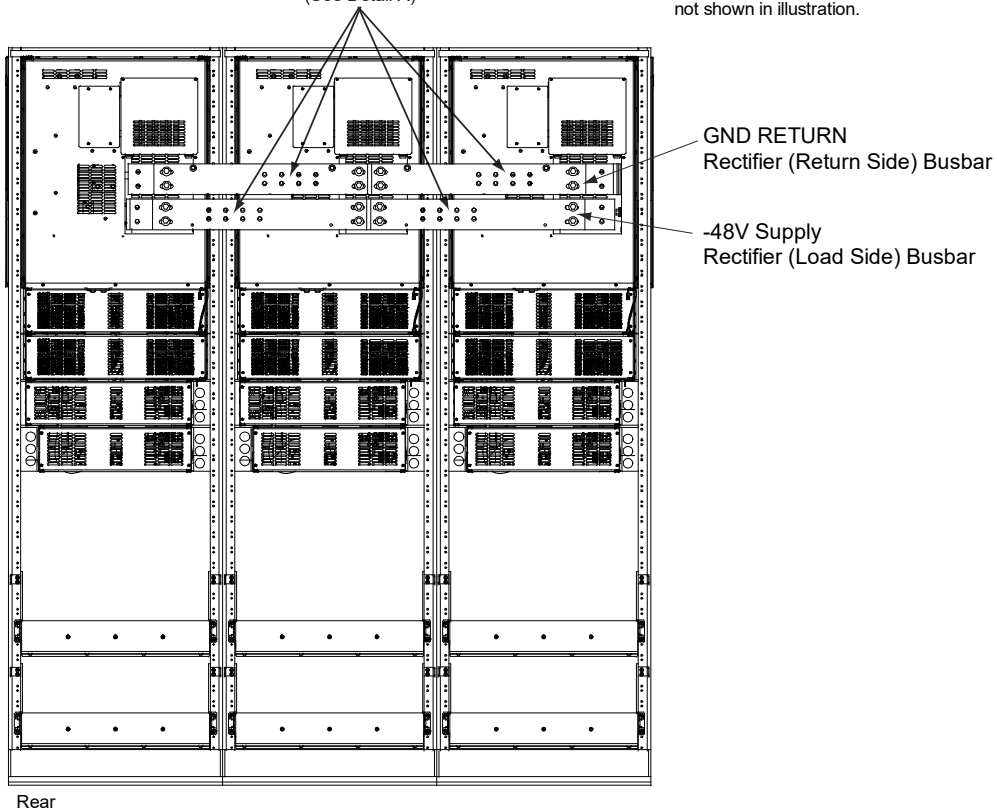


RECTIFIER AND RECTIFIER RETURN CONNECTIONS
(CAN ONLY BE USED FOR BATTERY CONNECTIONS
IF THE SYSTEM DOES NOT CONTAIN A BATTERY
SHUNT OR BATTERY DISCONNECT CONTACTOR)
3/8-16 Captive Nuts on 1" Centers
(Customer must supply additional hardware.)
Maximum Lug Width: 1.88 inches.
(See Detail A)

Notes:

1. All dimensions are in inches.

Rear busbar cover shields
not shown in illustration.

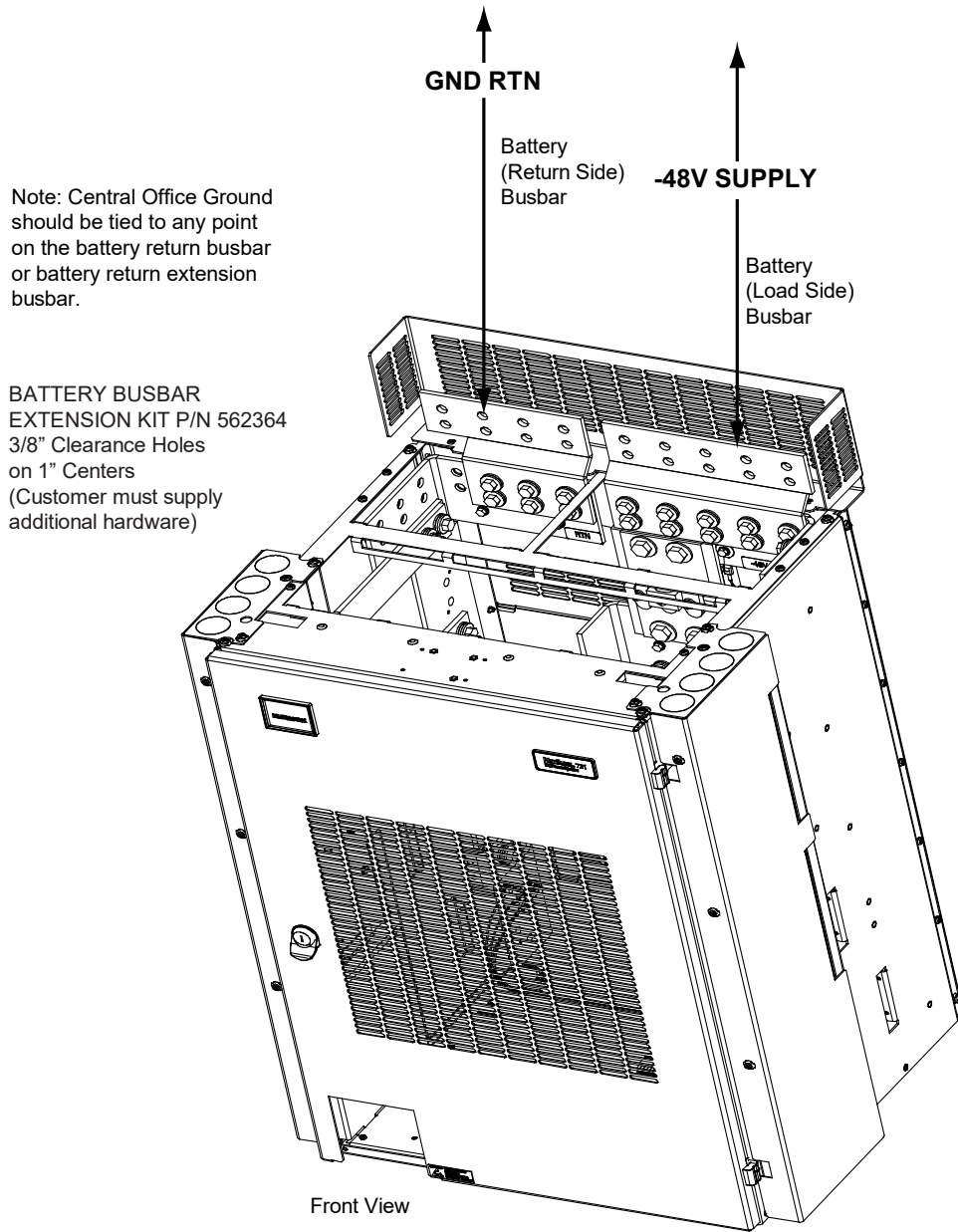


5.20.6 Battery Connections to Optional Battery Busbar Extension Kit P/N 562364 (for system mounted in a relay rack or enclosure)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Figure 5.67 Battery Connections to Optional Battery Busbar Extension Kit P/N 562364 (for system mounted in a relay rack)



Note: Central Office Ground should be tied to any point on the battery return busbar or battery return extension busbar.

BATTERY BUSBAR
EXTENSION KIT P/N 562364
3/8" Clearance Holes
on 1" Centers
(Customer must supply
additional hardware)

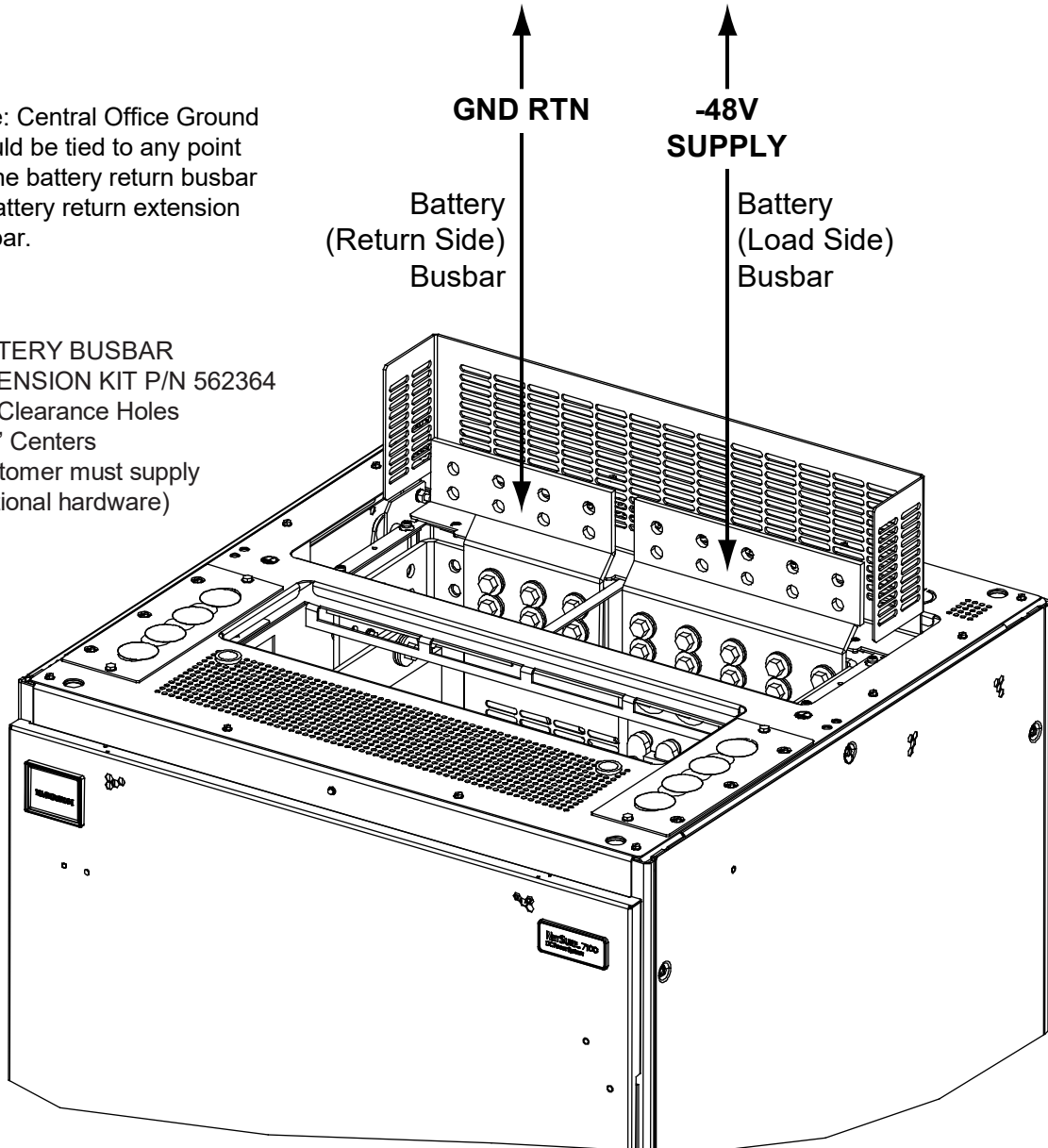
Front View

List 24 Distribution Cabinet
(List 23 similar)

Figure 5.68 Battery Connections to Optional Battery Busbar Extension Kit P/N 562364 (for system mounted in an enclosure)

Note: Central Office Ground should be tied to any point on the battery return busbar or battery return extension busbar.

BATTERY BUSBAR
EXTENSION KIT P/N 562364
3/8" Clearance Holes
on 1" Centers
(Customer must supply
additional hardware)



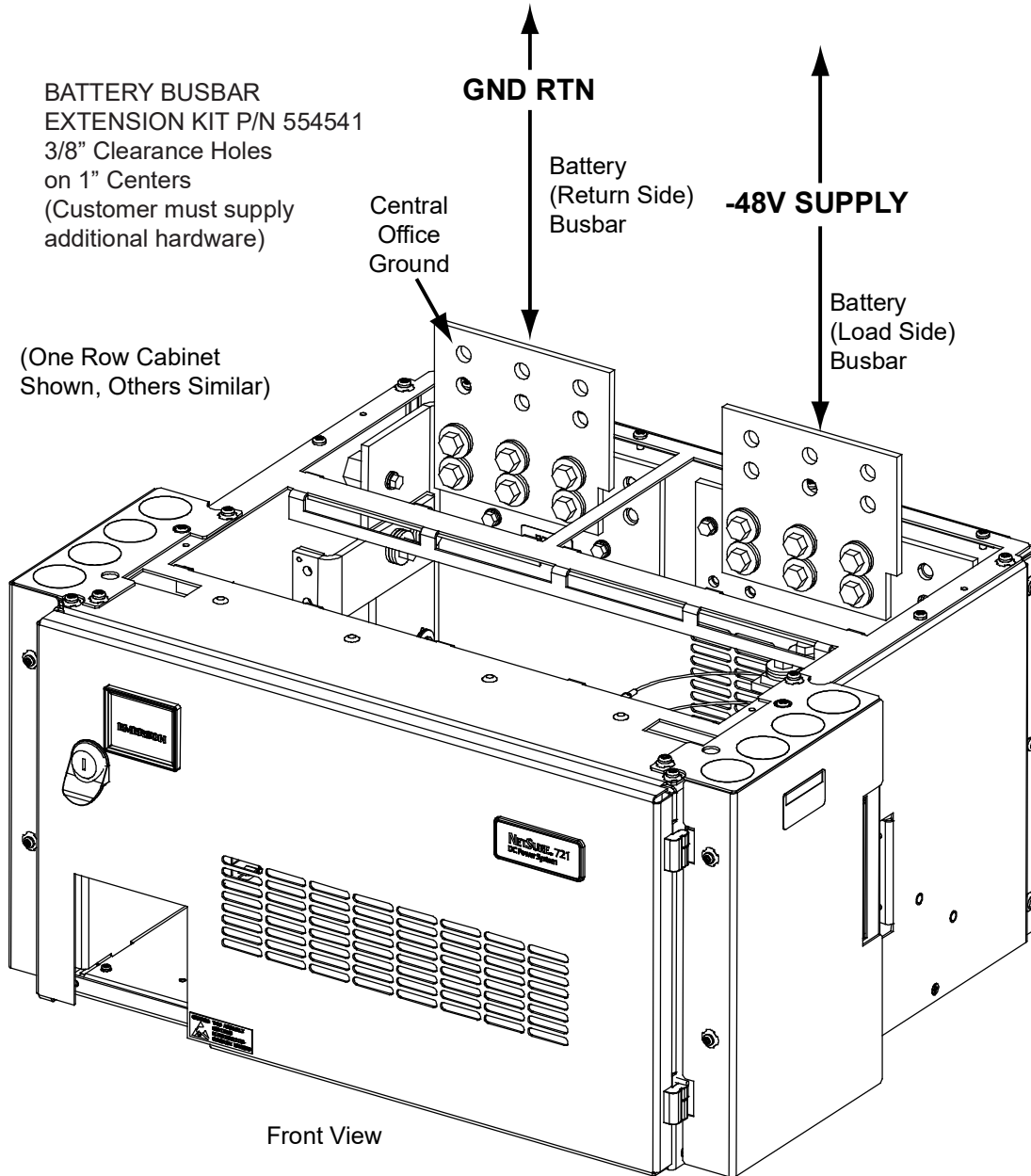
Power System Installed in a Cabinet
(Front View)

5.20.7 Battery Connections to Optional Battery Busbar Extension Kit P/N 554541 (for system mounted in an enclosure)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Figure 5.69 Battery Connections to Optional Battery Busbar Extension Kit P/N 562364 (for system mounted in an enclosure)

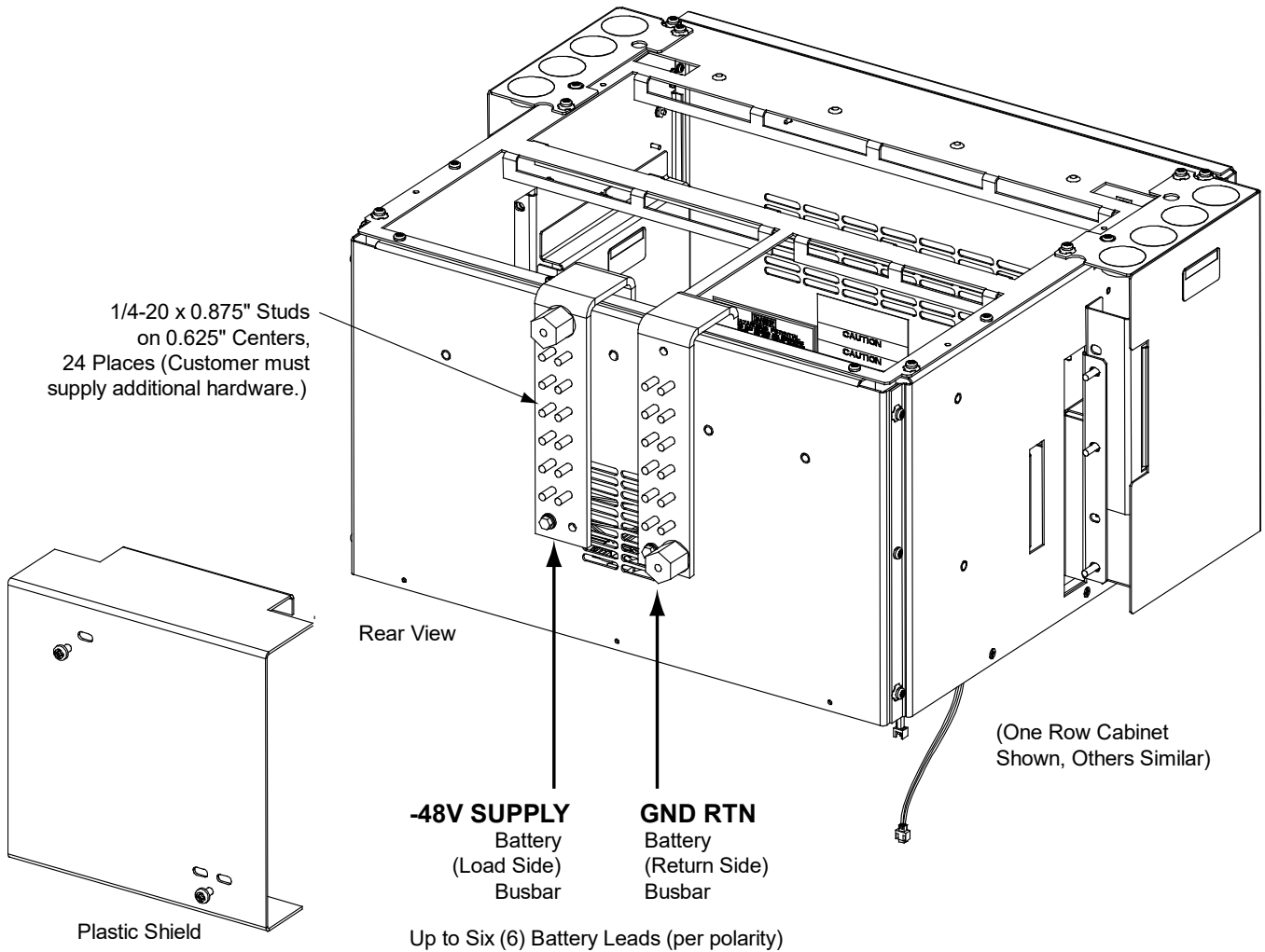


5.20.8 Battery Connections to Optional Battery Landing Busbar Kit P/N 553584 (for system mounted in a relay rack)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Figure 5.70 Battery Connections to Optional Battery Landing Busbar Kit P/N 553584 (for system mounted in a relay rack)

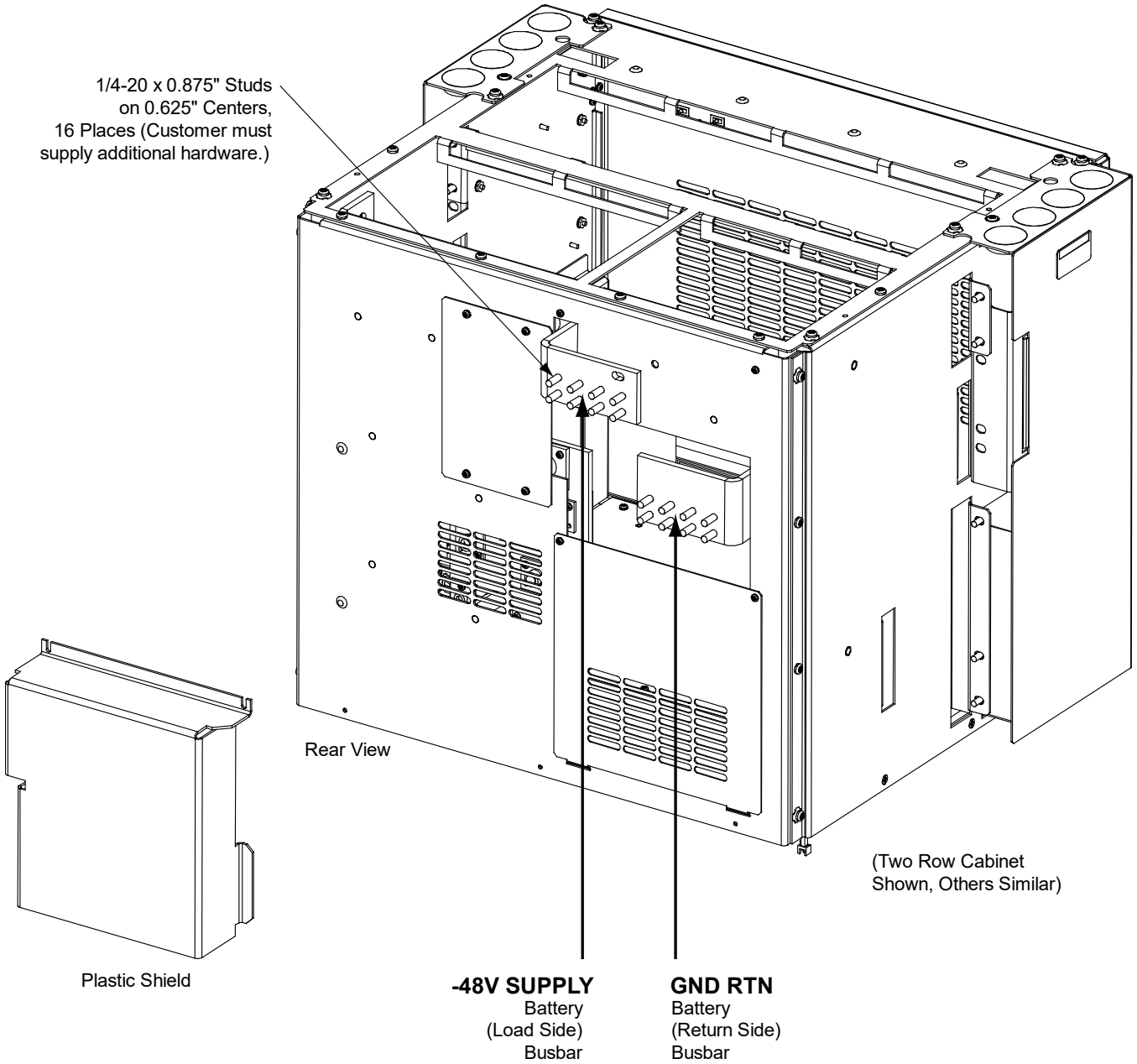


5.20.9 Battery Connections to Optional Battery Landing Busbar Kit P/N 555478 (for system mounted in a relay rack)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Figure 5.71 Battery Connections to Optional Battery Landing Busbar Kit P/N 555478 (for system mounted in a relay rack)



-48V SUPPLY
 Battery
 (Load Side)
 Busbar

GND RTN
 Battery
 (Return Side)
 Busbar

Up to Eight (8) Battery Leads (per polarity).
 [Four (4) battery landing positions, two (2)
 battery cable lugs back-to-back each position.]

5.21 Installing and Connecting Batteries in List 93 or List 95 Battery Tray (if furnished) (for system mounted in a relay rack)

Important Safety Instructions



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Battery Manufacturer Information

Refer to System Application Guide SAG582127000 for specifications and manufacturers of the batteries to be installed in this power system.

Installing Battery Landing Busbar Kit P/N 553584 (List 21) or 555478 (List 22, 23, or 24)



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

If the battery tray(s) was ordered with the system, these kits were installed at the factory. If a battery tray is installed in the field, customer must install the kit.

Procedure

1. Refer to Figure 5.72 or Figure 5.73 and install the Battery Landing Busbar Kit.

Figure 5.72 Battery Landing Busbar Kit P/N 553584

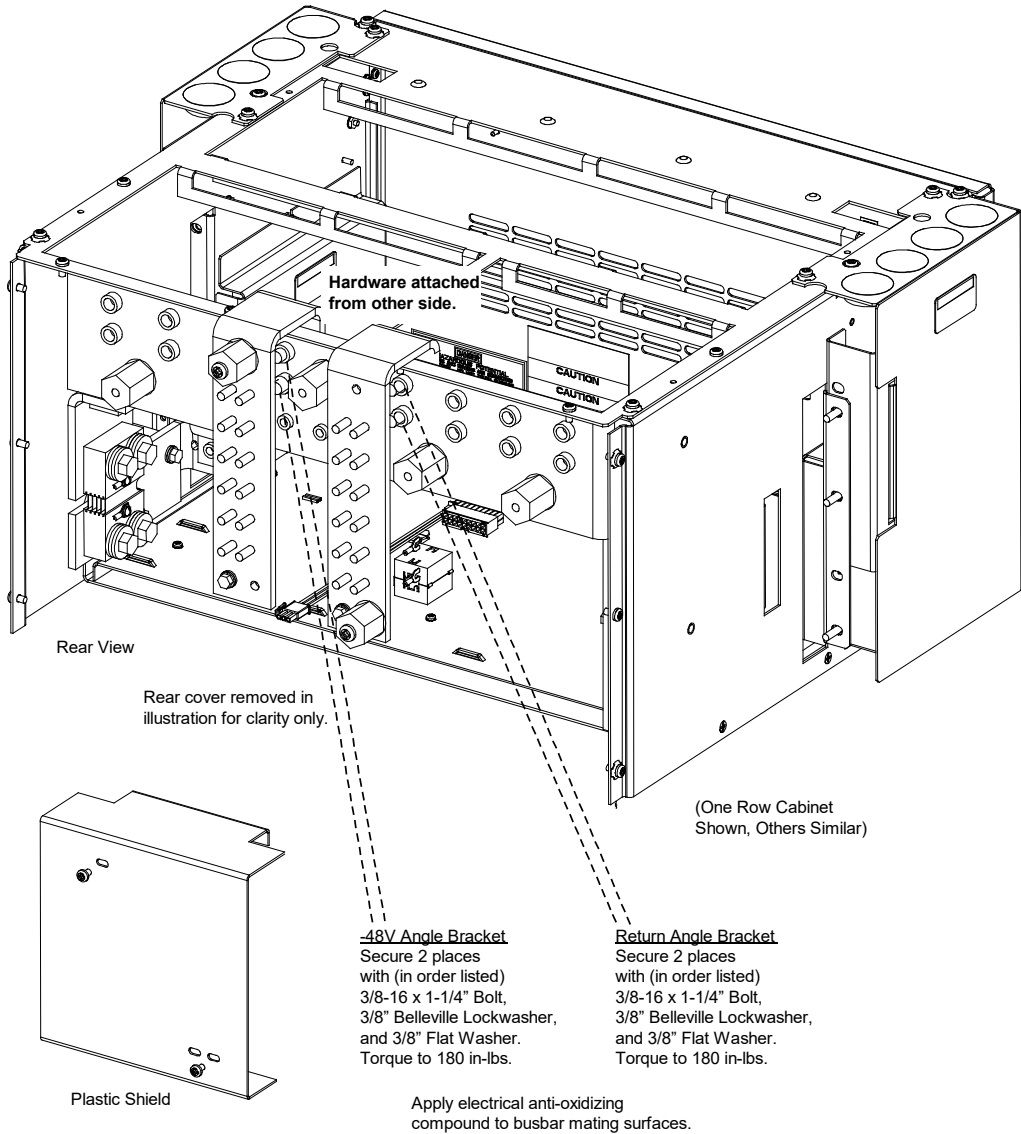
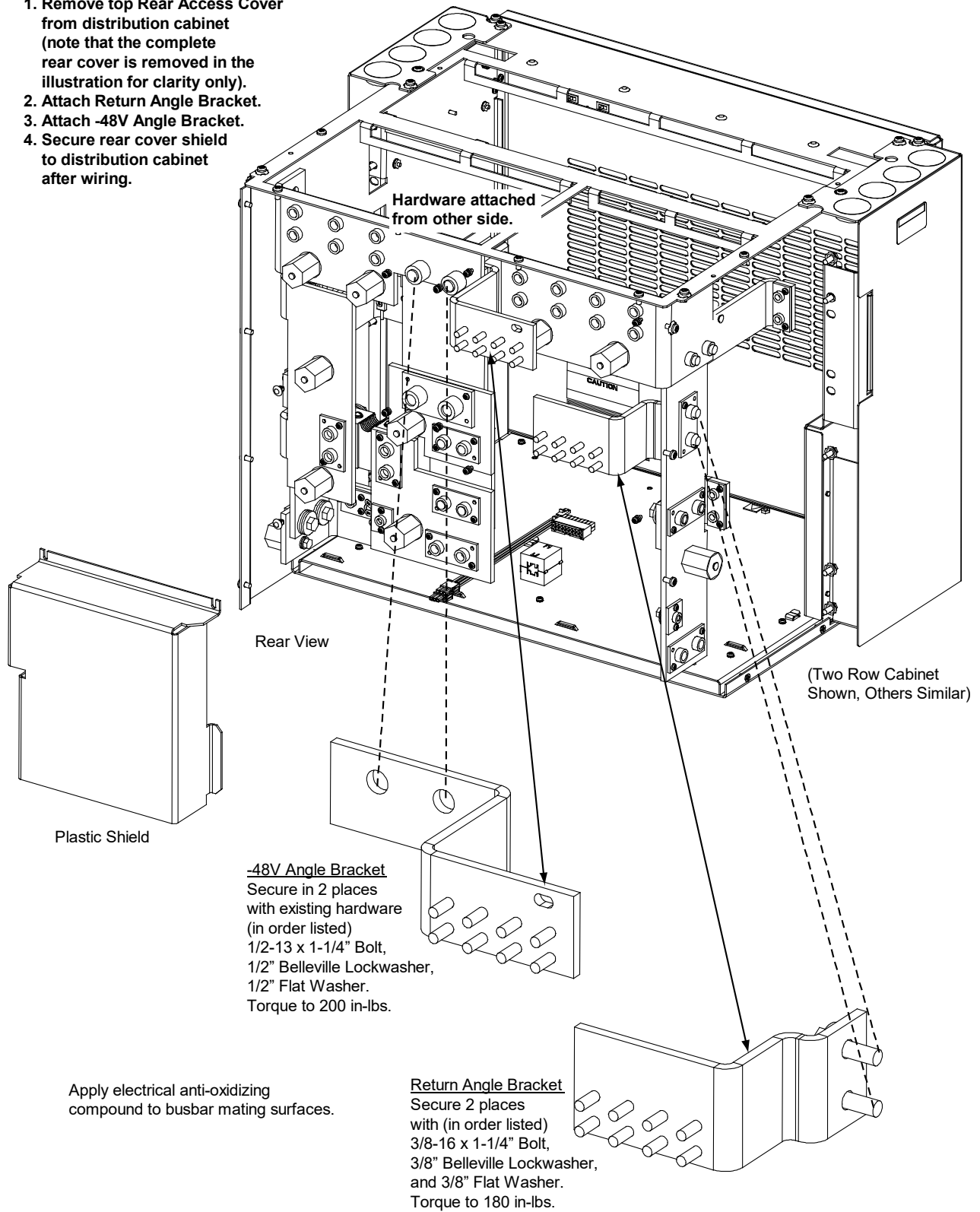


Figure 5.73 Battery Landing Busbar Kit P/N 555478

1. Remove top Rear Access Cover from distribution cabinet (note that the complete rear cover is removed in the illustration for clarity only).
2. Attach Return Angle Bracket.
3. Attach -48V Angle Bracket.
4. Secure rear cover shield to distribution cabinet after wiring.



Wiring to the Battery Tray



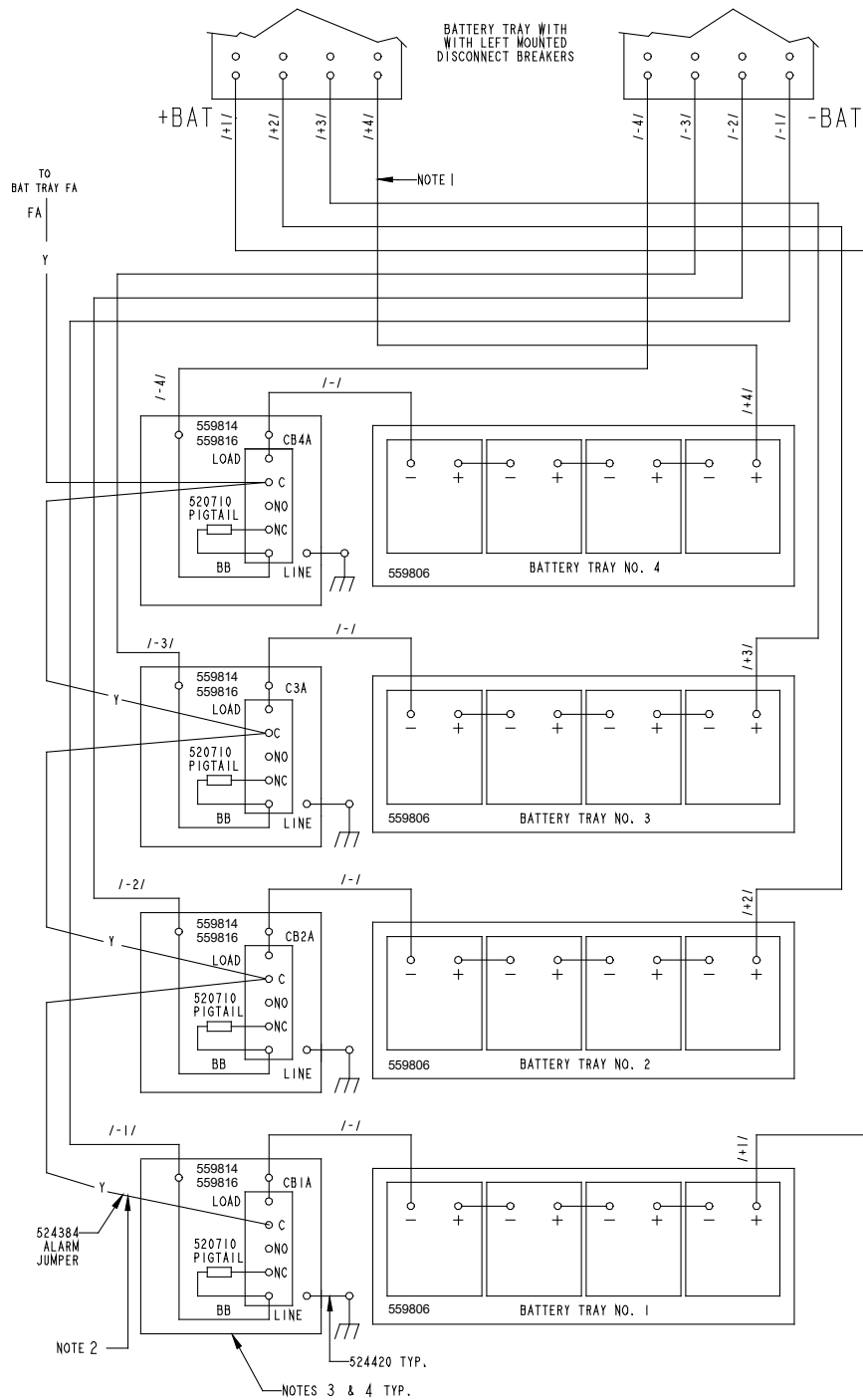
DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

If the battery tray(s) was ordered with the system, wiring to the battery tray was performed at the factory. If a battery tray is installed in the field, customer must wire to the battery tray.

Procedure

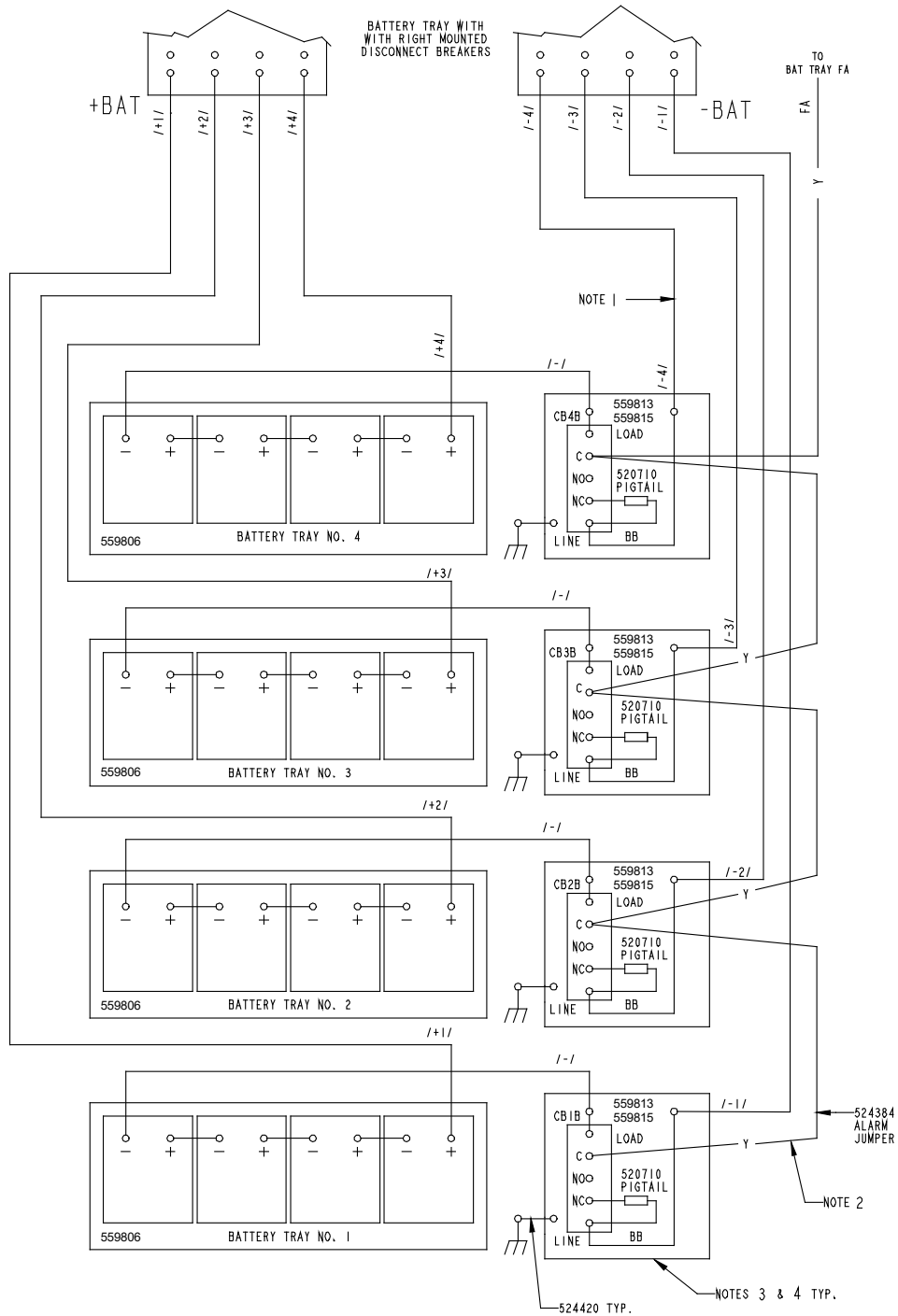
1. Refer to the wiring diagram provided in Figure 5.74, and wire the battery tray for your application. Refer also to Figure 5.72 or Figure 5.73.

Figure 5.74 Wiring Diagram - List 93 and List 95 Battery Tray (cont'd on next page)



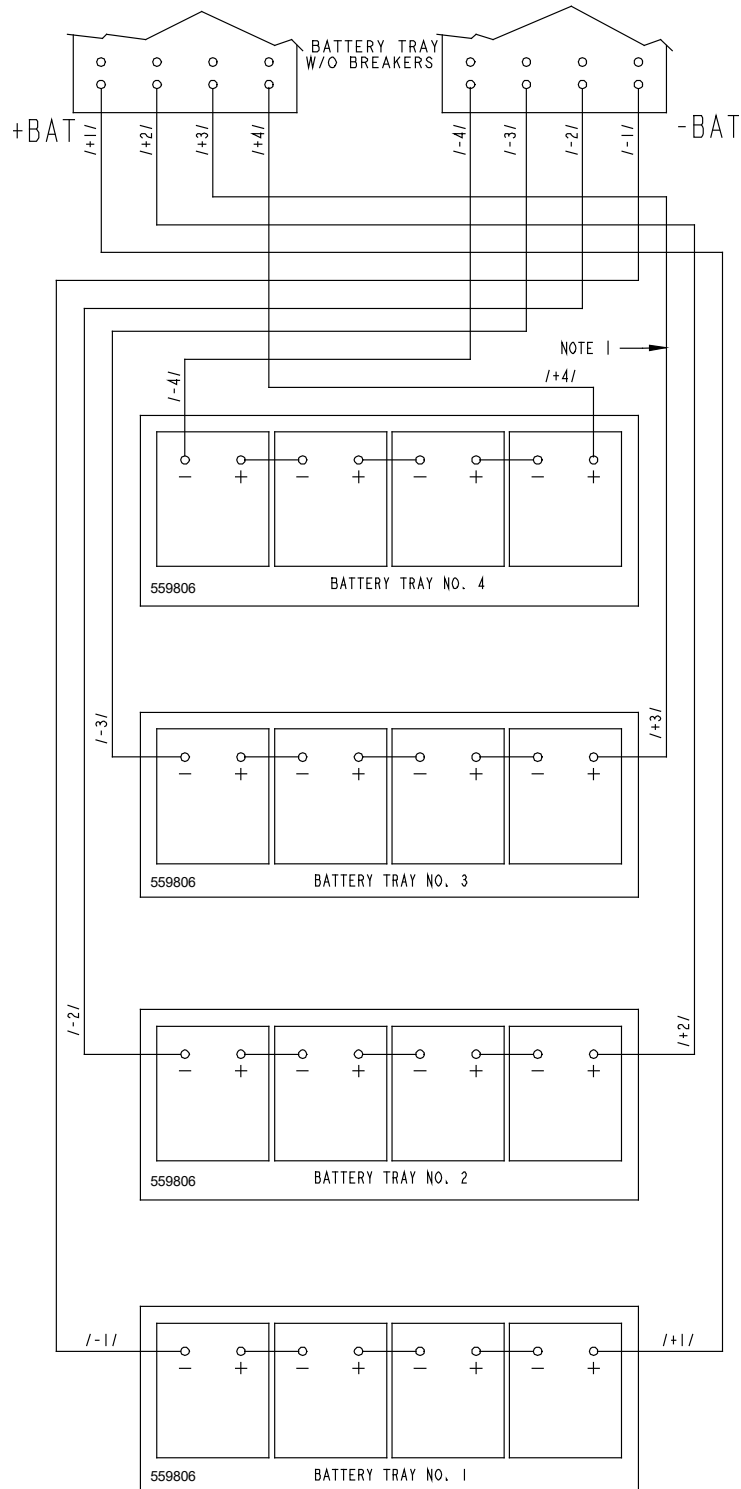
1. ALL BATTERY CABLES ARE SUPPLIED WITH LUGS AS PART OF LIST 93. CABLES AND LUGS ARE 1/0 IF NO BATTERY DISCONNECT IS FURNISHED. CABLES ARE 2 GA IF DISCONNECT IS 1-100A AND 1/0 IF 125-200A.
2. INSULATE AND TY-RAP ANY UNUSED WIRES.
3. BREAKER PANELS 559813 AND 559814 ARE TO BE USED FOR 0-100 AMP 1 POLE APPLICATIONS.
4. BREAKER PANELS 559815 AND 559816 ARE TO BE USED FOR 125-200 AMP 2 POLE APPLICATIONS.

Figure 5.74 Wiring Diagram - List 93 and List 95 Battery Tray (cont'd from previous page, cont'd on next page)



1. ALL BATTERY CABLES ARE SUPPLIED WITH LUGS AS PART OF LIST 93. CABLES AND LUGS ARE 1/0 IF NO BATTERY DISCONNECT IS FURNISHED. CABLES ARE 2 GA IF DISCONNECT IS 1-100A AND 1/0 IF 125-200A.
2. INSULATE AND TY-RAP ANY UNUSED WIRES.
3. BREAKER PANELS 559813 AND 559814 ARE TO BE USED FOR 0-100 AMP 1 POLE APPLICATIONS.
4. BREAKER PANELS 559815 AND 559816 ARE TO BE USED FOR 125-200 AMP 2 POLE APPLICATIONS.

Figure 5.74 Wiring Diagram - List 93 and List 95 Battery Tray (cont'd from previous page)



1. ALL BATTERY CABLES ARE SUPPLIED WITH LUGS AS PART OF LIST 93. CABLES AND LUGS ARE 1/0 IF NO BATTERY DISCONNECT IS FURNISHED. CABLES ARE 2 GA IF DISCONNECT IS 1-100A AND 1/0 IF 125-200A.

Installing and Connecting Batteries



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

Procedure



NOTE! Refer to Figure 5.75 as this procedure is performed.

1. **If Battery Trays are Equipped With a Circuit Breaker:** Turn OFF the Battery Disconnect circuit breaker located on all battery trays. Refer to Figure 5.75 for locations. Follow local lockout/tagout procedures to ensure circuit breakers remain in the off position during installation.
2. Remove the battery retention bracket as shown in Figure 5.75. To do so, remove the four 1/4-20 x 5/8” bolts and associated washers.
3. Slide batteries into the tray, with the battery terminals toward the front as shown in Figure 5.75. Slide batteries into the tray as far as they will go.



NOTE! The battery retention bracket can be oriented two ways to accommodate batteries of different lengths. A correctly oriented bracket will fit snugly against the batteries. If your batteries require the alternate bracket orientation shown in Detail A of Figure 5.75, remove and reinstall the bullet-shaped spacers as shown in Detail A before performing the next step.

4. Reinstall the battery retention bracket. The spacers on the bracket should separate the batteries from each other. Secure with the hardware removed in a previous step. Refer to Figure 5.75 for washer location.
5. Connect three links supplied by the battery manufacturer between pairs of battery terminals as shown in Figure 5.75. Use hardware furnished by the battery manufacturer. Torque hardware to battery manufacturer’s recommendations.
6. Ensure the battery cable ends in all trays are insulated with sleeving before performing the next step.



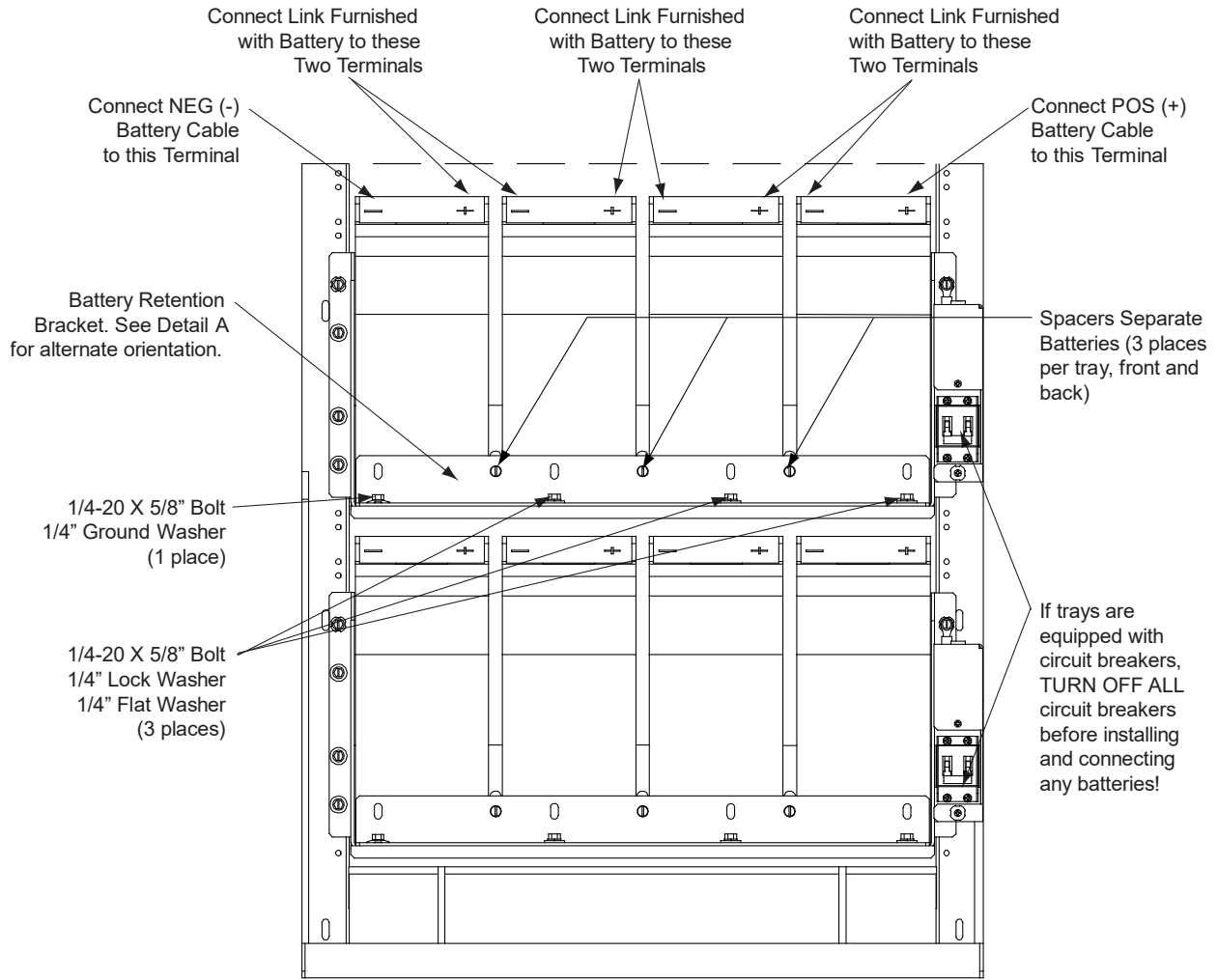
DANGER! In multiple-tray installations, when batteries in one tray are connected, the battery cables in all trays will be energized. Remove sleeving from and connect one cable at a time. Do not allow a cable end to contact the battery tray or equipment rack.



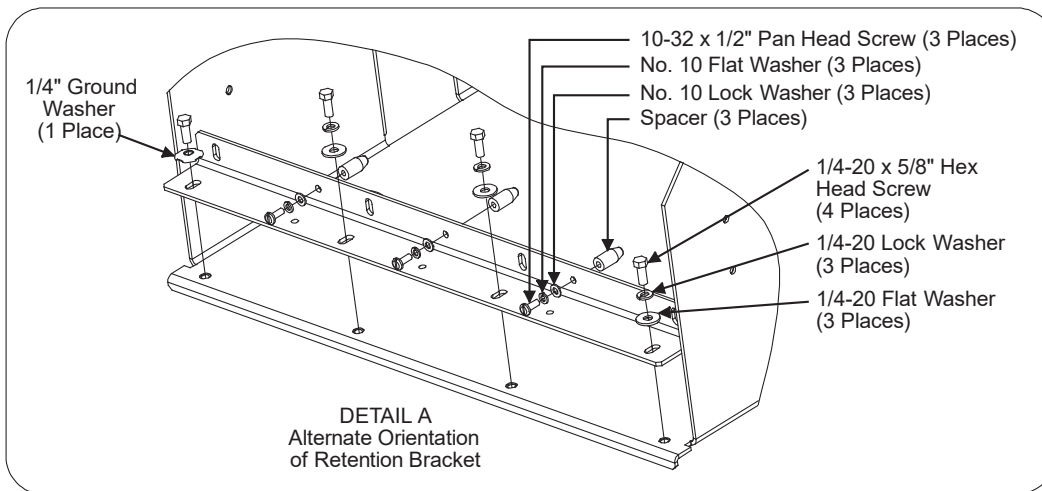
WARNING! In the next step, observe correct polarity. Connect only cables labeled “+” to battery terminals labeled “+”. Likewise, connect only cables labeled “-” to battery terminals labeled “-”.

7. Connect the cables found in the battery tray to the battery terminals, “+” to “+” and “-” to “-”. Observe correct polarity. Refer to Figure 5.75. Secure with hardware furnished with the battery. Torque hardware to battery manufacturer’s recommendations.
8. Repeat steps 1 through 7 for any remaining battery trays.
9. **If Battery Trays Are Equipped With a Circuit Breaker:** To connect the batteries to the power system, turn ON the Battery Disconnect circuit breaker located on all battery trays.

Figure 5.75 List 93 and List 95 Battery Tray Battery Installation Details



- Note:
1. Two trays shown as example.
 2. Cabling detail omitted.



6 Installing the Modules

6.1 Installing Rectifier Modules into Spec. No. 588705000 Module Mounting Assemblies

Rectifier modules are installed in a 588705000 module mounting assembly.

- Rectifiers are installed in 588705000 List 21, List 22, 31, and 32 shelves.

Rectifier modules can be inserted or removed with power applied (hot swappable).



NOTE! The rectifier module locks into the module mounting assembly through a latch located on the underside of the module. The latch and module handle are interactive. Push the handle into the module's front panel, and the latch will pop out from the module bottom. Click the handle to pop it out from the module's front panel, and the latch will retract back into the module. The latch mechanism is shown in Figure 6.1.



WARNING! To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing a module. NEVER hold the handle in the closed position when installing a module into a shelf.

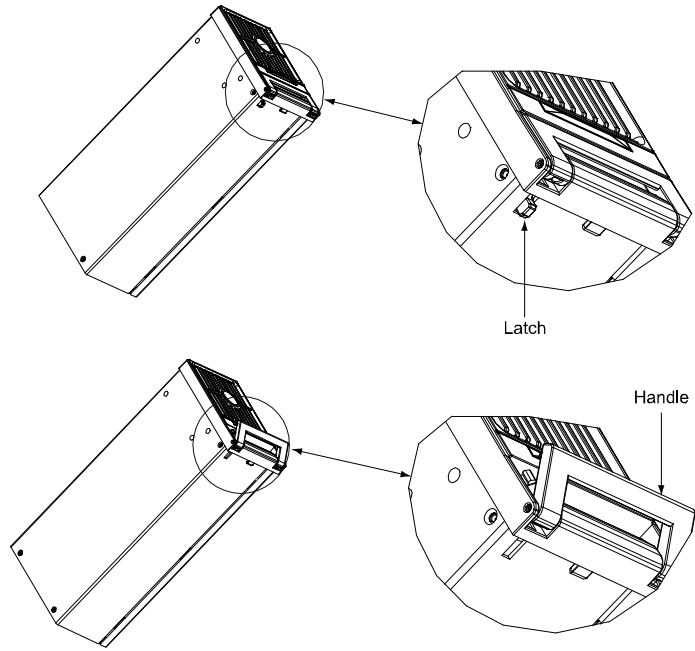


NOTE! *588705000 List 32 and List 33 Rectifier Mounting Assemblies Only (3-Phase Input):* One three-phase input feeds the three rectifier modules on the left-hand side of the shelf. The second three-phase input feeds the modules on the right-hand side. To maintain phase balance, install rectifier modules in groups of three; that is, fill all three mounting positions on the left and/or all three on the right.

Procedure

1. Unpack the rectifier modules.
2. If present, remove blank cover panels from the module mounting positions into which modules are to be installed.
3. Place the module into an unoccupied mounting slot without sliding it in completely.
4. Click the module handle in order to pop it forwards out of the module's front panel (this will also retract the latch mechanism located on the underside of the module).
5. Push the module completely into the shelf.
6. Push the handle into the front panel of the module. This will make the latch lock the module securely to the shelf.
7. Repeat the above steps for each module being installed in the system.
8. After the modules are physically installed in the mounting shelf(s), they are ready for operation immediately after power is supplied to them.

Figure 6.1 Installing Rectifier Modules into Spec. No. 588705000 Module Mounting Assembly



6.2 Installing Rectifier Modules into Spec. No. 588705500 Module Mounting Assemblies

Rectifier modules can be inserted or removed with power applied (hot swappable).



NOTE! The rectifier module locks into the module mounting assembly through a latch located on the underside of the module. The latch and module handle are interactive. Push the handle into the module's front panel, and the latch will pop out from the module bottom. Click the handle to pop it out from the module's front panel, and the latch will retract back into the module. The latch mechanism is shown in Figure 6.2.



WARNING! To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing a module. NEVER hold the handle in the closed position when installing a module into a shelf.

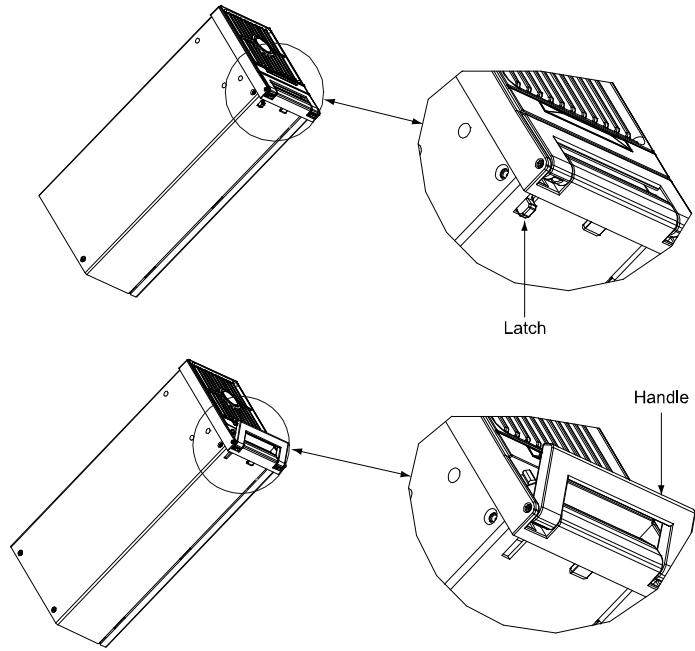


NOTE! *588705500 List 04 and List 05 Rectifier Mounting Assemblies Only (3-Phase Input):* One three-phase input feeds the three rectifier modules on the left-hand side of the shelf. The second three-phase input feeds the modules on the right-hand side. To maintain phase balance, install rectifier modules in groups of three; that is, fill all three mounting positions on the left and/or all three on the right.

Procedure

1. Unpack the rectifier modules.
2. If present, remove blank cover panels from the module mounting positions into which modules are to be installed.
3. Place the module into an unoccupied mounting slot without sliding it in completely.
4. Click the module handle in order to pop it forwards out of the module's front panel (this will also retract the latch mechanism located on the underside of the module).
5. Push the module completely into the shelf.
6. Push the handle into the front panel of the module. This will make the latch lock the module securely to the shelf.
7. Repeat the above steps for each module being installed in the system.
8. After the modules are physically installed in the mounting shelf(s), they are ready for operation immediately after power is supplied to them.

Figure 6.2 Installing Rectifier Modules into Spec. No. 588705500 Module Mounting Assembly



6.3 Installing the Rectifier and Converter Modules into Spec. No. 588705300 Module Mounting Assemblies

Rectifier and converter modules can be inserted or removed with power applied (hot swappable).

Rectifiers modules can be installed in any mounting position of each module mounting assembly. Converters modules can be installed in any of the three far right mounting positions of each module mounting assembly (as viewed from the front). See Figure 6.5. See Alerts below for restrictions.



NOTE! Each rectifier and converter module locks into the module mounting assembly by means of a latch located on the bottom of the module. The latch and module handle are interactive. Pushing the handle up into the module's front panel causes the latch to extend to the locking position; pulling the handle down out from the module's front panel causes the latch to retract. See Figure 6.5.



WARNING! To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing a module. NEVER hold the handle in the closed position when installing a module into a shelf.

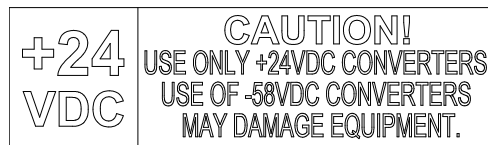


ALERT! The system can either have +24V DC-DC converters installed or -58V DC-DC converters installed. The system cannot have both types of converters installed at the same time.



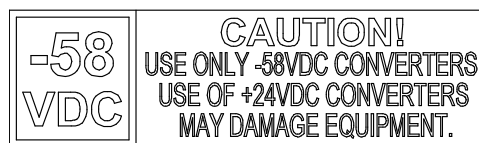
ALERT! The -48 VDC to +24 VDC converter modules must only be installed in a system position that accepts a +24V DC-DC converter. Refer to labeling on the system's module mounting shelf. A sample of this labeling is provided in Figure 6.3.

Figure 6.3 Sample Module Mounting Shelf Labeling



ALERT! The -48 VDC to -58 VDC converter modules must only be installed in a system position that accepts a -58V DC-DC converter. Refer to labeling on the system's module mounting shelf. A sample of this labeling is provided in Figure 6.4.

Figure 6.4 Sample Module Mounting Shelf Labeling

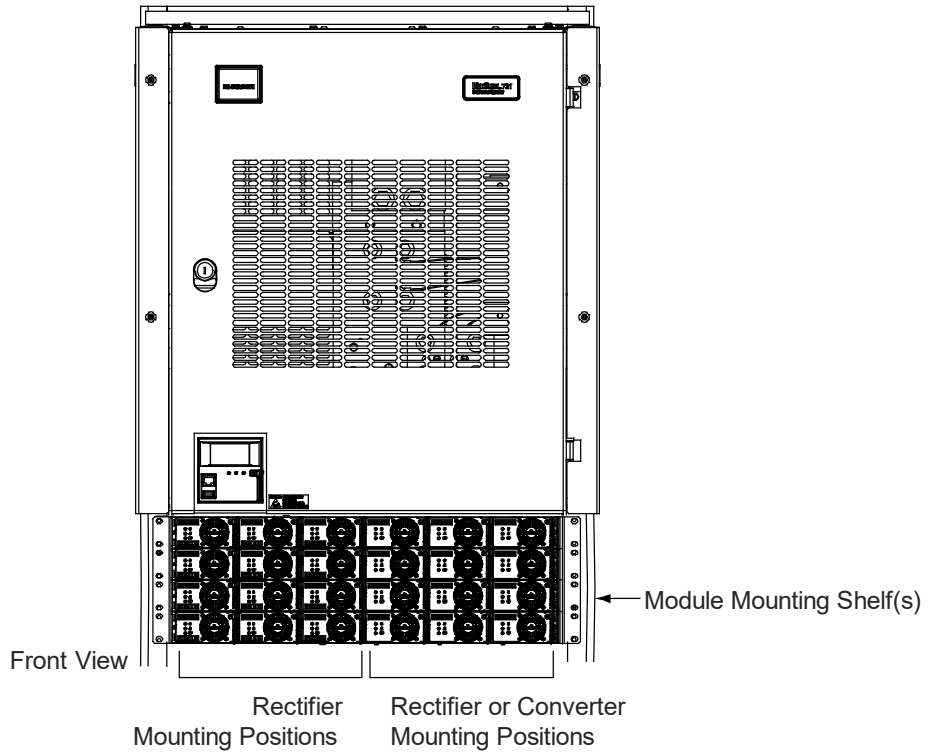


Procedure

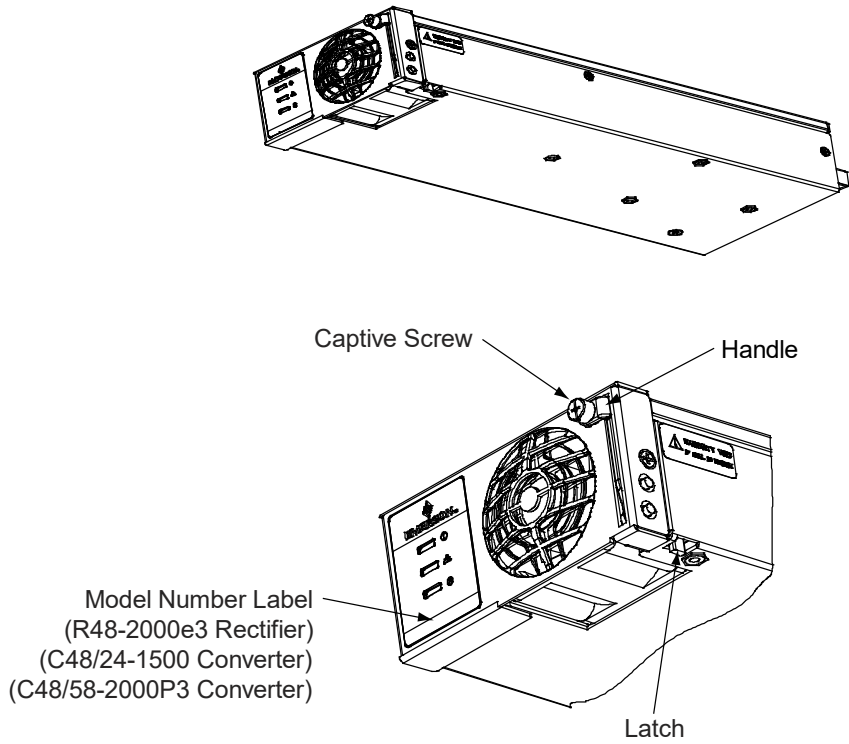
1. Unpack the modules.
2. Note the model number located on the front of each module. Model numbers starting with the letter "R" are rectifier modules. Model numbers starting with the letter "C" are converter modules.
3. Place the module into an unoccupied mounting position without sliding it in completely. Rectifiers modules can be installed in any mounting position of each module mounting assembly. Converters modules can be installed in any of the three far right mounting positions of each module mounting assembly (as viewed from the front). See Figure 6.5.
4. Loosen the captive screw on the module's handle. Pull the handle down out from the module's front panel (this will also retract the latch mechanism). See Figure 6.5.

5. Push the module completely into the shelf.
6. Push the handle up into the module's front panel. This will lock the module securely to the shelf. Tighten the captive screw on the handle.
7. Repeat the above steps for each module being installed in the system.
8. After the modules are physically installed in the mounting shelf(s), they are ready for operation immediately after power is supplied to them.

Figure 6.5 Installing Rectifier and Converter Modules into Spec. No. 588705300 Module Mounting Assembly



Rectifier or Converter Module



6.4 Installing Rectifier Modules into Spec. No. 588705400 Module Mounting Assemblies

Rectifiers can be inserted or removed with power applied (hot swappable).



NOTE! Each rectifier locks into the module mounting assembly by means of a latch located on the bottom of the rectifier. The latch and rectifier handle are interactive. Pushing the handle up into the rectifier's front panel causes the latch to extend to the locking position; pulling the handle down out from the rectifier's front panel causes the latch to retract. See Figure 6.6.



WARNING! To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing a rectifier. NEVER hold the handle in the closed position when installing a rectifier into a shelf.

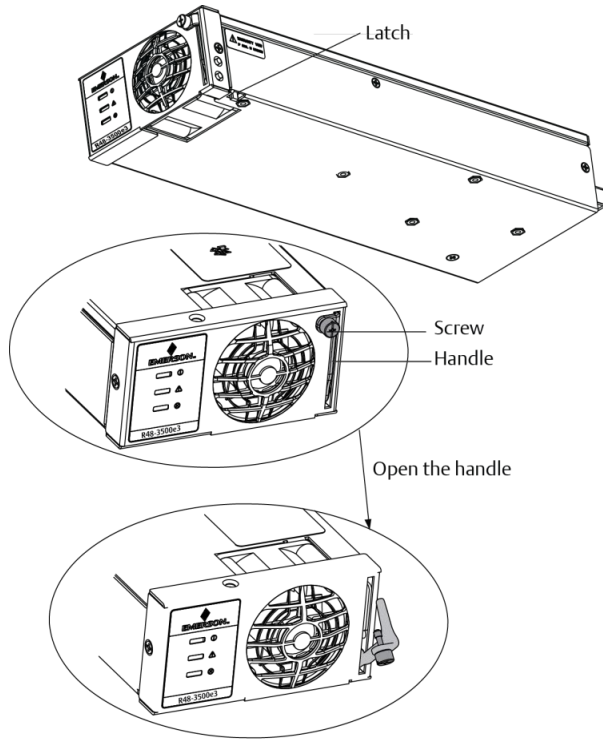


NOTE! *588705400 List 03 and List 04 Rectifier Mounting Assemblies Only (3-Phase Input):* One three-phase input feeds the three rectifier modules on the left-hand side of the shelf. The second three-phase input feeds the modules on the right-hand side. To maintain phase balance, install rectifier modules in groups of three; that is, fill all three mounting positions on the left and/or all three on the right.

Procedure

1. Unpack the rectifiers.
2. If present, remove blank cover panels from the module mounting positions into which rectifiers are to be installed.
3. Place the rectifier into an unoccupied mounting position without sliding it in completely.
4. Loosen the captive screw on the rectifier's handle. Pull the handle down out from the rectifier's front panel (this will also retract the latch mechanism). See Figure 6.6.
5. Push the rectifier completely into the shelf.
6. Push the handle up into the rectifier's front panel. This will lock the rectifier securely to the shelf. Tighten the captive screw on the handle.
7. Repeat the above steps for each rectifier being installed in the system.
8. After the rectifiers are physically installed in the mounting assembly(s), they are ready for operation immediately after power is supplied to them.

Figure 6.6 Installing Rectifiers into Spec. No. 588705400 Module Mounting Assembly



6.5 Installing Inverter Module in Inverter Module Mounting Assembly (If Equipped with Optional Inverter System)

Inverter modules can be inserted or removed with power applied (hot swappable).



NOTE! Each inverter module locks into the module mounting shelf by means of a latch located on the bottom of the inverter module. The latch and inverter module handle are interactive. Pushing the handle up into the inverter module's front panel causes the latch to extend to the locking position; pulling the handle down out from the inverter module's front panel causes the latch to retract. See Figure 6.7.

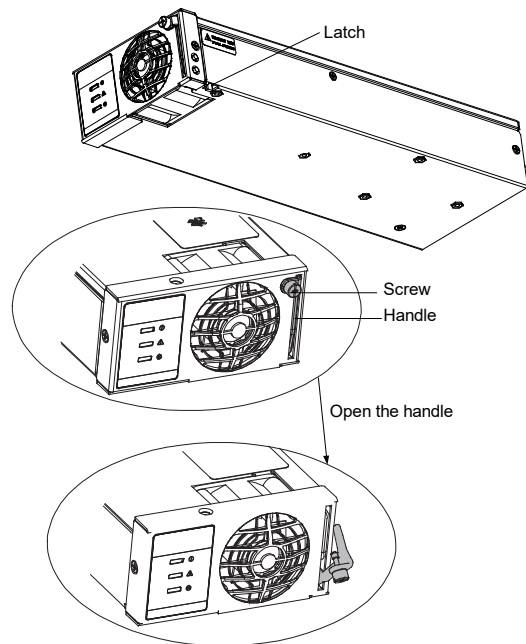


WARNING! To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing an inverter module. NEVER hold the handle in the closed position when installing an inverter module into a shelf.

Procedure

1. Unpack the inverter modules.
2. If present, remove blank cover panels from the module mounting positions into which inverter modules are to be installed.
3. Place the inverter module into an unoccupied mounting position without sliding it in completely.
4. Loosen the captive screw on the inverter module's handle. Pull the handle down out from the inverter module's front panel (this will also retract the latch mechanism). See Figure 6.7.
5. Push the inverter module completely into the shelf.
6. Push the handle up into the inverter module's front panel. This will lock the inverter module securely to the shelf. Tighten the captive screw on the handle.
7. Repeat the above steps for each inverter module being installed in the system.
8. After the inverter modules are physically installed in the mounting shelf(s), they are ready for operation immediately after power is supplied to them.

Figure 6.7 Installing Inverter Modules



7 Initially Starting, Configuring, and Checking System Operation



CAUTION! Performing various steps in the following procedures may cause a service interruption and/or result in the extension of alarms. Notify any appropriate personnel before starting these procedures. Also, notify personnel when these procedures are completed.

7.1 Initial Startup Preparation

- Ensure that all blocks, except the last one, in the “Installation Acceptance Checklist” starting on page 2 have been checked.
- Ensure that module mounting positions are filled by a rectifier module, converter module, Inverter Module or a blank cover panel, as required. It is acceptable for positions to be left vacant.
- Refer to the configuration drawing (C-drawing) supplied with your power system documentation for factory settings of adjustable parameters.

7.2 Initially Starting the System

Procedure

1. Apply battery power to the system by closing the external battery disconnect(s) or protective device(s) that supplies battery power to the system, if furnished. Close the system’s internal battery disconnect circuit breakers, if furnished.
2. Apply AC power to the system by closing ALL external AC disconnects or protective devices that supply AC input power to the module mounting assemblies. Rectifiers automatically start. Inverters automatically start (if equipped with Optional Inverter System).



NOTE! By default, the inverter runs in AC Mode. Refer to the NCU Instructions (UM1M830BNA) to change this mode, if required.

3. Open the distribution cabinet’s front door by turning the latch in the counterclockwise position (system’s in a relay rack), or open the system’s enclosure door.
4. Place each distribution circuit breaker (if furnished) to the ON position.
Place each circuit breaker located on the AC distribution shelf(s) to the ON position. (if equipped with Optional Inverter System).

7.3 NCU Controller Procedure

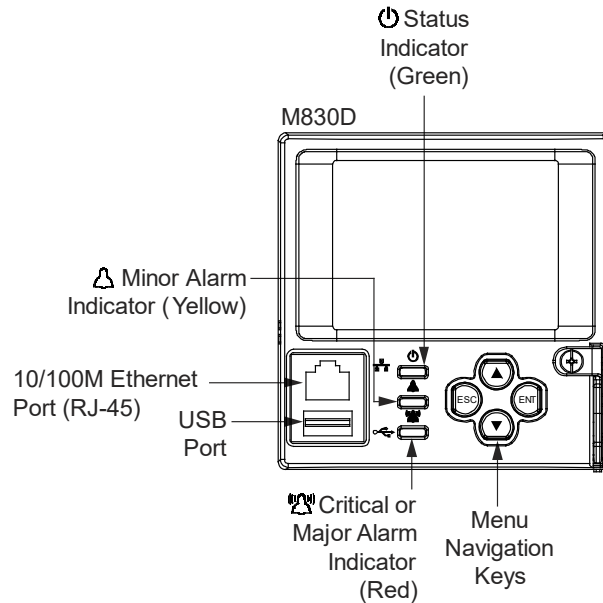
Refer to this section if your system is furnished with an NCU Controller.

NCU Controller Initialization

Refer to the NCU Instructions (UM1M830BNA) for detailed instructions.

Refer to Figure 7.1 for locations of the NCU local indicators and navigation keys.

Figure 7.1 NCU Local Indicators and Navigation Keys



Procedure



NOTE! The initialization routine takes several minutes. During that time various alarm indicators may illuminate on the NCU front panel and an audible alarm may sound. Disregard all alarms. An audible alarm can be silenced at any time by momentarily depressing the **ENT** key on the NCU Controller.

1. After the NCU is powered on, the display shows the “**logo**” screen. The controller is initializing.
2. When initialization is complete, the language screen appears. Press the up or down arrow key to select the desired language. Press the **ENT** key to confirm the selection.
3. The Main Menu displays. See Figure 7.2.
4. If equipped with optional inverter system, The NCU is factory configured for use with this inverter system and no adjustment is required.

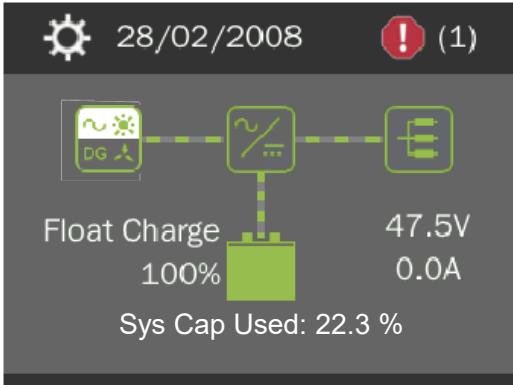
Figure 7.2 NCU Local Display Main Menu

Main Menu

Date and time are alternately displayed.

Green - No Alarm
Red - Alarm

The number in () indicates the total number of alarms.



Press the UP and DOWN keys to highlight the desired Menu graphic in the Main Menu.

Press the ENT key to enter the selected menu.

Graphics	Menu Name	Description
	Alarm (Green - No Alarm) (Red - Alarm)	View active alarms and alarm history.
	Settings	Gain access to the NCU Controller's settings menus.
	Input Power	View AC, Solar, DG, and Wind related information.
	Module	View rectifier, solar converter, and converter module related information.
	DC	View DC equipments related information.
	Battery	View battery related information.

To reboot the Controller, from the Main Menu press the ENT and ESC keys at the same time. Release both keys. Press ENT to confirm.



NOTE! "Sys Cap Used" is based on the number of installed rectifiers and solar converters (if furnished).

- System information is displayed in multiple screens. Press the ESC key to view other system information. Press the down arrow key to view the next screen. Press the ESC key to return to the Main Menu.
- From the Main Menu, press the UP and DOWN keys to highlight the desired Menu graphic in the Main Menu. Press the ENT key to enter the selected menu.



NOTE! Repeatedly press the "ESC" key to return in reverse order level by level from any submenu until the Main Menu appears.

- Verify and set the NCU controller as required for your application. Refer to the NCU Instructions (UM1M830BNA) for procedures. Note that you will have to program the NCU for any temperature probes and external inputs/outputs connected to the IB2 Interface Board, optional EIB Interface Board, and optional SM-DU+ Shunt Interface Board. Refer also to "NCU Start Wizard" on page 200.



NOTE! When setting total rectifier or total converter current limit, the set point to each unit is the total set point divided by the number of units. For example, if the system contains five rectifiers and the current limit is set to 150 amps then each rectifier has a current limit set point of 30 amps. If one or more rectifiers or converters are removed or fail it will take several seconds for the individual set points to the remaining rectifiers or converters to be reset. In the example given, if one rectifier is removed the current limit set point will drop to 120 amps (30 amps times four remaining rectifiers) until the controller can send updated set points to the remaining rectifiers. This takes a couple communication cycles (several seconds) after which each rectifier would have a new set point of 37.5 amps for a total of 150 amps. The total current limit of the rectifiers and converters should not be set such that the loss of the redundant rectifiers or converters will cause this temporary set point to drop below the actual maximum expected load. If batteries are used on the rectifier output, the batteries should support the load until the current limit set points can be re-established due to loss of a rectifier.

NCU Start Wizard

For initial startup, you can perform the Start Wizard from the local keypad and display to enter basic programmable parameters in one session. Refer to the “Start Wizard” section in the NCU Instructions (UM1M830BNA).

Verifying the Configuration File

Your NCU was programmed with a configuration file that sets all adjustable parameters. The version number of the configuration file can be found on the configuration drawing (C-drawing) that is supplied with your power system documentation, and on a label located on the NCU. You can verify that the correct configuration file has been loaded into your NCU by performing the following procedure.



NOTE! The quantity of LVD's and shunt values for your specific system may be different from the values shown on the C-drawing.

Procedure

1. With the Main Menu displayed, press **ESC**. A screen displays the NCU name, serial number, IP number, software version, hardware version, and configuration version number.
2. Press **ESC** to return to the Main Menu.

Checking Basic System Settings

Navigate through the controller menus and submenus to check system settings. You can adjust any parameter as required. Note that these settings can also be checked (and changed if required) via the WEB Interface. Refer also to “NCU Start Wizard” on page 200.



NOTE! Repeatedly press the “ESC” key to return in reverse order level by level from any submenu until the Main Menu appears.

Procedure

1. **To Select a Sub-Menu:**
Press the UP and DOWN keys to highlight the desired sub-menu. Press the ENT key to enter the selected sub-menu.
2. **To Select a User:**
To select a User, use the UP and DOWN keys to move the cursor to the Select User field. Press ENT. Use the UP and DOWN keys to select a User previously programmed into the NCU. Press ENT to select the User. Note that only Users programmed into the NCU are shown. Users are programmed via the Web Interface. The default User is admin.
3. **To Enter a Password:**
To enter a password, use the UP and DOWN keys to move the cursor to the Enter Password field. Press ENT. Use the UP and DOWN keys to choose a character. Press ENT to accept and move to the next character. Continue this process until all characters are entered. Press ENT again to accept the password. The default password is 640275.
4. **To Change a Parameter:**
Press the UP and DOWN keys to move up and down the list of parameters. Press ENT to select the parameter. Press the UP and DOWN keys to change the parameter. Press ENT to make the change. Press ESC to cancel the change.



NOTE! When a List 5 is cabled to the main battery term bars in the List 1, the battery shunt should be turned off and “Calculate Battery Current” can be turned on.

Table 7.2 shows the menu navigation for some basic settings. Refer to the separate NCU Manual (UM1M830BNA) supplied with your power system for complete Local Display menus.



NOTE! If an NCU configuration is furnished that enables NCU capability to receive status information sent from Fiamm SoNick (Sodium Nickel) batteries, some NCU parameters cannot be changed. Refer to the NCU controller manual UM1M830BNA for details.

Table 7.1 NCU Basic Settings Menu Navigation

Parameter	Menu Navigation
Date	Main Menu / Settings Icon / Sys Settings / Date.
Time	Main Menu / Settings Icon / Sys Settings / Time.
IP Communications Parameters (IP address, subnet mask address, gateway address)	Main Menu / Settings Icon / Comm Settings / enter parameters.
Float Voltage	Main Menu / Settings Icon / Batt Settings / Charge / Float Voltage.
Equalize Voltage	Main Menu / Settings Icon / Batt Settings / Charge / EQ Voltage.
Battery Current Limit	Main Menu / Settings Icon / Batt Settings / Charge / Curr Limit Mode and Batt Curr Limit.
Battery Capacity	Main Menu / Settings Icon / Batt Settings / Batt1 Settings or Batt2 Settings / Rated Capacity.
Reset Battery Capacity	Main Menu / Settings Icon / Batt Settings / Basic Settings / Reset Batt Cap
BTRM Feature	Web Menu Navigation Only: Settings Menu / Battery Tab.
Battery Charge Temperature Compensation	Main Menu / Settings Icon / Batt Settings / Temp Comp (enter parameters).
HVSD Limit	Web Menu Navigation Only: Settings Menu / Rectifiers Tab / HVSD (set to enabled) then set HVSD Limit.
Rectifier Current Limit	Main Menu / Settings Icon / Rect Settings / Current Limit (set to enabled) then set Curr Limit Pt.
Over Voltage Alarm 1	Main Menu / Settings Icon / Other Settings / Over Voltage 1.
Over Voltage Alarm 2	Main Menu / Settings Icon / Other Settings / Over Voltage 2.
Under Voltage Alarm 1	Main Menu / Settings Icon / Other Settings / Under Voltage 1.
Under Voltage Alarm 2	Main Menu / Settings Icon / Other Settings / Under Voltage 2.

Changing Battery Capacity Rating in the NCU



NOTE! After setting the battery capacity, the User should also reset the battery capacity (battery must be fully charged).

1. Change the battery capacity setting of the NCU to match the battery connected to the power system.

Local Menu Navigation:

Main Menu / Settings Icon / Batt Settings / Batt1 Settings or Batt2 Settings / Rated Capacity.

Web Menu Navigation:

Settings Menu / Battery Tab / Batt1 Rated Capacity and Batt2 Rated Capacity.

2. Reset the battery capacity (resets the battery capacity calculation).



NOTE! Only reset the battery capacity when the battery is fully charged; otherwise, the battery charge status may not be accurate.

Local Menu Navigation:

Main Menu / Settings Icon / Batt Settings / Basic Settings / Reset Batt Cap.

Web Menu Navigation:

Settings Menu / Battery Tab / Reset Battery Capacity.

Refer to the NCU Instructions (UM1M830BNA) for detailed instructions.

Configuring the NCU Identification of Rectifiers and Assigning which Input Feed is Connected to the Rectifiers

When rectifiers are all installed prior to applying power and starting the system, the order in which the NCU identifies the rectifiers is by serial number (lowest serial number is Rect 1, next lowest is Rect 2, etc.). If you prefer the NCU to identify the rectifiers by position in the system, perform the following procedure.

Upon power up, the NCU arbitrarily assigns Feed AC1, AC2, or AC3 to each rectifier. This assignment is used to display rectifier AC input feed voltage(s). The User may reassign the feed to each rectifier per your specific installation by following the procedure below.

Local Menu Navigation:

None.

Web Menu Navigation:

Refer to the NCU Instructions (UM1M830BNA) for detailed instructions.

Configuring the NCU Identification of Converters

When converters are all installed prior to applying power and starting the system, the order in which the NCU identifies the converters is by serial number (lowest serial number is Conv 1, next lowest is Conv 2, etc.). If you prefer the NCU to identify the converters by position in the system, perform the following procedure.

Local Menu Navigation:

None.

Web Menu Navigation:

Refer to the NCU Instructions (UM1M830BNA) for detailed instructions.

NCU Alarm Relay Check

To verify operation of the external alarm relays, use the NCU alarm relay test feature. Refer to the NCU Instructions (UM1M830BNA) for instructions in using this feature.



NOTE! The relays may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.

7.4 Programming the Controller for any Installed Supplemental Bays

Procedure

Supplied with the supplemental bay is a USB drive which contains the product documentation along with a document file that provides a listing of the SM-DU and optional SM-DU+ settings required for that particular supplemental bay. See Table 7.3 and Table 7.4 for samples of the information provided in the file. Refer to this document file (chart) and program the SM-DU and optional (if furnished) SM-DU+ settings in the controller with the specific values listed in the chart. Refer to the NCU Instructions (UM1M830BNA) for programming details. There are also labels located near the SM-DU and SM-DU+ in the supplemental bay that detail the controller's settings for this bay.

Once the controller has been programmed for the newly installed supplemental bay, refer to the NCU Instructions (UM1M830BNA) and save a copy of the "SettingParam.tar" file.

Table 7.2 Sample Supplemental Bay SM-DU Programmable Parameter Chart

Device	Parameter	Factory Setting	Setting for this Bay
SM-DU Shunt 1 Load	Full Scale Current (A)	2500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU Shunt 2 Battery	Full Scale Current (A)	2500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU LVD	LVD1	Enabled	Refer to USB Drive
	LVD2	Enabled	Refer to USB Drive

Table 7.3 Sample Supplemental Bay Optional SM-DU+ Programmable Parameter Chart (cont'd on next page)

Device	Parameter	Factory Setting	Setting for this Bay
SM-DU+ Shunt 1	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 2	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 3	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 4	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 5	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 6	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 7	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 8	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 9	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 10	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 11	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 12	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 13	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 14	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 15	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive

Table 7.4 Sample Supplemental Bay Optional SM-DU+ Programmable Parameter Chart (cont'd from previous page)



















Device	Parameter	Factory Setting	Setting for this Bay
SM-DU+ Shunt 16	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 17	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 18	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 19	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 20	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 21	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 22	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 23	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 24	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive
SM-DU+ Shunt 25	Full Scale Current (A)	500	Refer to USB Drive
	Full Scale Voltage (mV)	25	Refer to USB Drive

7.5 Checking System Status

Procedure

1. Observe the status of the indicators located on the controller, rectifiers, converters, and inverters (if furnished). If the system is operating normally, the status of these is as shown in Table 7.5.

Table 7.4 Status and Alarm Indicators

Component	Indicator		Normal State
NCU		Status (Green)	On
		Minor (Yellow)	Off
		Critical or Major Alarm (Red)	Off
Rectifier Modules	 or 	Power (Green)	On
	 or 	Protection (Yellow)	Off
	 or 	Alarm (Red)	Off
Converter Modules	 or 	Power (Green)	On
	 or 	Protection (Yellow)	Off
	 or 	Alarm (Red)	Off
Inverter Modules		Power (Green)	On
		Protection (Yellow)	Off
		Alarm (Red)	Off

7.6 Final Steps

Procedure

1. If any controller configuration settings were changed, refer to the NCU Instructions (UM1M830BNA) and save a copy of the configuration file. This file can be used to restore the controller settings, if required, at a later date.



NOTE! Note that provided on a USB drive furnished with the system is a controller configuration drawing (C-drawing) and the controller configuration files loaded into the controller as shipped.

2. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.
3. Verify all rectifier, converter modules, inverter modules (if equipped with Optional Inverter System) and the controller are fully seated, latched, and the latch handle screws secured.
4. Verify there are no external alarms and the local indicators are as shown in Table 7.5.

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