Installation Guide for Galaxy Power Systems

Note: Instructions in this manual reference installation and setup of GPS 4848/100, GPS 4827, and GPS 4830 power systems, using the Millennium II Controller. For installation and setup with other controllers and rectifiers refer to their product manuals.

Installation Guide
Select Code 167-792-157
Comcode 108327362
Version 13.2
July 2018

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1 Introduction

Product Documentation

This Installation Guide

This Installation Guide provides instructions for installing GPS 4848/100, GPS 4827, and GPS 4830 Power Systems.

Revisions

For information on systems components that are no longer available (Discontinued Availability, DA) see earlier issues of this manual.

Related Documentation

GPS Systems

Ordering Guide	H569-4827_4830_434
Manufacturing Drawings	ED83142-30 (AC) ED83143-31 (DC) J85582C-1 (System)
Wiring Diagram	T83314-30
GPS 4848/100 User's Guide	108994042
GPS 4827 User's Guide	850022019
GPS 4830 User's Guide	TBD

Millennium II Controller

Manufacturing Drawing	J85501P-1
Product Manual	108994645

Remote Peripheral Monitoring System

Manufacturing Drawing	J85501G-1
Wiring Diagram	T83275-30
Schematic Drawing	SD-83275-01
Product Manual Select Code	167-790-063

Customer Service Contacts

Customer Service, Technical Support, Product Repair and Return, and Warranty Service	For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-877-546-3243. This number is staffed from 7:00 am to 5:00 pm Central Time (zone 6), Monday through Friday, on normal business days. At other times this number is still available, but for emergencies only. Services provided through this contact include initiating the spare parts procurement process, ordering documents, product warranty administration, and providing other product and service information. For other customers worldwide contact your local field support center or your sales representative to discuss your specific needs.
Customer Training	ABB offers customer training on many Power Systems products. For information call 1-972-244-9288 (WATT). This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.
Downloads and Software	To obtain the latest product information, product software, or software upgrades, contact your local field support center or your sales representative.

2 Safety

Safety Statements

Please read and follow all safety instructions and warnings before installing, maintaining, or repairing a Galaxy Power System. Reference the individual module product manuals for additional safety statements specific to the modules.

- The Galaxy Power Systems, GPS 4848/100, GPS 4827, and GPS 4830, are Underwriters Laboratories (UL) Listed products, evaluated to UL Standard for Safety for Information Technology Equipment - Safety - Part 1: General Requirements, ANSI/UL60950-1-2014, Second Edition, dated November 10, 2014 and CAN/CSA C22.2 No. 60950-1-07, Second Edition + A2:2014 (MOD), dated October 10, 2014, UL Subject 1801, Issue Number 2, Power Distribution Centers for Communication Equipment dated June 12, 2003, and IEC 61204-7, Low voltage power supplies, d.c. output, Annex PS-E. Rectifiers are individually UL Recognized and/or CSA Certified to ENSI/UL60950-1-2014 and CAN/CSA C22.2 No. 60950-1-07, Second Edition + A2:2014 (MOD), dated October 14, 2014. Rectifiers are also approved to IEC60950-1/EN60950-1:2006+A11+A1+A12+A2 by an EC Notified Body and have outputs classified as SELV.
- Install only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17, and 110-18 of the U.S. National Electric Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.
- Rules and Regulations – Follow all national and local rules and regulations when making field connections.
- Cable Dress – Dress to avoid damage to the conductors and undue stress on the connectors.
- Electrical Connection Securing – Torque electrical connections to the values specified on labels orin the product documentation.

Safety Statements, continued

- Use this equipment in a controlled environment (an area where the humidity is maintained at levels that cannot cause condensation on the equipment, the contaminating dust is controlled, and the steady-state ambient temperature is within the range specified).
  GPS 4848/100 and GPS 4827 have been evaluated for use in a continuous ambient temperature not to exceed 40°C. Short-term excursions to 45°C are acceptable for the GPS 4848/100 and 43°C for the GPS 4827. GPS 4830 has been evaluated for use in a continuous ambient temperature not to exceed 35°C for Types GZ1, GZ8-GZ10, GZ20, and GZ21 and 45°C for Types GZ2-GZ7 and GZ17-GZ19. Short-term excursions to 50°C are acceptable for all models.
- Do not install this equipment over combustible surfaces.
- Circuit Breakers and Fuses: Installing fuses or circuit breakers not specified for use in this equipment may result in injury to service personnel or equipment damage.
  - Fuses/circuit breakers may not be provided with the equipment. Refer to the Galaxy Power System documentation for the proper hardware. Use only those specified in the equipment ordering guide.
  - Size as required by the National Electric Code (NEC) and/or local codes. Safety Tested Limits - Refer to the equipment ratings to assure current does not exceed:
    Maximum Load – 80% of protector rating
  - GMT Style Fuses – Use only fuses provided with safety caps.
- Compression Connectors – For installations in the U. S. or Canada, use Listed/Certified compression connectors to terminate Listed/Certified field-wire conductors where required. For all installations, apply the appropriate connector to the correct size conductor as specified by the connector manufacturer, using only the connector manufacturer's recommended tooling or tooling approved for that connector. If the proper connector for the country of installation is not provided, obtain appropriate connectors and follow manufacturer's and all local requirements for proper connections.
- Battery input cables must be dressed to avoid damage to the conductors (caused by routing around sharp edges or routing in areas where wires could get pinched) and undue stress on the connectors.

Safety Statements, continued

- Field-wired Conductors – Follow all National Electric Code (NEC) and local rules and regulations.
  - Insulation rating: 90°C minimum; 105°C (minimum) if internal to enclosed equipment cabinets.
  - Size AC field-wired conductors with 75°C ampacity (NEC) equal to or greater than their panel board circuit breaker rating.
  - Size DC field-wired conductors with 90°C ampacity (NEC) equal to or greater than circuit breaker/fuse rating.
- Provide an accessible AC and DC disconnect/protection device to remove input power from the equipment in the event of an emergency. This device must open all poles and be connected together. When connecting to 3-wire plus neutral supply systems, the neutral must be readily earthed at the supply, i.e., this equipment is not intended to be connected to IT supply systems.
- Alarm Signals – Provide external current limiting protection. Rating 60V, 0.5A unless otherwise noted.
- Grounding – Connect the equipment chassis directly to ground. In enclosed equipment cabinets connect to the cabinet AC service ground bus. In huts, vaults, and central offices connect to the system bonding network.

Warning and Safety Symbols

The symbols may sometimes be accompanied by some type of statement; e.g., “Hazardous voltage/energy inside. Risk of injury. This unit must be accessed only by qualified personnel.” Signal words as described below may also be used to indicate the level of hazard

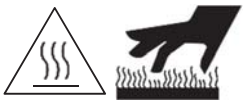
DANGER	Indicates the presence of a hazard that will cause death or severe personal injury ifthe hazard is not avoided.
WARNING	Indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.
CAUTION	Indicates the presence of a hazard that will or can cause minor personal injury orproperty damage if the hazard is not avoided.

This symbol identifies the need to refer to the equipment instructions for important information.

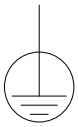
These symbols (or equivalent) are used to identify the presence of hazardous ac mains voltage.

This symbol is used to identify the presence of hazardous ac or dc voltages. It may also be used to warn of hazardous energy levels.

One of these two symbols (or equivalent) may be used to identify the presence of rectifier and battery voltages. The symbol may sometimes be accompanied by some type of statement, for example: “Battery voltage present. Risk of injury due to high current. Avoid contacting conductors with uninsulated metal objects. Follow safety precautions.”



One of these two symbols may be used to identify the presence of a hot surface. It may also be accompanied by a statement explaining the hazard. A symbol like this with a lightning bolt through the hand also means that the part is or could be at hazardous voltage levels.



This symbol is used to identify the protective safety earth ground for the equipment.

This symbol is used to identify other bonding points within the equipment.

This symbol is used to identify the need for safety glasses and may sometimes be accompanied by some type of statement, for example: “Fuses can cause arcing and sparks. Risk of eye injury. Always wear safety glasses.”

Precautions

When working on or using this type of equipment, the following precautions should be noted:

- Install, service, and operate equipment only by professional, skilled and qualified personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment.
- Multiple AC inputs may be present to equipment. Make sure that the appropriate circuit protection device for each AC input being serviced is disconnected before servicing the equipment.
- Disconnect batteries from outputs and/or follow safety procedures while working on equipment. Batteries may be connected in parallel with the output of the rectifiers. Turning off the rectifiers will not necessarily remove power from the bus.
- High leakage currents may be possible on this type of equipment. Make sure the equipment is properly safety earth grounded before connecting power.
- Exercise care and follow all safety warnings and practices when servicing this equipment. Hazardous energy and voltages are present in the unit and on the interface cables that can shock or cause serious injury. When equipped with ringer modules, hazardous voltages will be present on the ringer output connectors.
- Do not disconnect permanent bonding connections unless all power inputs are disconnected.
- Load cables must be sized in accordance with the cable lengths shown in Table 2-A and Figure 2-1 to keep interrupt currents less than the ratings of DC protectors used in distribution panels, as shown in Table 2-B.

Precautions, continued

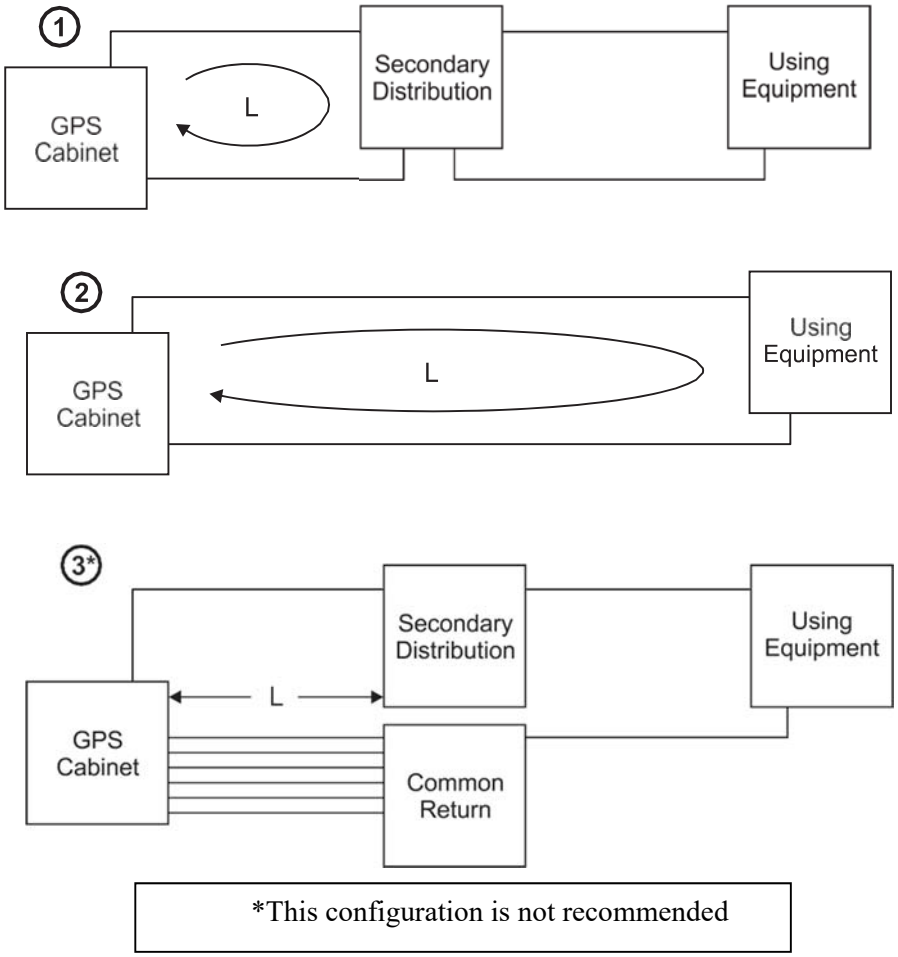


Figure 2-1: Short Circuit Current Calculations

Precautions, continued

To determining the minimum cable length to achieve the required interrupt circuit rating of circuit breaker or fuse, use the following steps:

1. Find the interrupt current rating of the chosen fuse or circuit breaker from Table 2-B.

2. See Table 2-A for the minimum length (L) for the engineered cable size to be run at the interrupt rating found in Step 1.

Table 2-A: Cable Run Lengths

Cable Size	**Minimum Length "L" Required to Limit the Current to an Interrupt Rating of:**		
	100KA	**25KA**	**10KA**
10 GA ($6mm^2$)	--	--	5 feet
8 GA ($10\ mm^2$)	--	--	8 feet
6 GA ($16\ mm^2$)	--	5 feet	12 feet
4 GA ($25\ mm^2$)	--	8 feet	19 feet
2 GA ($35\ mm^2$)	3 feet	12 feet	30 feet
1/0 GA ($50\ mm^2$)	5 feet	19 feet	--
2/0 GA ($70\ mm^2$)	6 feet	24 feet	--
4/0 GA ($120\ mm^2$)	10 feet	38 feet	--
(2) 4/0 GA ((2) $120\ mm^2$)	19 feet	76 feet	--
(3) 4/0 GA ((3) $120\ mm^2$)	29 feet	113 feet	--
350 MCM	17 feet	63 feet	--
(2) 350 MCM	32 feet	125 feet	--
(3) 350 MCM	47 feet	188 feet	--

Precautions, continued

Table 2-B: Interrupt Current Ratings for Fuses and Circuit Breakers

Description	ED83143-31 Groups	Interrupt Current Rating (amps)
Large bolt-in circuit breakers	1, 2, 5	25,000
Small plug-in circuit breakers	11, 12	10,000
Small bullet-style circuit breakers	15 - 17	10,000
Large fuse (TPL)	54 – 56, 72	100,000
Medium fuse (TPS)	53	100,000
Small plug-in fuse (TPA)	11, 12	100,000
DIN-style fuses	Not available from ABB Contact fuse or circuit breaker manufacturer.	
DIN-style circuit breakers	Not available from ABB Contact fuse or circuit breaker manufacturer.	

Precautions, continued

- Electricity produces magnetic fields that can affect implanted medical electronic devices, such as pacemakers. The strength of the magnetic field depends on the amount of current in the circuit, as well as other conditions (such as number of conductors, placement, and distance from the conductor). DC power and distribution systems, including the batteries, that are typically used in telecommunications utility rooms can operate at high current levels. Personnel with electronic medical devices need to be aware of their restrictions when working around electricity.
- In addition to proper job training and safety procedures, the following are some basic precautions that should always be used:
  - Use **only** properly insulated tools.
  - Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
  - Follow Lock Out Tag Out (LOTO) procedures: customer specified, site specific, or general as appropriate. Disconnect all power input before servicing the equipment. Check for multiple power inputs.
  - Wear safety glasses.
  - Follow Personal Protective Equipment requirements: customer specified, site specific, or general as appropriate.
  - Test circuits before touching.
  - Be aware of potential hazards before servicing equipment.
  - Identify exposed hazardous electrical potentials on connectors, wiring, etc. (note the condition of these circuits, especially any wiring).
  - Avoid contacting circuits when removing or replacing covers.
  - Use a personal ESD strap when accessing or removing electronic components.

Note: Refer to Section 13, *Power Up and Installation Completion*, for precautions and proper methods for handling rectifiers and converters.

Special Installation Notes

Deutsch – German

Installationsanleitung
(Installation Instructions)

- Eingangsspannung (Input Voltage):
  200-277/200-277, 3W+PE/380-480, 3W+N+PE (H569-4827)
  200-240/200-240, 3W+PE/380-480, 3W+N+PE (H569-434)
  380-480, 3W+PE (H569-4830)

- Eingangsstrom (Input Current):
  22A/rectifier/104Amax/88Amax (H569-4827)
  22A/rectifier/120Amax/75Amax. (H569-434)
  32Amax (H569-4830)

- Nennfrequenz (Frequency): 50/60Hz

- Abmessungen sind nur zur referenz:
  (Dimensions are for reference only:)
  600mm x 600mm

- Max. Umgebungstemperatur:
  (Max. operation temperature:)
  40°C (104°F) for H569-434 and H569-4827
  35°C (95°F) for H569-4830 Types GZ1, GZ8-GZ10, GZ20, and GZ21
  45°C (113°C) for H569-4830 Types GZ2-GZ7, GZ17-GZ19

- Achtung: Für kontinuierlichen Feuerschutz sollte die Sicherung nur mit einer des gleichen Types ersetzt werden.
  (Warning: For continued protection against fire replace with same type and rating of fuse.)

- Das Schaltnetzteil ist ein Gerät der Schutzklasse I
  (Power Supply is a Class I Equipment)

Special Installation Notes, continued

Deutsch – German, continued

- Ausgangsspannungen und Ausgangsstöme
  (Output Voltage and Current)

	Ausgangsspannungen	**Ausgangsstöme**
H569-434	-48 Vdc	14,080 A
H569-4830	-48 Vdc	6400 A
H569-4827	-48 Vdc	9600 A

- Das Gerät darf nur in Räumen mit beschränktem Zutritt aufgestellt werden. Nur ausgebildetes Personal
  (Restricted access)

- Das Gerät muß mindestens mit einer Anschlußleitung 4 x mm oder 5 x mm versehen sein.
  (Suitable for 4-conductor or 5-conductor systems.)

- Das Gerät hat keinen eigenen Ausschalter, es muß daher mit einem Ein- und Ausschalter im Versorgungskreis versehen sein.
  (Mains disconnect switch required in the installation.)

- Das Gerät hat kein Brandschutzgehäuse es darf daher nur auf nicht brennbaren Untergrund aufgestellt werden. (Beton, Metall usw.)
  (No fire enclosure, must be mounted on non-combustible surface)

- Das Gerät wird fest am Boden installiert (siehe weitere Anleitung)
  (Must be bolted to the floor)

Special Installation Notes, continued

Español – Spanish

Notas especiales para instalaciones en países de habla hispana Instrucciones de instalación (Installation Instructions)

- Voltaje de entrada (Input Voltage):
  200-277/200-277, 3W+PE/380-480, 3W+N+PE (H569-4827)
  200-240/200-240, 3W+PE/380-480, 3W+N+PE (H569-434)
  380-480, 3W+PE (H569-4830)

- Corriente de entrada (Input Current):
  22A/rectifier/104Amax/88Amax (H569-4827)
  22A/rectifier/120Amax/75Amax. (H569-434)

- 32Amax (H569-4830)Frecuencia (Frequency): 50/60Hz

- Las dimensiones son únicamente para referencia:
  (Dimensions are for reference only:)
  600mm x 600mm

- Temperatura máxima de operación:
  (Max. operation temperature:)
  40°C (104°F) for H569-434 and H569-4827
  35°C (95°F) for H569-4830 Types GZ1, GZ8-GZ10, GZ20, and GZ21
  45°C (113°C) for H569-4830 Types GZ2-GZ7, GZ17-GZ19

- Advertencia: Para una protección continua contra incendios, reemplace por el mismo tipo y clasificación de fusible.
  (CAUTION: For continued protection against risk of fire, replace only with same type and rating of fuse.)

- La fuente de alimentación es un equipo clase I
  (Power Supply is a Class I Equipment)

Special Installation Notes, continued

Español – Spanish, continued

- Voltaje y corriente de salida
  (Output Voltage and Current)

	Voltaje	**Corriente**
H569-434	-48 Vdc	14,080 A
H569-4830	-48 Vdc	6400 A
H569-4827	-48 Vdc	9600 A

- Acceso restringido
  (Restricted access)

- Adecuado para sistemas de 4 conductores o de 5 conductores.
  (Suitable for 4-conductor or 5-conductor systems.)

- Se requiere un interruptor de desconexión de la línea principal en la instalación.
  (Mains disconnect switch required in the installation.)

- Sin cabina contra incendios, suelo no combustible
  (No fire enclosure, must be mounted on non-combustible surface)

- Debe estar anclado al piso
  (Must be bolted to the floor)

Special Installation Notes, continued

Français – French

Instructions d'installation
(Installation Instructions)

- Tension d'entrée (Input Voltage):
  200-277/200-277, 3W+PE/380-480, 3W+N+PE (H569-4827)
  200-240/200-240, 3W+PE/380-480, 3W+N+PE (H569-434)
  380-480, 3W+PE (H569-4830)

- Courant d'entrée (Input Current):
  22A/rectifier/104Amax/88Amax (H569-4827)
  22A/rectifier/120Amax/75Amax. (H569-434)

- 32Amax (H569-4830)Fréquence (Frequency): 50/60Hz

- Les dimensions sont pour référence seulement:
  (Dimensions are for reference only:)
  600mm x 600mm

- Max. température de fonctionnement:
  (Max. operation temperature:)
  40°C (104°F) for H569-434 and H569-4827
  35°C (95°F) for H569-4830 Types GZ1, GZ8-GZ10, GZ20, and GZ21
  45°C (113°C) for H569-4830 Types GZ2-GZ7, GZ17-GZ19

- ATTENTION: Pour ne pas compromettre la protection contre les risques d'incendie, remplacer par un fusible de même type et de mêmes caractéristiques nominales.
  (CAUTION: For continued protection against risk of fire, replace only with same type and rating of fuse.)

- Alimentation est un équipement de classe I
  (Power Supply is a Class I Equipment)

Special Installation Notes, continued

Français – French, continued

- Tension et courant de sortie
  (Output Voltage and Current)

	Tension	**Courant**
H569-434	-48 Vdc	14,080 A
H569-4830	-48 Vdc	6400 A
H569-4827	-48 Vdc	9600 A

- Accès restreint
  (Restricted access)

- Convient aux systèmes à 4 conducteurs ou 5 conducteurs
  (Suitable for 4-conductor or 5-conductor systems)

- Enveloppe électrique interrupteur de sectionneur requis dans l'installation.
  (Mains disconnect switch required in the installation.)

- Aucune enceinte d'incendie, doit être monté sur une surface non combustible
  (No fire enclosure, must be mounted on non-combustible surface)

- Doit être boulonné au sol
  (Must be bolted to the floor)

3 Getting Started

Tools and Hardware

You will need the following tools and hardware to install the Galaxy Power System:

- Material-handling equipment to unload the cabinet at the installation site, remove from shipping container, and set in final position [minimum lifting capacity: 900 lbs. (410Kg)] Note: Use the equipment weights and dimensions as a guideline for choosing material-handling equipment.
- Drill and drill bits to install floor anchors
- 3/16-inch (5mm) Allen-head wrench (provided)
- ***Insulated*** hand tools
- Screw drivers (flat-blade and Phillips)
- Wire cutters and stripper
- Torque wrenches (see Table 3-A) 35-513 in·lbs (4-58 N·m)
- Sockets:

Metric	English Equivalent	Hardware
8mm	5/16"	M5
10mm	--	M6
13mm	1/2"	M8
17mm	11/16"	M10
19mm	3/4"	M12
--	3/8"	1/4"
--	9/16"	3/8"

Tools and Hardware, continued

- Crimp tools
  - 22-16 gauge
  - 10-500 MCM (5-120mm^2)
- Jeweler's screwdriver
- Digital multimeter (DMM) with 0.05% accuracy on dc scale
- Load box (200 amperes @ 48V)
- Laptop or personal computer (PC) loaded with Windows 3.1 or later (optional)
- ESD wrist strap*

  *Equipment is ESD sensitive. It is required that an ESD wrist strap be worn during installation and repair. An ESD wrist strap (408157105) is provided with each controller.

Torque Settings for Hardware

Table 3-A: Torque Settings for Hardware

Metric		
Screw Size	**Torque (N·m)**	**Torque (in·lbs)**
M2	0.24	2
M2.5	0.48	4
M3	0.9	8
M3.5	1.4	12
M4	2	18
M5	4	35
M6	7	62
M8	18	145
M10	34	300
M12	58	513
English		
Screw Size	**Torque (N·m)**	**Torque (in·lbs)**
6-32	1.1	10
8-32	2.3	20
10-32	2.8	25
12-24	4	35
1/4-20	7	65
5/16-18	15	135
3/8-16	27	240

Unpacking – Location

Before continuing, verify that the following conditions exist at the installation site:

- Floor is conditioned and clean (refers to removal of any combustible flooring, e.g., carpet, wood, etc.).
- Batteries and associated stands are in place.
- Cable rack not supported by cabinets is in place.
- Job Site Documentation is available that details cabinet locations, dc distribution assignments, and Remote Peripheral Monitoring System module location and assignment.

4 System Electrical Architecture Overview

Introduction

This section is a basic system overview of the architecture of Galaxy Power Systems. The overview provides information about the connections and physical considerations of the systems that must be understood before the installation process begins.

The GPS individual cabinets may be connected together in two basic architectures, distributed or centralized, to form systems. These two architectures contain the same basic modules, but are arranged in different cabinet configurations.

Bonding Network

GPS systems are suitable for installation as part of a Common Bonding Network (CBN) or an Isolated Bonding Network (IBN).

In this manual Battery Return grounds labeled "System (CO) ground" are "Isolated DC return (DC-I)".

Installation as part of a Common Bonding Network (CBN) or an Isolated Bonding Network (IBN) is determined by the point external to the GPS system connected to GPS "System (CO) ground".

Facility

GPS systems are suitable for installation in Network Telecommunication Facilities and locations where NEC applies.

Single-Cabinet Distributed System

Single-cabinet distributed systems are illustrated in Figure 4-1.

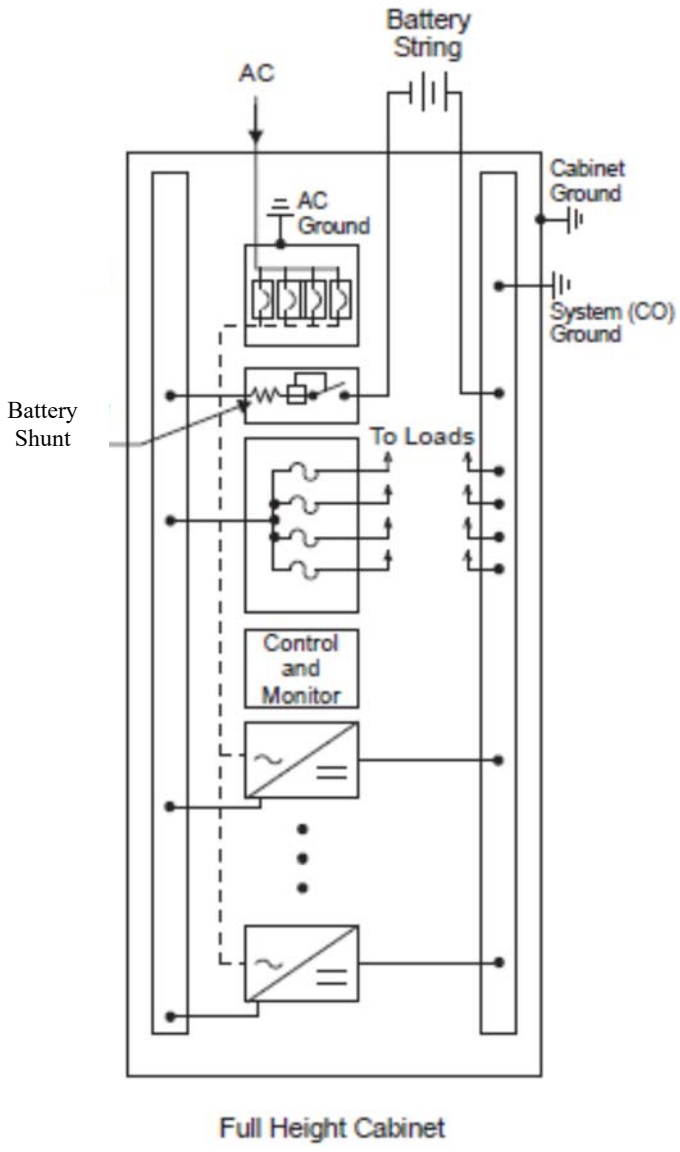


Figure 4-1: Single-Cabinet Configuration, Distributed Architecture

Note: A single shunt is used in this power system configuration to monitor the battery charge (- polarity) or discharge (+ polarity) currents. The shunt readings are summed with the rectifiers' currents by the system controller to determine the plant's total load current.

Distributed Architecture

A distributed architecture is best thought of as small systems that are combined together to form a much larger system (plant). Each small system (cabinet) contains an entire dc power system that includes ac input, rectifiers, battery connection modules (with external batteries), and dc distribution modules.

The dc power, generated by the rectifiers and supported by battery strings attached to the cabinet, will be approximately equal to the dc power distributed to the loads from that cabinet. The dc power of each cabinet is electrically interconnected so that power may be shared (up to 1800A) between the cabinets of the plant. This sharing allows the plant to handle imbalances between the individual cabinet loads (due to improper sizing or to rectifier or battery module failure).

Distributed architecture is summarized as follows: Each cabinet generates and distributes all the dc power it requires, as a stand-alone "system," but, also, has additional capacity to share power (feeding or receiving) with other cabinets within the plant. Growth of the system is accomplished by adding additional cabinets, with their interconnection hardware, to other cabinets of the plant.

Multiple-cabinet configurations are shown in Figure 4-2 (two-cabinet configuration) and Figure 4-3 (three-cabinet (or more) configuration).

Distributed Architecture, continued

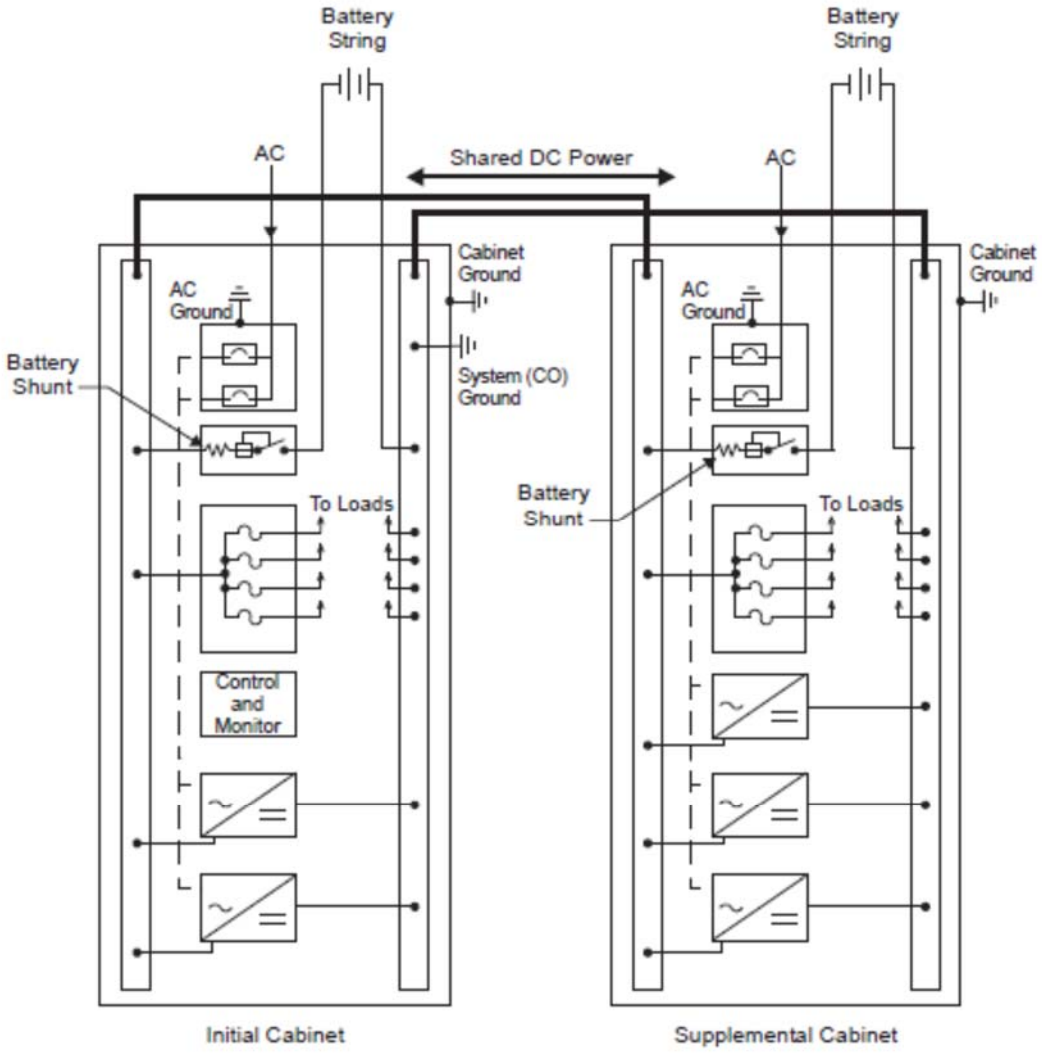


Figure 4-2: Two-Cabinet Configuration, Distributed Architecture

Note: There are one or more shunts used in this power system configuration to monitor the battery charge (- polarity) or discharge (+ polarity) current. The shunt readings are summed with the rectifier loads to determine the plant's total load current.

Distributed Architecture, continued

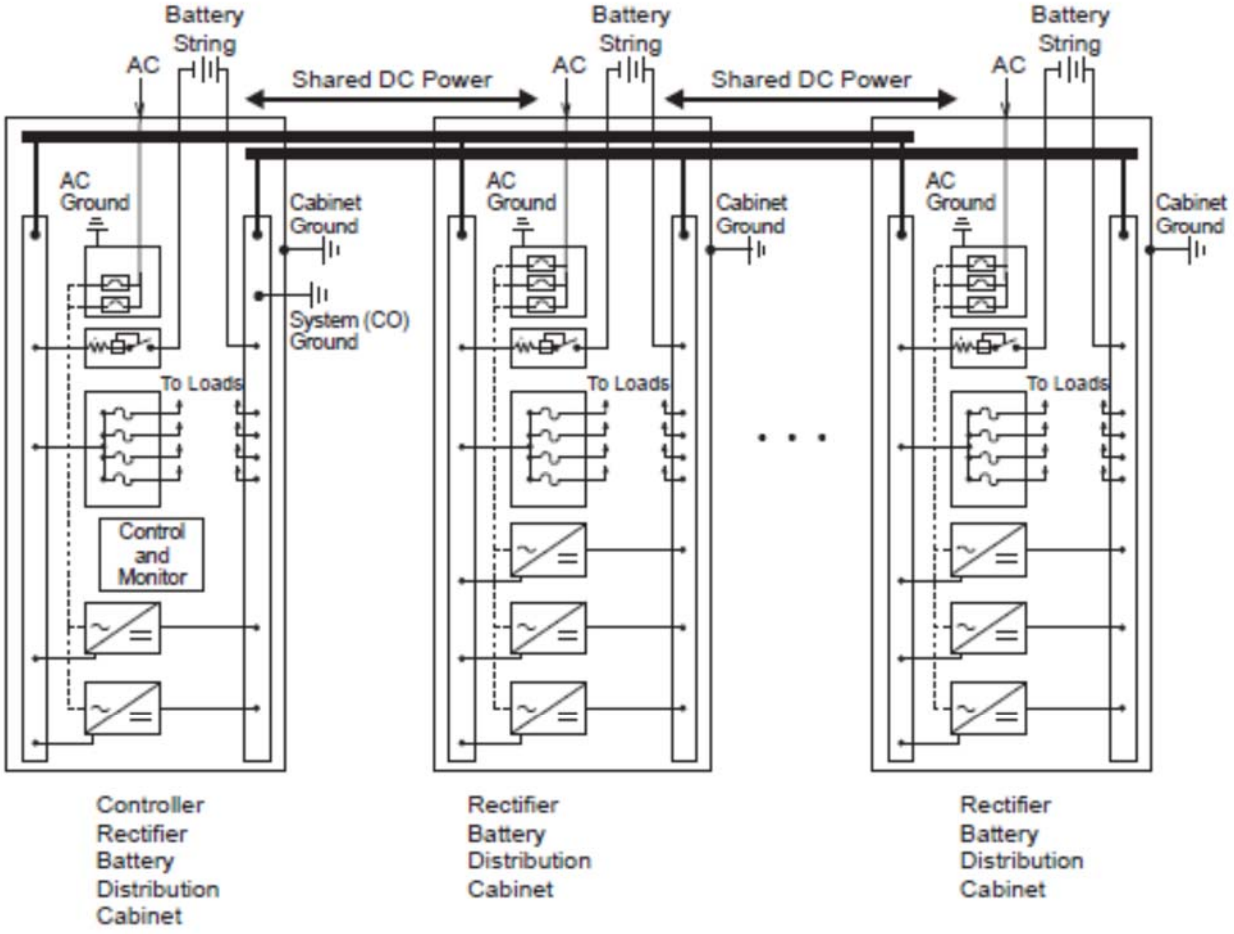


Figure 4-3: Three-Cabinet (or more) Configuration, Distributed Architecture

Centralized Architecture

The centralized architecture is best thought of as all the rectifier outputs of the individual cabinets and the battery strings of the plant, connected together on a single dc bus, with the loads connected, through the centralized distribution modules, to the same dc bus. Since all the system power is brought together at a central point, the central point must be sized for the ultimate capacity of the system. Growth of the system is accomplished by increasing rectifier capacity (adding ac inputs and shelves to an existing cabinet or adding another cabinet to the plant), adding more distribution panels (to an existing cabinet or adding a new cabinet), or by adding more batteries.

Figure 4-4 illustrates the centralized architecture.

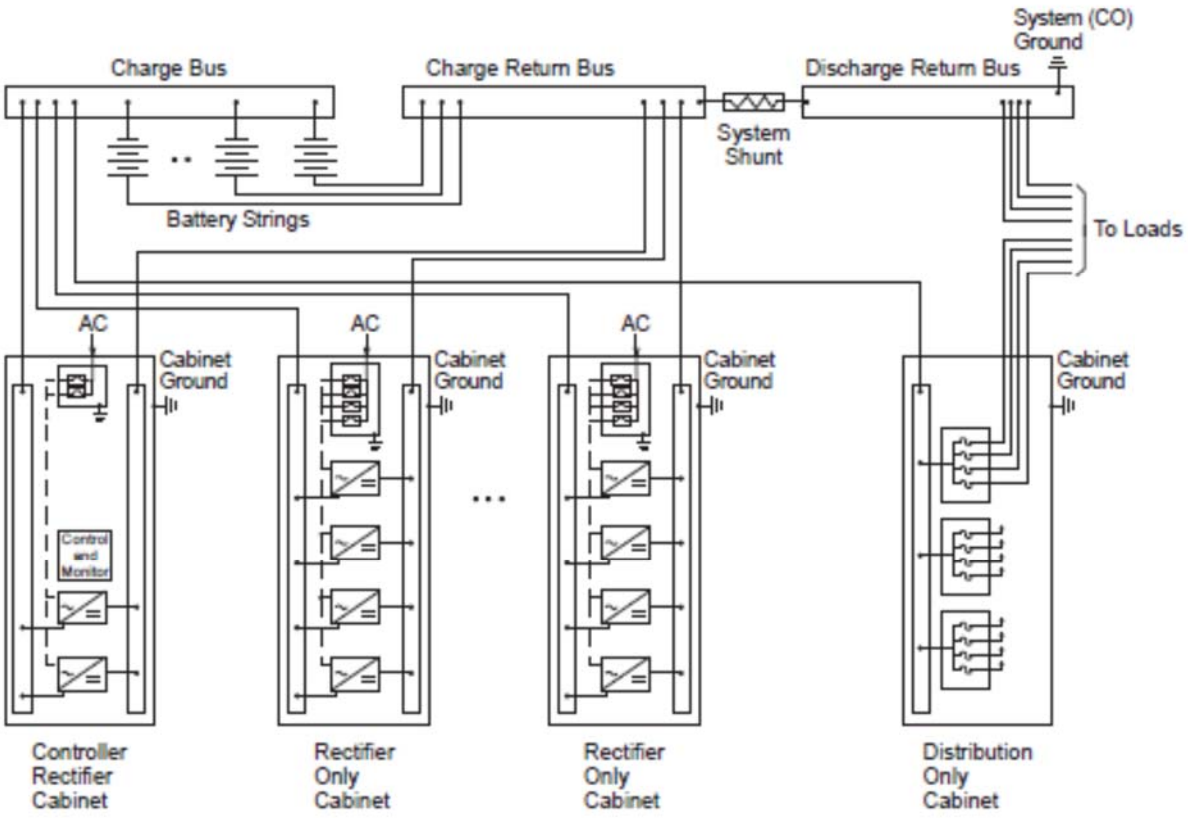
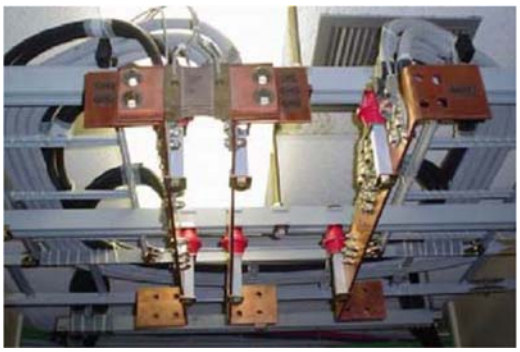


Figure 4-4: Centralized Architecture

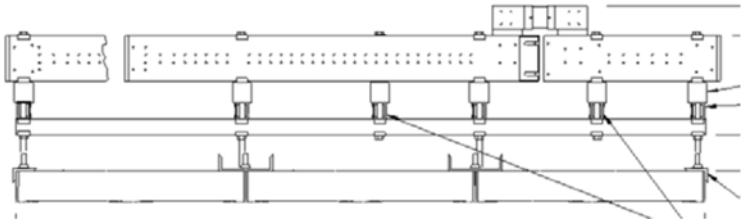
Note: The batteries and rectifiers are all connected to a common bus in this power system configuration. The plant's total load is determined by the system controller from the readings taken from the single system current shunt located in the common bus.

Centralized Architecture

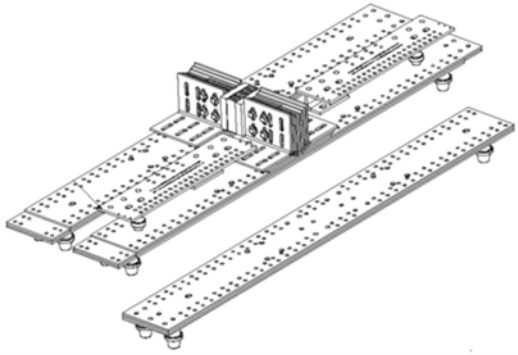
Some of the common Centralized Architecture chandelier options where the rectifiers, batteries, and distribution cabling are all routed through include the following:



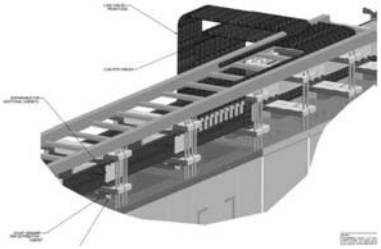
J85504A1 L5 (1300A); L5 & LG (2600A)



J85504A1 L15 (2600A); L15 & Q (5200A); L20 (5200A Horizontal Buses)



ED83019-50 G23 (10,000A); G26 (10,000A w/15,000A Shunt)



ED83311-30 G211-213 (5000A); G201-203 (10,000A)

Note: These systems may have either one or two Load Type shunts monitored directly off the M2 controller (both at the same bus potential) or can have numerous Load Type shunts summed together using BIC (Bay Interface Card) or PIC (Panel Interface Card – used with H569-534 DC Busway applications) shunt channels. Shunts monitored directly by the M2 controller use no CLRs (Current Limiting Resistors), while shunts monitored by BIC or PIC shunt channels must include CLRs in the monitoring path. Refer to Section 6 for details.

5 Cabinet Floor Mounting and Grounding

Cabinet Installation

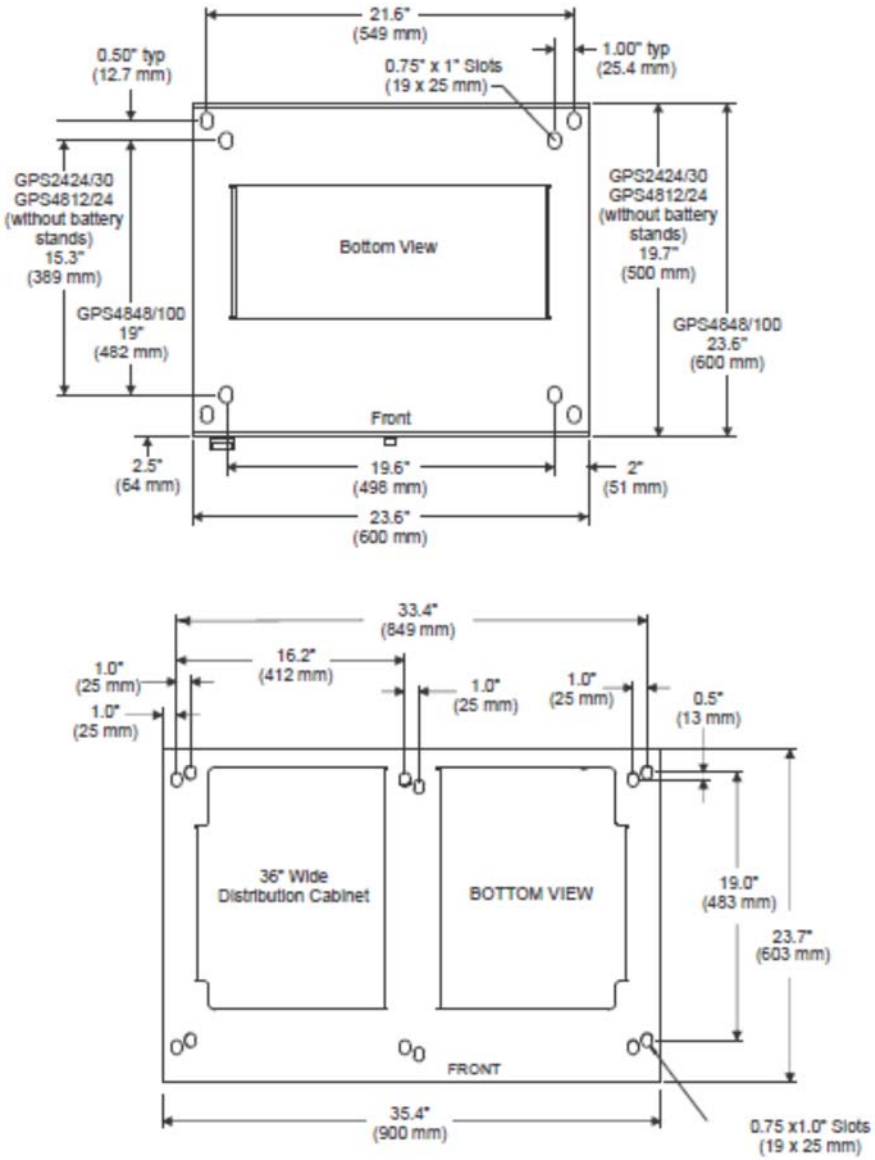


Figure 5-1: Footprint for Galaxy Power System Cabinets

Cabinet Installation, continued

Table 5-A: GPS Mounting Specifications

Seismic Zone(s)	Comcode	Anchor Type (HILTI)	Hole Size	Wrench	Torque	
0, 1	847135720	(4) 3/8" drop in	1/2" bit 1-9/16" deep	--	85 in·lbs (7.1 ft·lbs)	9.6 N·m
0, 1	847135712	(4) 3/8" self drill	--	--	85 in·lbs (7.1 ft·lbs)	9.6 N·m
0, 1, 2	847135662	(4) 1/2" drop-in	5/8" bit 2" deep	3/4"	216 in·lbs (18 ft·lbs)	24.5 N·m
0, 1, 2	847135654	(4) 1/2" self drill	--	3/4"	216 in·lbs (18 ft·lbs)	24.5 N·m
0, 1, 2, 3, 4	847135670	(4) 12mm self drill	--	19mm	720 in·lbs (60 ft·lbs)	81.6 N·m
0, 1, 2, 3, 4	847135688	(4) 12mm cap bolts	18mm 100mm deep	19mm	720 in·lbs (60 ft·lbs)	81.6 N·m

Cabinet Installation, continued

Procedure

Refer to Figure 5-12 for this procedure.

Cabinet Installation	
Step	**Action**
1	Position the appropriate drill template where the cabinet is to be located. Comcode of Template, 847891280
2	Using a drill bit, drill anchor holes to the depths specified in Table 5-B.
3	Locate the cabinet in position using two or four anchor bolts and hold-down washers.
4	Shim under cabinet corners to level.
5	Torque anchors as specified in Table 5-B.
6	Secure cabinets together using the hardware provided.

Note: See H569-407 for more details.

Cabinet Installation, continued

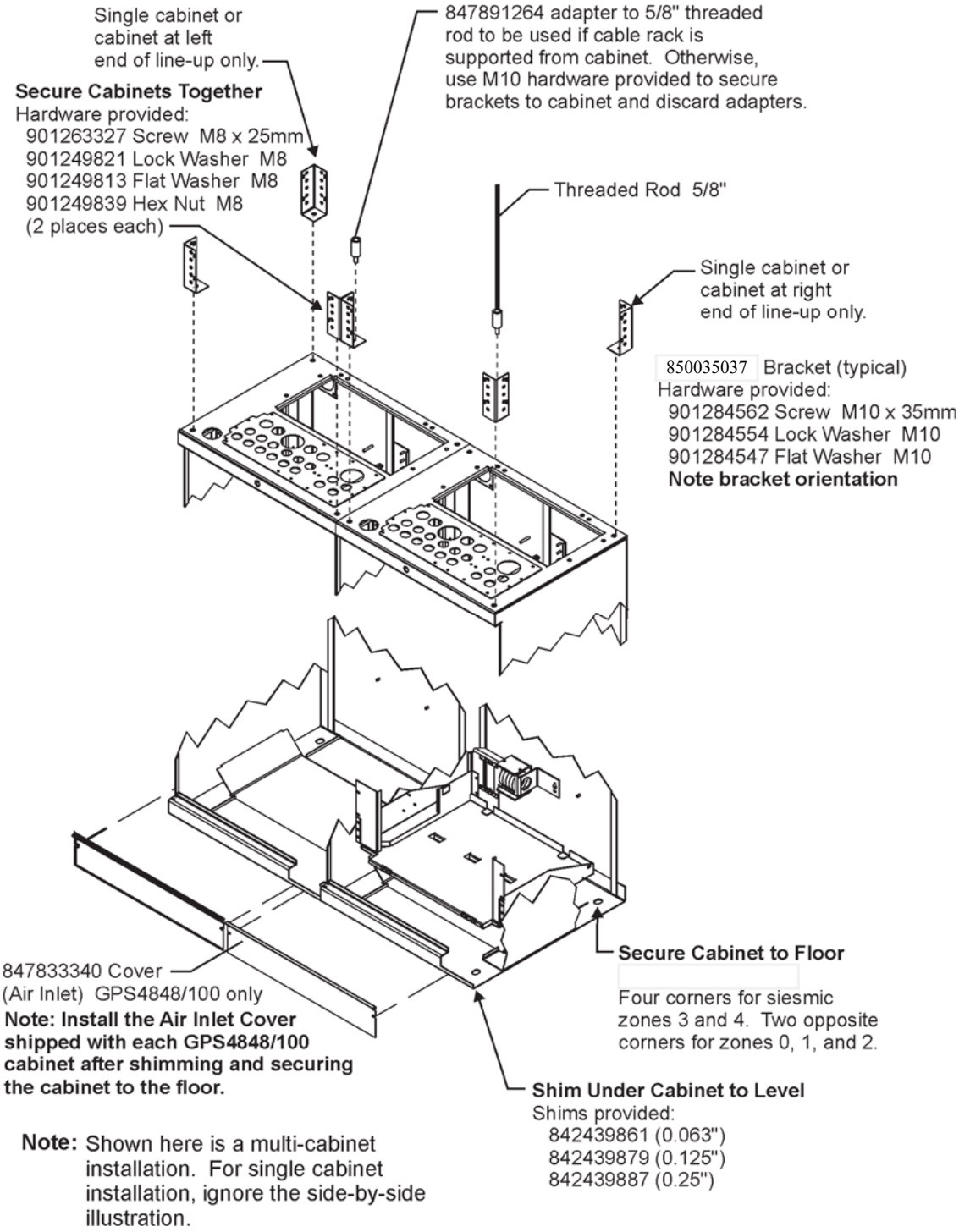


Figure 5-12: Cabinet Installation Procedure

Cabinet Ground and Central Office Ground

Cabinet Ground Procedure

The next step is to ground the cabinet framework. Local grounding practices will determine the grounding method and the size of cable connected to the cabinet. A 2-gauge pigtail (847992070), as shown in Figure 5-13, is provided for this purpose.

Cabinet Ground	
Step	**Action**
1	Run and connect the framework ground lead as shown in Figure 5-13.
2	Torque connection as specified in Figure 5-13.

Central Office Ground Procedure

The system ground should be connected to the building's principal ground point (Central Office Ground). The conductor size must conform to local standards.

Centralized Architecture

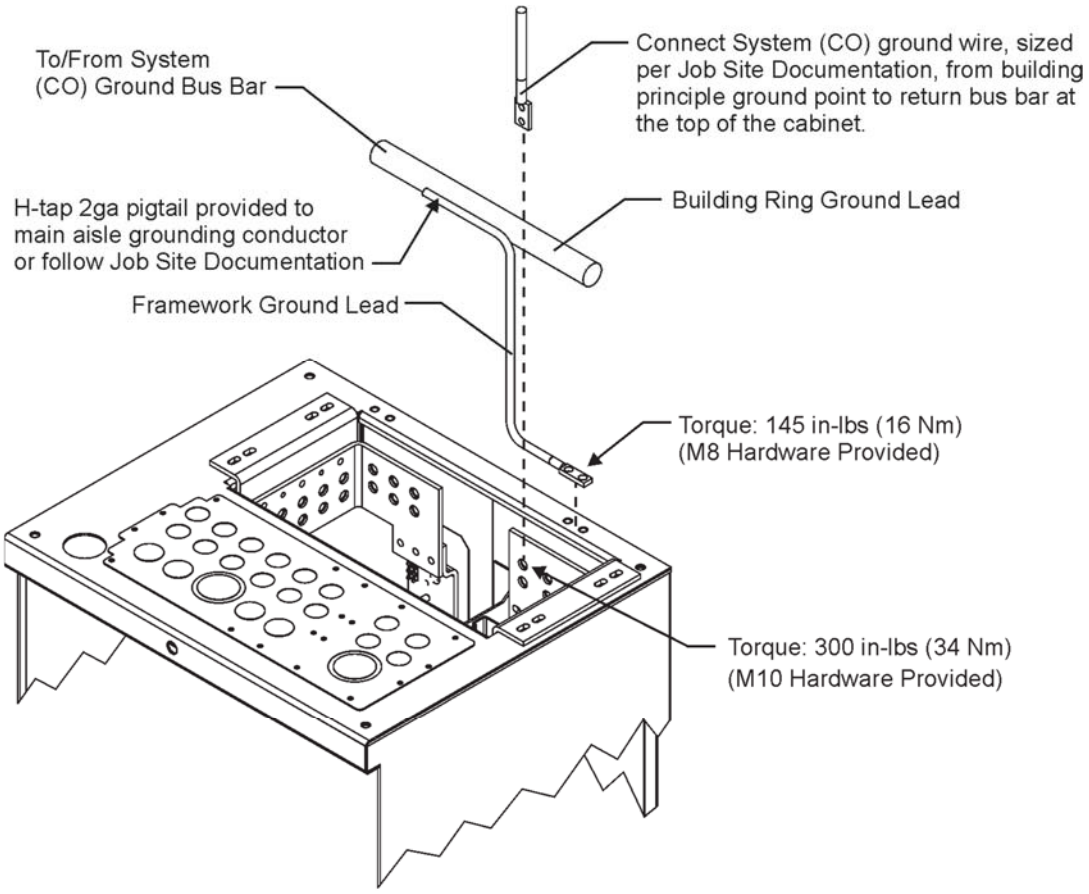
Follow local practice for Centralized Architecture.

Distributed Architecture

Connection to the power system is through the M10 studs located on the distribution return bus. See Figure 5-13 (full-height cabinet).

Central Office Ground for Distributed Architecture	
Step	**Action**
1	Run and connect the system ground lead to the initial cabinet return bus. This connection will connect the return side of the dc system to earth ground.
2	Torque connections as specified in Figure 5-13.

Cabinet Ground and Central Office Ground, continued



System (CO) Ground Lugs and Hardware

Lug Comcode	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
406338665	2	--	35	Provided: (2) M10 HH Bolts (2) M10 Lock Washers (2) M10 Flat Washers
407726041	--	2	--	
405348228	1/0	--	50	
405348236	2/0	1/0	70	
406032725	--	2/0	--	
405348521	4/0	--	--	
405347923	--	4/0	120	
407890748	350	--	--	
407890763	--	350	--	
407850833	500	--	--	
407890755	--	500	--	
406335141	750	--	--	
407890730	--	750	--	

Figure 5-13: Full-Height Cabinet and System Central Office Ground

Recommended Cable Rack Layout

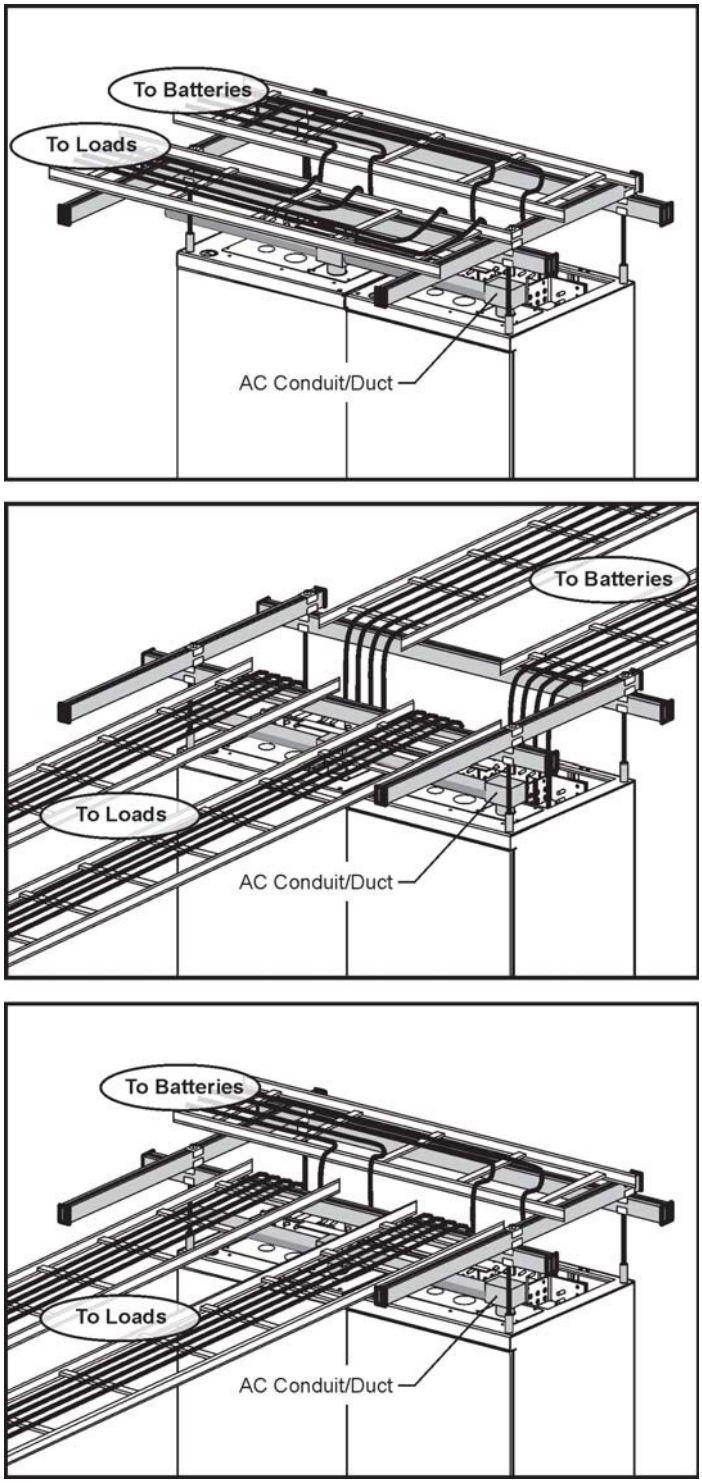


Figure 5-15: Various Cable Rack Arrangements

Notes

6 Centralized or Distributed Architecture Connections

Multiple-Cabinet Installations

Special Requirements

This section covers the special requirements for multiple-cabinet installations. These are:

- Centralized Architecture
  - DC power connections to central bus bar
  - Remote voltage sense (regulation) and system shunt for the Galaxy Power System controller
- Distributed Architecture
  - Intercabinet dc power bus connections
- All Types
  - Intercabinet alarm and serial bus connections

Centralized Architecture

Introduction

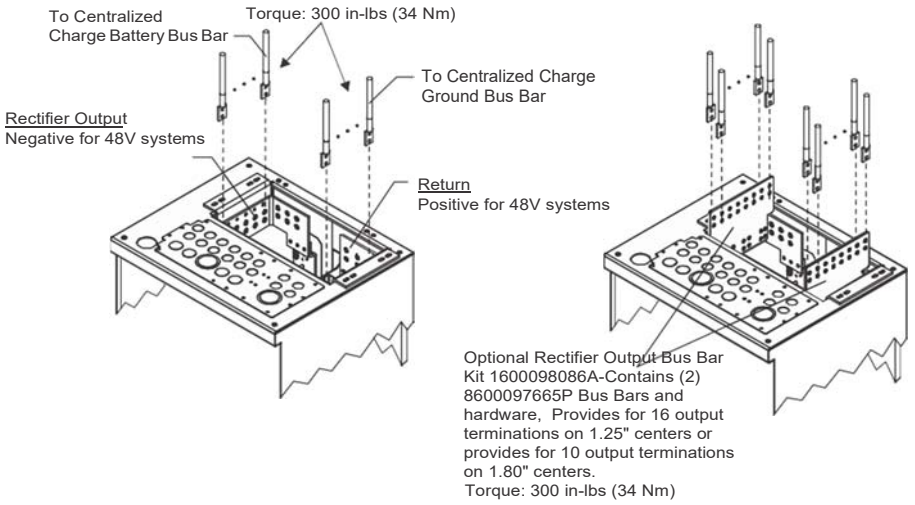
This section covers the field assembly for Centralized Architecture.

DC Power Connections to Central Bus Bar

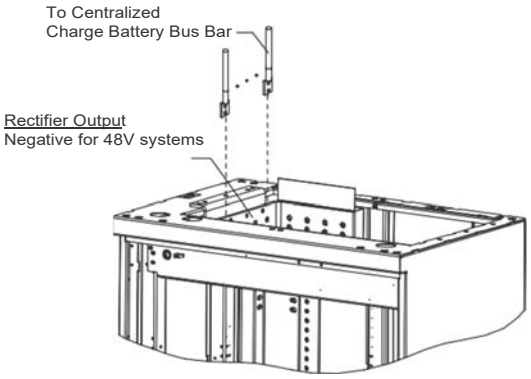
Refer to Figure 6-1 for this procedure.

DC Power Connections to Central Bus Bar	
Step	**Action**
1	Install optional plates if more than 8 connections are needed. (See Figure 6-1.)
2	Run and connect new wires from positive and negative bus bars in each cabinet to charge and charge return centralized bus bars located outside the equipment. Note: In centralized architectures all return wires from the load must be terminated to the external discharge return bus. These return wires may *not* be terminated in the cabinet.

Centralized Architecture, continued



Rectifier-only Cabinets



Distribution-only Cabinets

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
405348228	Bat/Rtn	1/0	–	50	847867132 (One or two required per connection.)
405348236	Bat/Rtn	2/0	1/0	70	
406021725	Bat/Rtn	–	2/0	–	
405348251	Bat/Rtn	4/0	–	–	
405347923	Bat/Rtn	–	4/0	120	
407890763	Bat/Rtn	350	–	–	
407890748	Bat/Rtn	–	350	–	
407850833	Bat/Rtn	500	–	–	
407890755	Bat/Rtn	–	500	–	(Note)
406335141	Bat/Rtn	750	–	–	
407890730	Bat/Rtn	–	750	–	

Note: Requires wider 1.80-inch terminations on 1600098086A extension buses.

Figure 6-1: DC Power Connections to Centralized Bus Bars

Centralized Architecture, continued

Remote Voltage Sense and System Shunt for Millennium II Controller when in a Cabinet with BLJ/BIC9 Bay Board

These procedures convert the Millennium II Controller to external battery sense (voltage sense at the central charge and discharge buses) and a single system shunt for load current, when used in a Cabinet with a BLJ/BIC9 Bay Board.

Refer to Figure 6-2 for these procedures.

Remote Voltage Sense for Millennium II Controller with BLJ/BIC9 Bay Board	
Step	**Action**
1	Cut the regulation wires that run from the controller to the rear bus bars in the cabinet (RB and RG, Slate and Black wires, respectively).
2	Remove and discard the ends of the wires that run to the cabinet bus bars.
3	Run new wires from the central bus bars; butt splice to the cut wires that remain connected to the controller. Note: If central bus bars have LVBD, sense leads must be on the rectifier side of the contactor.

System Shunt for Millennium II Controller with BLJ/BIC9 Bay Board	
Step	**Action**
1	Run new wires (installer-provided) from the system shunt to connection points M1 (SH-, violet wire) and M2 (SH+, white wire) on the BLJ termination board. Limit the resistance of this wiring to 1 ohm maximum. Typically, this may be accomplished with 22 AWG conductors 25 ft long (1-way) or 20 AWG conductors 45 ft long (1-way). If the cabling distance to the shunt exceeds these lengths, then 12 AWG conductors may be used and spliced down to 22 AWG within the wiring gutter above the BLJ card to permit termination onto the insulation displacement terminals of M1 and M2. **Note: For -48V systems, the SH- connection is to the load side of the shunt (if it is in the return path), and the SH+ connection is to the battery/rectifier side of the shunt.** **Caution:** Remove the Violet and White wires from M1 and M2. Splice directly to the leads coming from the shunt.
2	If the system shunt is located in the “hot” or ungrounded side of the chandelier, it will also be necessary to move the BL lead designated “CG” (T83314-30 Figure 3F) of the Millennium Power/Sense P6-9 cable set off its default termination on the return bus at the top of the cabinet, to the hot bus instead.

Centralized Architecture, continued

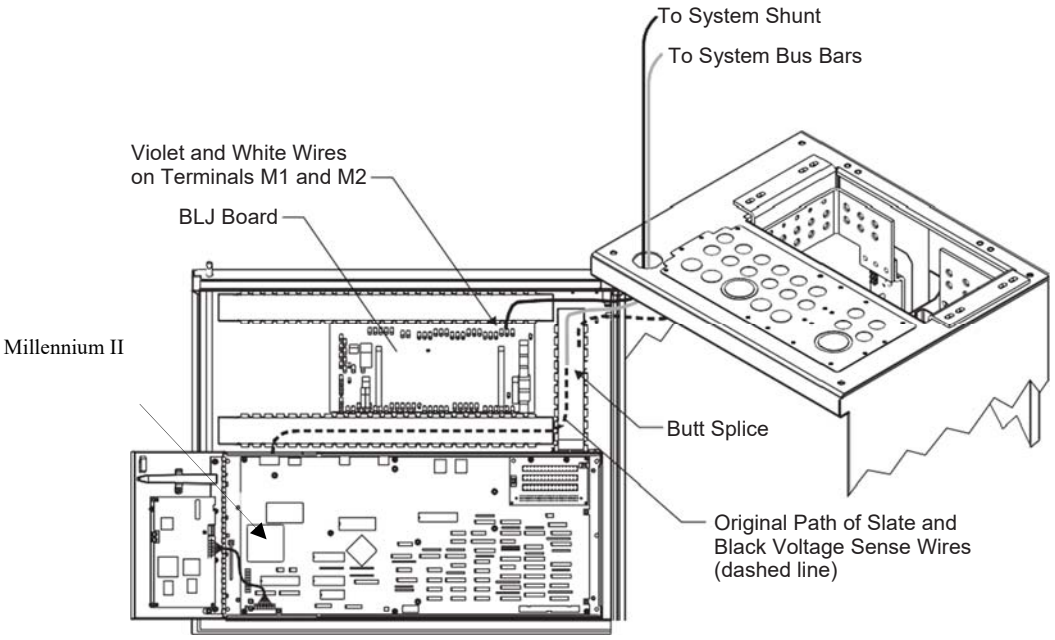


Figure 6-2: System Shunt and Remote Voltage Sense for Millennium II Controller in Cabinet with BLJ/BIC9 Bay Board

Centralized Architecture, continued

Remote Voltage Sense and System Shunt for Millennium II Controller when in a Cabinet with BIC10 Bay Board

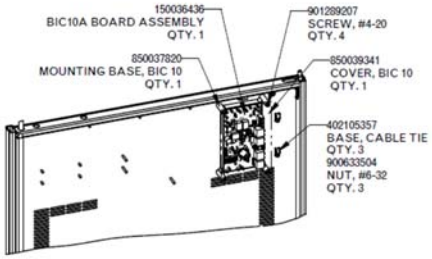
These procedures convert the Millennium II Controller to external battery sense (voltage sense at the central charge and discharge buses) and a single system shunt for load current, when used in a Cabinet with a BIC10 Bay Board.

Refer to Figure 6-3 for these procedures.

Remote Voltage Sense for Millennium II Controller with BIC10 Bay	
Step	**Action**
1	Run new wires from the central bus bars. Connect to the BIC 10 TB1-1 (RB) and TB1-2 (RG). Note: If central bus bars have LVBD, sense leads must be on the rectifier side of the contactor.
2	Move the VSns Jumpers at J20 (Bat Sns) & J21 (DG Sns) from LCL to RMT.

System Shunt for Millennium II with BIC10 Bay Board	
Step	**Action**
1	Run new wires (installer-provided) from the system shunt to the BIC 10 TB1-3 (SH+) and TB1-4 (SH-). Limit the resistance of this wiring to 1 ohm maximum. Typically, this may be accomplished with 22 AWG conductors 25 ft long (1-way) or 20 AWG conductors 45 ft long (1-way). If the cabling distance to the shunt exceeds these lengths, then 12 AWG conductors may be used. Do NOT use any CLRs (Current Limiting Resistors) in this circuit. **Note: For -48V systems, the SH- connection is to the load side of the shunt (if it is in the return path), and the SH+ connection is to the battery/rectifier side of the shunt.**

Centralized Architecture, continued



BIC10 INSTALLATION

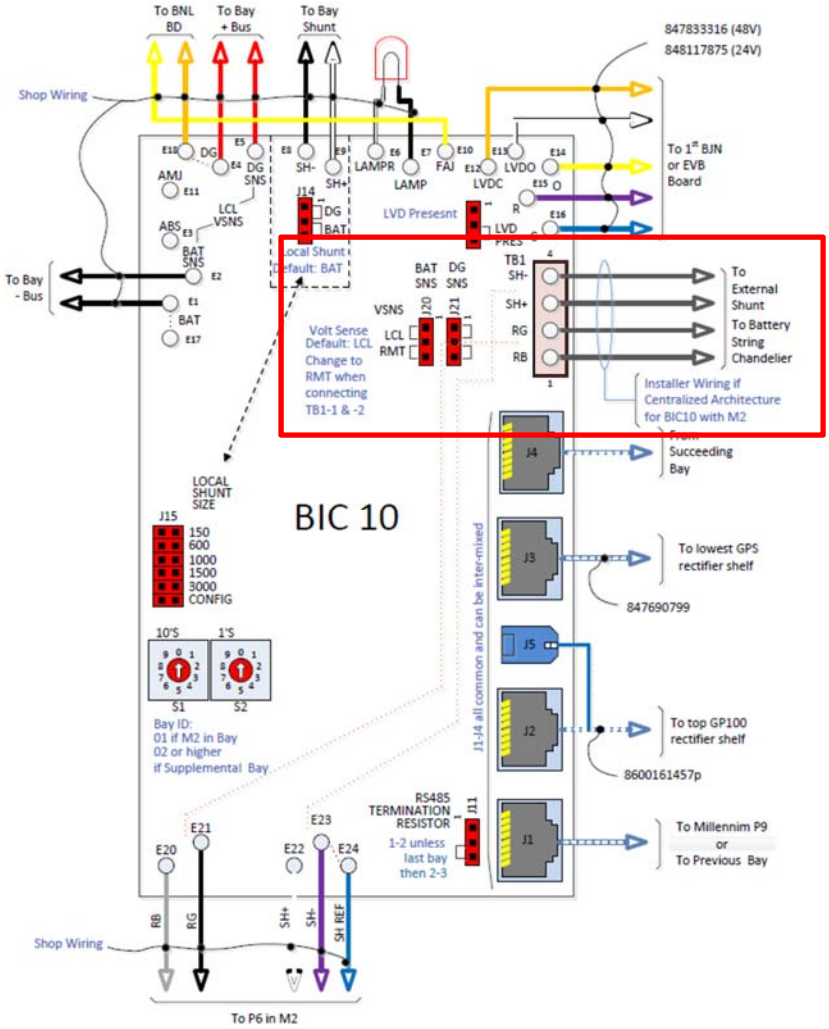


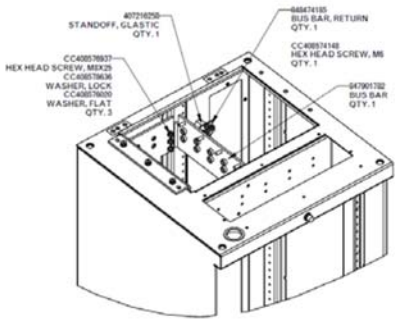
Figure 6-3: System Shunt and Remote Voltage Sense for Millennium II Controller in Cabinet with BIC10 Bay Board

Centralized Architecture, continued

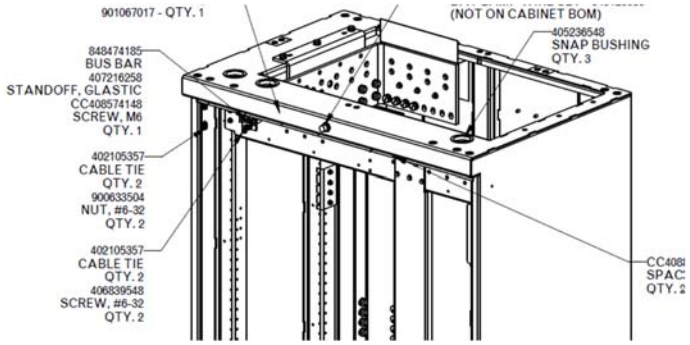
Ground Terminal Strip in 4800A GPS Distribution-only Cabinets

4800A GPS Distribution-only cabinets (H569-434 G429, G430; H569-4830 G429, G430) do not have any internal return buses, so the return circuits for the BIC (Bay Interface Card) and controller, mounted on the cabinet door, are wired to a ground terminal strip (848474185) mounted off a standoff on either the rear wall (standard width J85582C1 L3) or the left side of the top front panel (wide width J85582C1 L103) as indicated below:

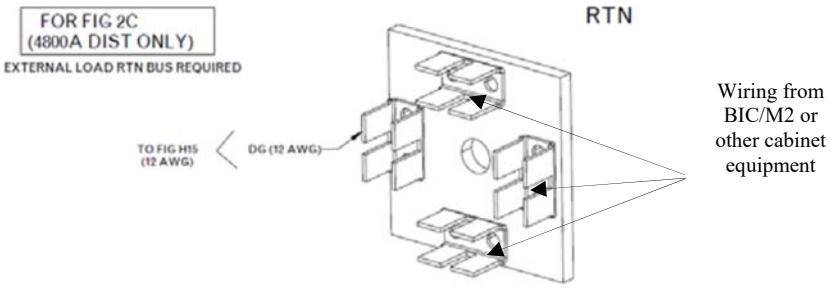
J85582C1L3
4800A DISTRIBUTION ONLY CABINET



J85582C1 L10
WIDE BAY 4800A DISTRIBUTION ONLY CABINET

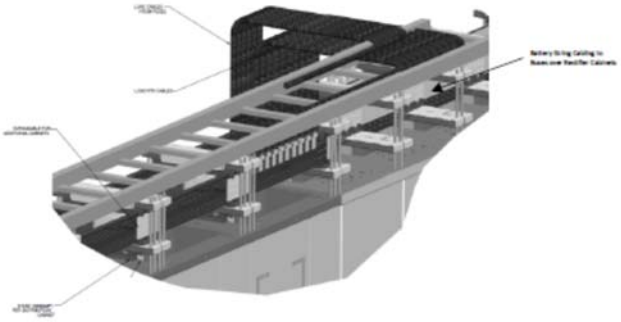


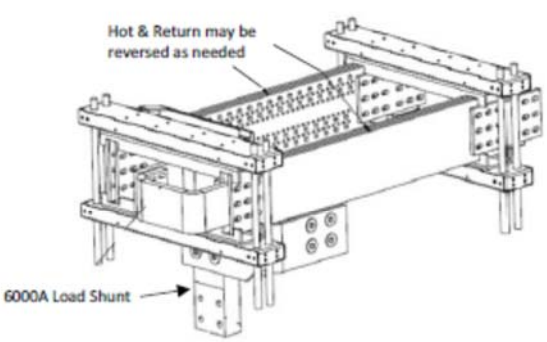
In order for the BIC or M2 to be powered in these cabinets, a 12 ga return lead must be extended from the external plant return bus to this ground terminal strip:



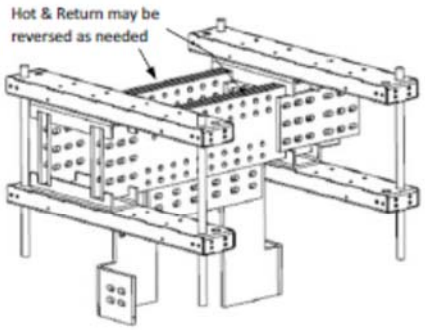
Centralized Architecture, continued

Several additional vintages of centralized architecture systems may also be employed in GPS plants, as defined on the ED83311-30 overhead bus assembly spec. The more common arrangements of this system provide bus capacities of 5000A or 10,000A run over top of the GPS lineup, in place of the external battery stand chandelier typically cabled to for centralized architecture, shown schematically in Fig 4-4. Instead, ED83311-30 provides bus connections into each rectifier-only and distribution-only GPS cabinet from the overhead bus run, while the battery strings cable back to this bus run at the rectifier cabinets and the distribution circuit returns use the bus run over the distribution cabinets, keeping all circuits closely coupled in a compact, growable system. Each distribution cabinet in these arrangements is fed through a 6000A load shunt, which is then monitored by its BIC (Bay Interface Card) shunt circuit, utilizing the optional "All Loads Monitored" function of the system M2 controller for summing each of these distribution cabinet load shunt readings into a total plant load for the M2.





Distribution Cabinet - Vertical Bus



Rectifier Cabinet - Vertical Bus

Refer to Figures 6-6 or 6-6A and the configuration section that follows them for information on the wiring and configuration of the distribution cabinet shunt pair required for the proper monitoring of multiple Load shunts use the ED83311-30 overhead bus assemblies.

Distributed Architecture

Intercabinet DC Power Bus Connections

Refer to Figure 6-4 for this procedure.

Intercabinet DC Power Bus Connections	
Step	**Action**
1	Install the intercabinet bus bars as shown.
2	Install the bus bar shield as shown.
3	Torque connections as specified in Figure 6-4.

Distributed Architecture, continued

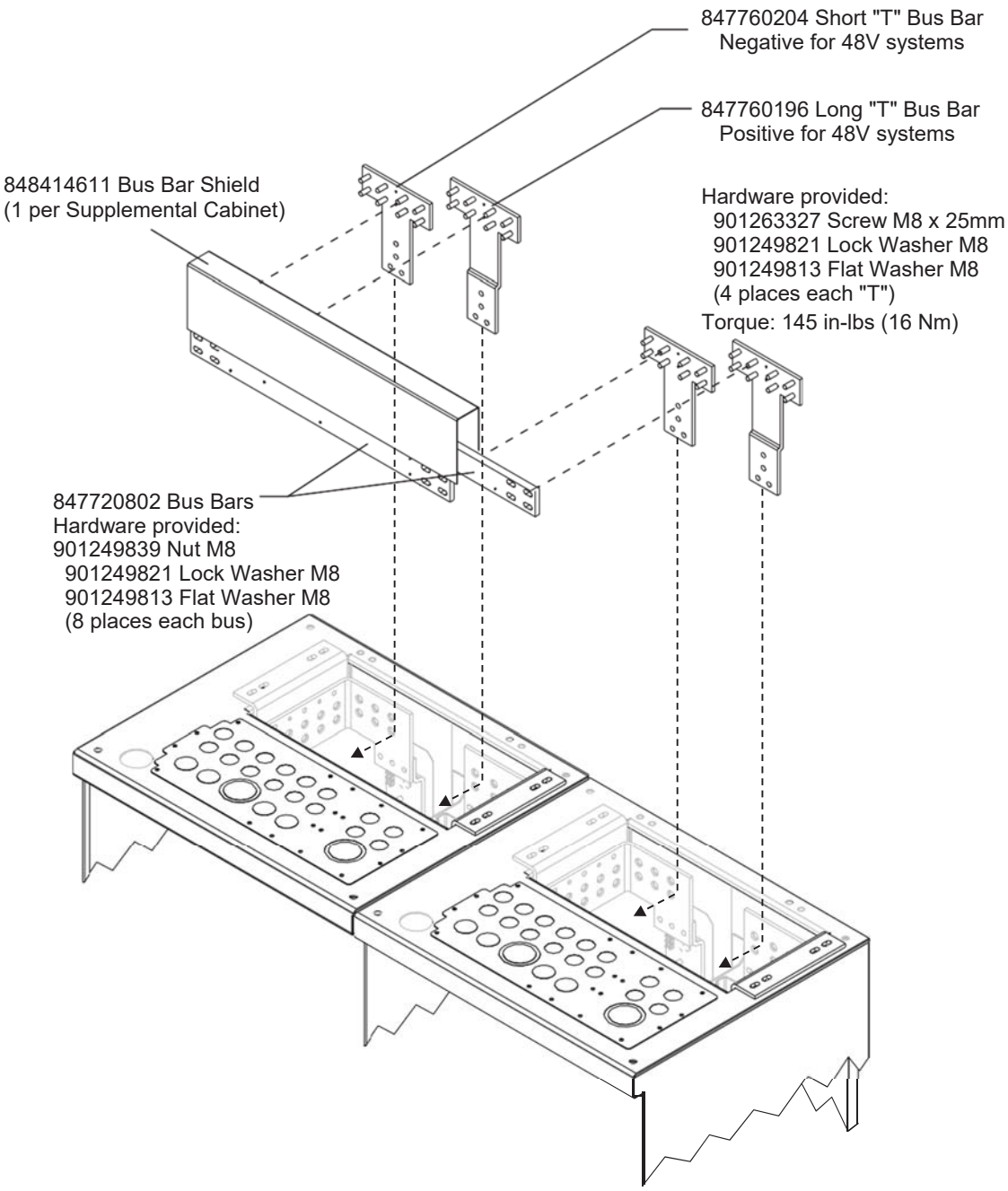


Figure 6-4: Distributed Architecture Intercabinet DC Power Bus Connections
Standard 1800A Intercabinet Tie Bar Kit shown.
Optional 5000A Tie Bar Kit (150022833) is available.

Intercabinet Alarm and Serial Bus Connections

BLJ2/3 to BLJ2/3 (Millennium II Controller)

The cable used in this procedure is:

- Rectifier Interface Cable Assembly 847690799 (10 feet) (provided with cabinet)

Refer to Figure 6-5 for this procedure.

BLJ2/3 to BLJ2/3 (Millennium II Controller)	
Step	**Action**
1	Connect the Rectifier Interface Cable Assembly from J5 of one BLJ2/3 board to J6 of the BLJ2/3 board in the next cabinet. Note: Remove and discard any resistors that are blocking access to J6 or J5 connection points, except for those in J5 of the last cabinet.

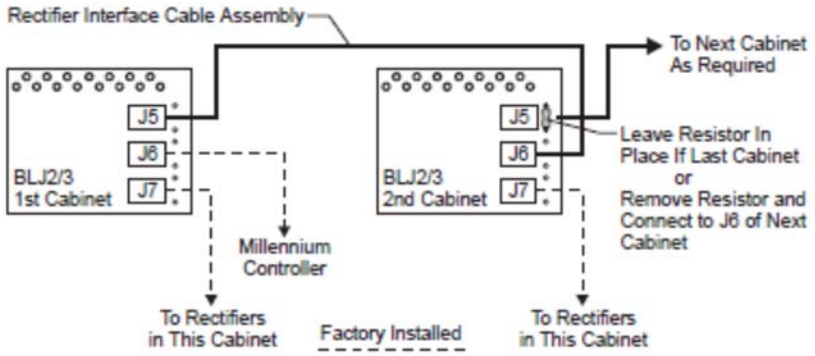


Figure 6-5: BLJ2 or BLJ3 Board Connections, Millennium Controller

Intercabinet Alarm and Serial Bus Connections, continued

BLJ2/3 to BIC10 or BIC10 to BIC10 (Millennium II Controller)

The cable used in this procedure is:

- Rectifier Interface Cable Assembly 847690799 (10 feet) (provided with cabinet)

Refer to Figure 6-5A for this procedure.

BLJ2/3 to BIC10 or BIC10 to BIC10 (Millennium II Controller)	
Step	**Action**
1	Connect the Rectifier Interface Cable Assembly from J5 of one BLJ2/3 board to any J1-J4 of the BIC10 board in the next cabinet or from any of J1 to J4 of one BIC 10 to any of J1 to J4 of the next BIC10. (J1 to J4 are all common on the BIC10.) Note: Remove and discard any resistors that are blocking access to J5 connection point. Set the J11 RS485 termination jumper to the 2-3 position in the BIC 10 of the last cabinet in the system.

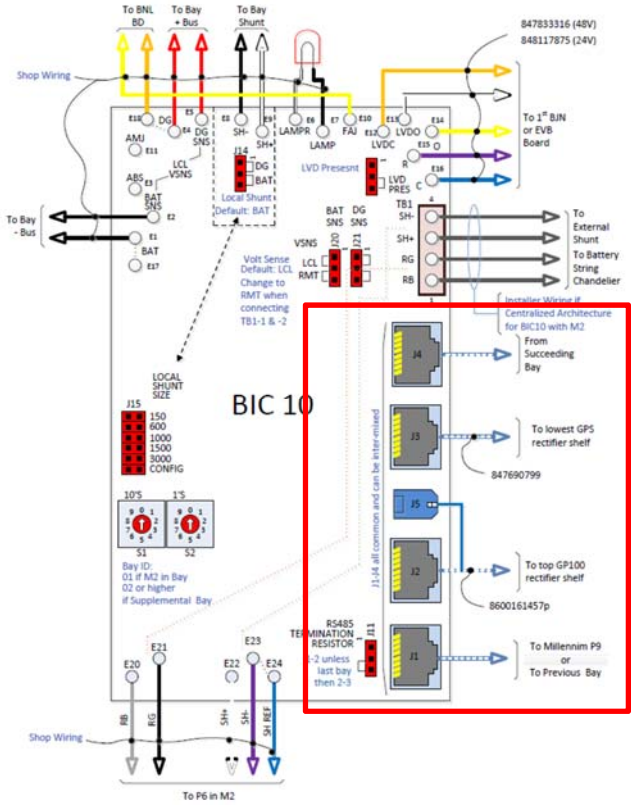


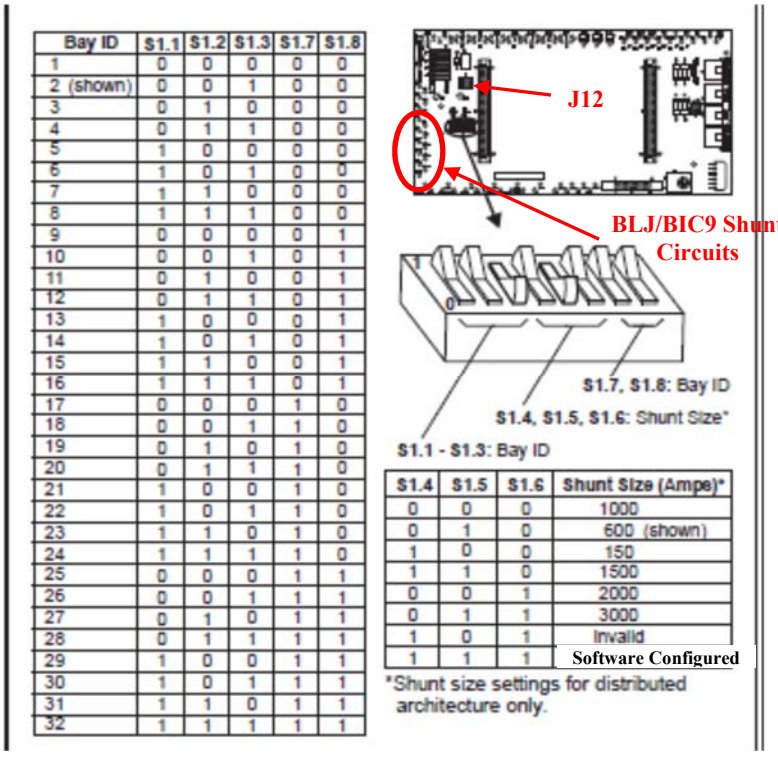
Figure 6-5A: BIC 10 Intercabinet Alarm and Serial Bus Wiring

Bay ID and Shunt Size Configuration

Refer to Figure 6-6 for this procedure.

BLJ2/3 (Millennium II Controller)

BLJ2/3 (Millennium II Controller)	
Step	**Action**
1	Set the DIP switches S1.1, S1.2, S1.3, S1.7, & S1.8 on the BLJ2/3 board for the bay ID number. (Factory default is Bay 1.)
2	Set DIP switches S1.4, S1.5, & S1.6 on the BLJ2/3 board per the Table below to configure the shunt size for the 4 shunt circuits of the BIC9. Note: All shunt circuits wired to the BLJ2/3 must be at the same bus potential and must have 100K ohm CLRs (Current Limiting Resistors) installed at the shunt end of the circuit. If the shunts to be monitored are at return bus potential instead of hot bus potential, then jumper J12 (immediately above S1) must be moved to the 2-3 position.
3	If the Software Configured Shunt Size is selected, proceed to the next section on configuration of it using the Millennium II controller web pages.



Bay ID	S1.1	S1.2	S1.3	S1.7	S1.8
1	0	0	0	0	0
2 (shown)	0	0	1	0	0
3	0	1	0	0	0
4	0	1	1	0	0
5	1	0	0	0	0
6	1	0	1	0	0
7	1	1	0	0	0
8	1	1	1	0	0
9	0	0	0	0	1
10	0	0	1	0	1
11	0	1	0	0	1
12	0	1	1	0	1
13	1	0	0	0	1
14	1	0	1	0	1
15	1	1	0	0	1
16	1	1	1	0	1
17	0	0	0	1	0
18	0	0	1	1	0
19	0	1	0	1	0
20	0	1	1	1	0
21	1	0	0	1	0
22	1	0	1	1	0
23	1	1	0	1	0
24	1	1	1	1	0
25	0	0	0	1	1
26	0	0	1	1	1
27	0	1	0	1	1
28	0	1	1	1	1
29	1	0	0	1	1
30	1	0	1	1	1
31	1	1	0	1	1
32	1	1	1	1	1

S1.4	S1.5	S1.6	Shunt Size (Ampe)*
0	0	0	1000
0	1	0	600 (shown)
1	0	0	150
1	1	0	1500
0	0	1	2000
0	1	1	3000
1	0	1	Invalid
1	1	1	Software Configured

Figure 6-6: BLJ2/3 DIP Switch Settings When Using a Millennium II Controller

Bay ID and Shunt Size Configuration, continued

Refer to Figure 6-6A for this procedure.

BIC10 (Millennium II Controller)

BIC 10 Millennium II Controller	
Step	**Action**
1	Set the Bay ID for the BIC 10 by using the S1 (10s place) & S2 (1s place) rotary switches. The cabinet holding the Millennium II controller should always be ID'd as 01 since the software activates the Bay 01 bay lamp for any controller alarm. Cabinets without a controller should be ID'd as 02 or higher.
2	Set the size for the local shunt circuit of the BIC 10 by using the appropriate J15 jumper position. If the shunt to be monitored is at return bus potential instead of hot bus potential, then jumper J14 (immediately below the local shunt connection) must be moved to the 1-2 position.er J12 (immediately above S1) must be moved to the 2-3 position. Note: Any shunt circuit wired to this BIC 10 local shunt circuit must have 100K ohm CLRs (Current Limiting Resistors) installed at the shunt end of the circuit. These CLRs are provided already by the shop when the shunt circuit is pre-wired.
3	If the Software Configured Shunt Size is selected, proceed to the next section on configuration of it using the Millennium II controller web pages.

Bay ID and Shunt Size Configuration, continued

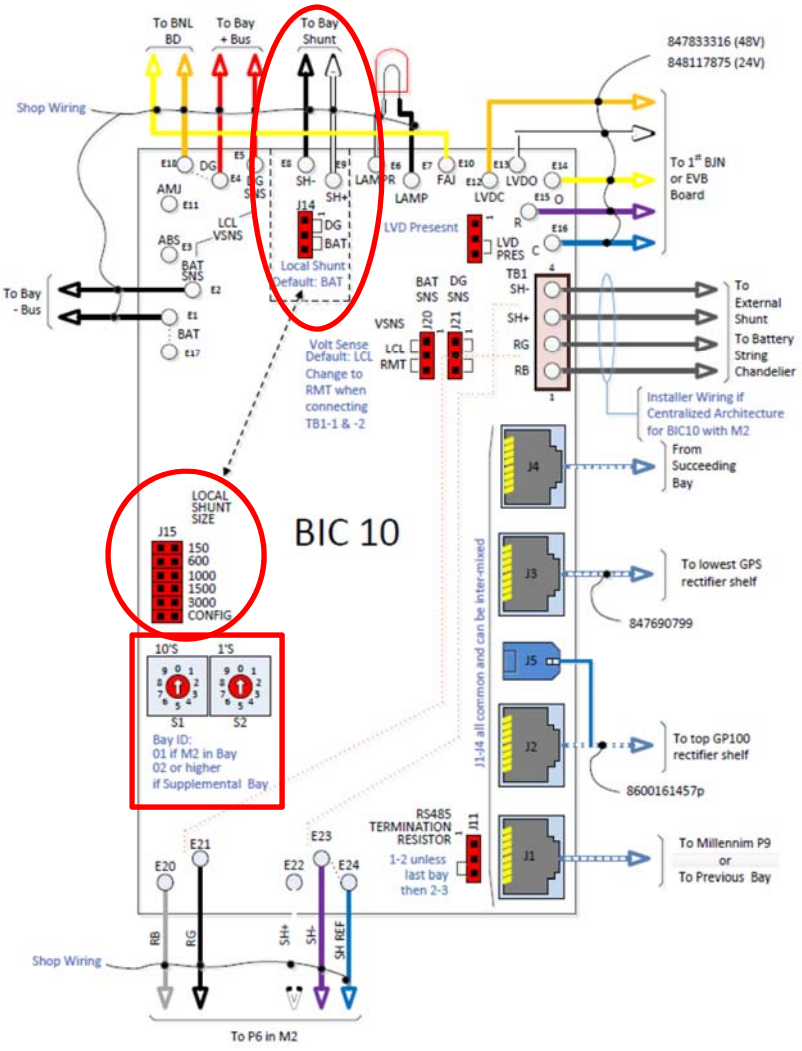


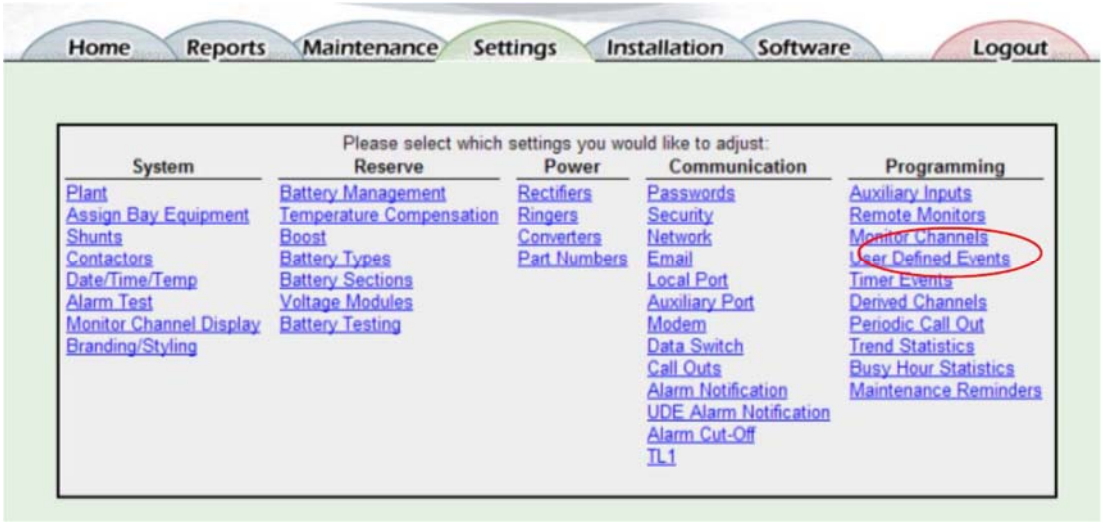
Figure 6-6A: BIC 10 Bay ID and Shunt Size Configuration

Millennium II Controller Configuration of BIC Shunt Channels

Software Configured Bay Current Shunt Channel Configuration in Millennium II

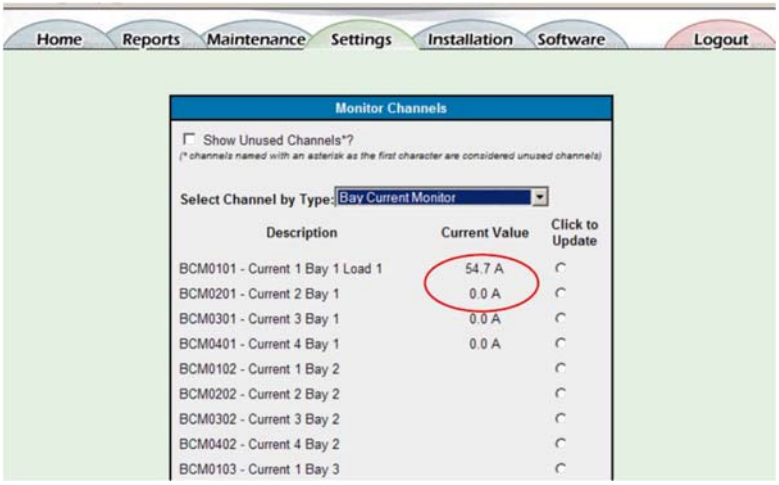
Bay Shunt Channels that have been set to “Software Configured” (BLJ2/3) or “CONFIG” (BIC 10) setting must be then set to the desired configuration for the shunt size and type within the Millennium II controller itself, by logging in over the web pages.

1. Go to the Settings ► Programming ►Monitor Channels screen. Click on “Monitor Channels”.



2. Choose the “Bay Current Monitor” item from the pull-down menu.

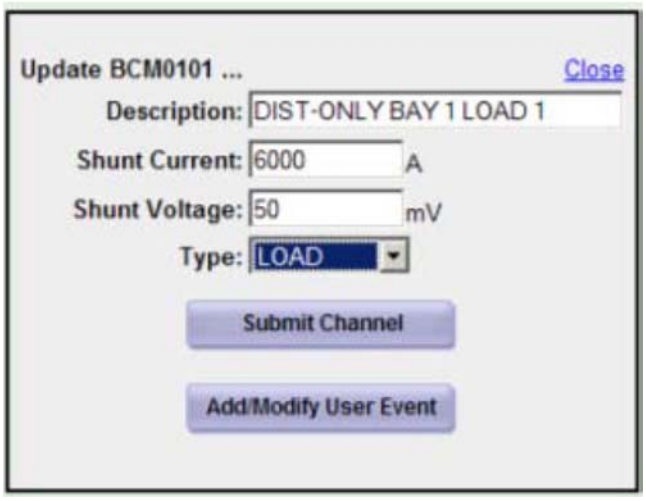
3. All BIC Current inputs should be listed. Those with current values (including zero) are installed and active. The BIC current monitoring channels are identified by “BCMxxyy” where “xx” is the input channel number and “yy” is the ID number set for the BIC.



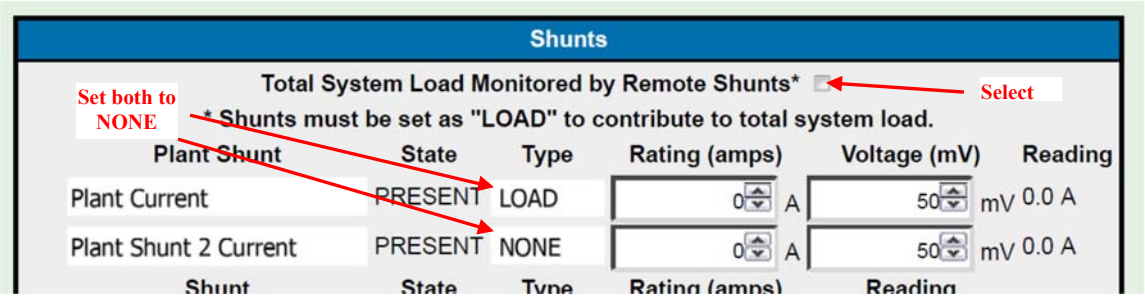
Millennium II Controller Configuration of BIC Shunt Channels, continued

Software Configured Bay Current Shunt Channel Configuration in Millennium II, continued

4. Select the "Click to Update" button of the appropriate BIC Shunt channel. A separate pop-up menu specific for the selected input will appear for editing.



5. Edit/verify all appropriate configuration settings which include:
   - ➢ Shunt Current and Voltage values.
   - ➢ Shunt Type
     - Shunt Type will typically be set to "Battery" if the assigned shunt is measuring Battery string charge (-) or discharge (+) current in a distributed architecture plant.
     - Shunt Type will be set to "Load" (shown above) only when using the ED83311-30 overhead bus arrangements with Distribution-only cabinets each fed by their own shunt. When this is the case, Shunt Type for Plant Current & Plant Shunt 2 Current on the *Settings -> Shunts* web page (below) must both be set to None and the "Total System Load Monitored by Remote Shunts" checkbox there must be selected.



   - ➢ Click the "Submit Channel" button to ensure all changes are saved.
   - ➢ Repeat for all BIC monitored software configured Shunt channels.

7 AC Connection and Wiring

⚠ Safety

Read Section 2, *Safety*, carefully before connecting AC to the Galaxy Power System.

Wire Sizing and Ampacity

Table 7-A: Wire Sizing and Ampacity

Standard Ga	**Metric (mm^2)**	**NEC Table 310-16 75°C (A)** (see Note)
10	6	35
8	10	50
6	16	65
4	25	85
2	35	115
1/0	50	150
2/0	70	175
4/0	120	230
Note: For NEC code compliance, all wire sizing calculations are made assuming 75°C rated wire. Lineage Power recommends the use of 90°C rated wire, which has a higher current carrying capacity, for all ac connections.		

AC Input Schemes

GPS 4848/100: 595 Rectifiers (48V, 200A) and 595LT Rectifiers (48V, 220A)

595 and 595LT series rectifier input and output voltages are as shown below.

Input	Rectifier	Output
380-480Vac, 3-phase, 50/60 Hz	595A and 595LTA series	48Vdc / 220A
200-240Vac, 3-phase, 50/60 Hz	595B and 595LTB series	

The GPS 4848/100 system supports three AC schemes:

- Single bulk 3-wire (3-phase): The panel is factory-equipped to distribute the appropriate connections to the rectifiers through circuit breakers.
- Multiple bulk 3-wire (3-phase): The panel is factory-equippedto distribute the appropriate connections to the rectifiers through circuit breakers.
- Multiple 3-wire (3-phase): Connected directly to the terminal strips, which then, distribute the ac power to the rectifiers. One feed for each rectifier, external circuit overload protection, must be provided by customer.

Note: All wire sizes are based on the US National Electric Code.

AC Input Schemes, continued

GPS 4830: GP100 Rectifiers (48V, 100A)

GP100 series rectifier input and output voltages are as shown below.

Input	Rectifier	Output
380-480Vac, 3-phase, 50/60 Hz	GP100 series	48Vdc / 100A

The GPS 4830 system supports three AC schemes:

- Single bulk 3-wire (3-phase): The panel is factory-equipped to distribute the appropriate connections to the rectifiers through circuit breakers.
- Multiple bulk 3-wire (3-phase): The panel is factory-equippedto distribute the appropriate connections to the rectifiers through circuit breakers.
- Multiple 3-wire (3-phase): Connected directly to the terminal strips, which then, distribute the ac power to the rectifiers. One feed for two rectifiers (A suffix); one feed for four rectifiers (B suffix); of one feed per rectifier (C suffix). External circuit overload protection, must be provided by customer.

Note: All wire sizes are based on the US National Electric Code.

AC Input Schemes, continued

GPS 4827: NE050AC48TEZ Rectifiers (48V, 50A) and NE075AC48TEZ Rectifiers (48V, 75A)

Infinity NE series rectifier input and output voltages are as shown below.

Input	Rectifier	Output
208-277Vac, 1-phase, 50/60 Hz	NE050AC48ATEZ	48Vdc / 50A
208-277Vac, 1-phase, 50/60 Hz	NE075AC48ATEZ	48Vdc / 75A

The GPS 4827 system supports three AC schemes:

- Single bulk 3-wire (3-phase): The panel is factory-equipped to distribute the appropriate connections to the rectifiers through circuit breakers.
- Multiple bulk 3-wire (3-phase): The panel is factory-equippedto distribute the appropriate connections to the rectifiers through circuit breakers.
- Multiple 2-wire (1-phase): Connected directly to the terminal strips, which then, distribute the ac power to the rectifiers. One feed for one, two, or three rectifiers. External circuit overload protection, must be provided by customer.

Note: All wire sizes are based on the US National Electric Code.

AC Cable Routing

Caution: Follow all local codes and practices when performing the steps to connect ac to the power system.

AC Cable Routing	
Step	**Action**
1	Clearly label the main AC circuit breaker panel, stating that installers are working in the AC cabling.
2	Check that all AC circuit breakers are turned OFF.
3	Route the AC cables to the cabinet as required by local building codes.
4	At the cabinet, route the AC cables through the access hole(s) in the top of the cabinet.
5	Install terminal lugs (if applicable) to cables.

Connecting AC Conduit

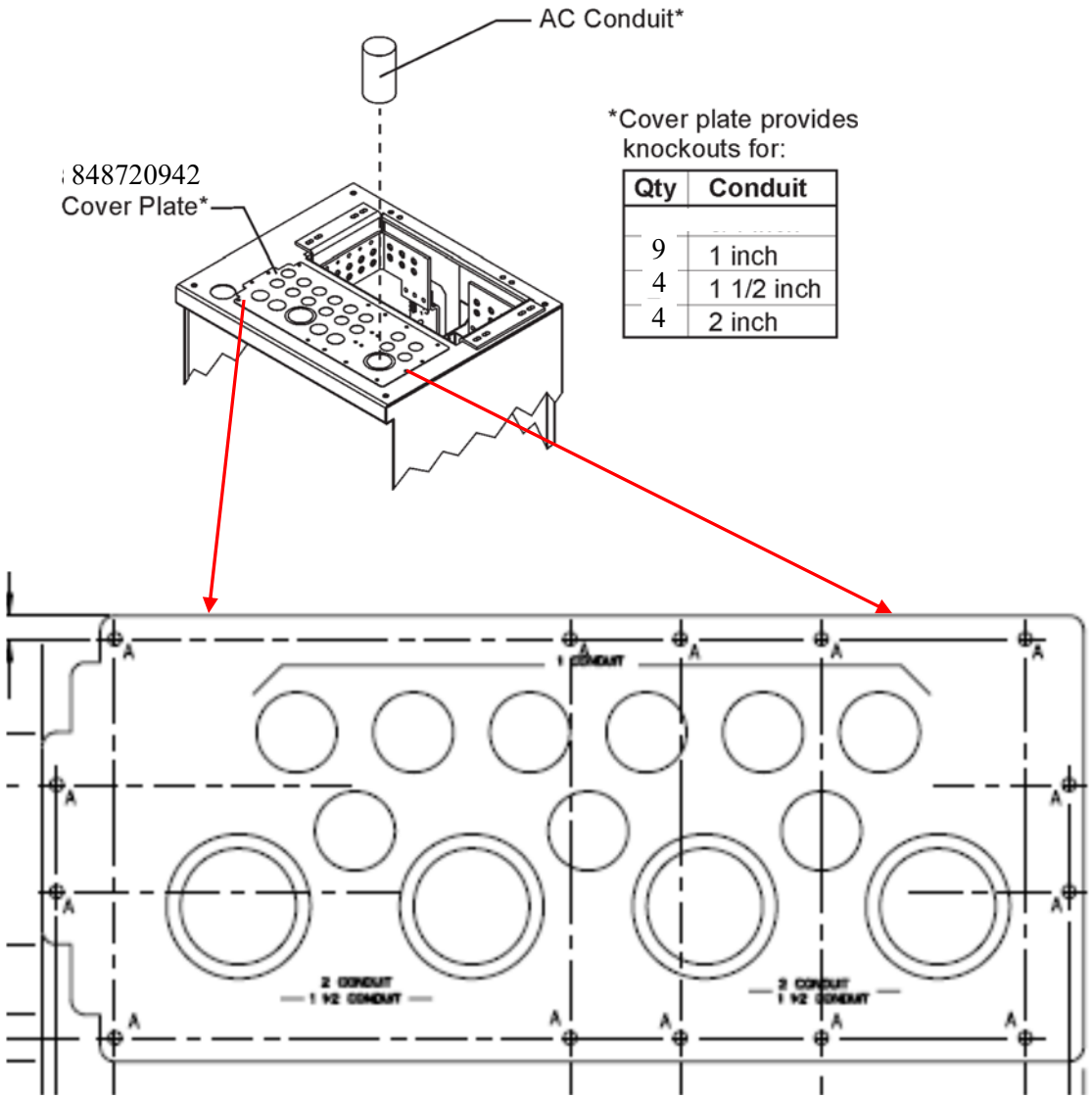


Figure 7-1: Attaching AC Conduit

Rectifier Positions

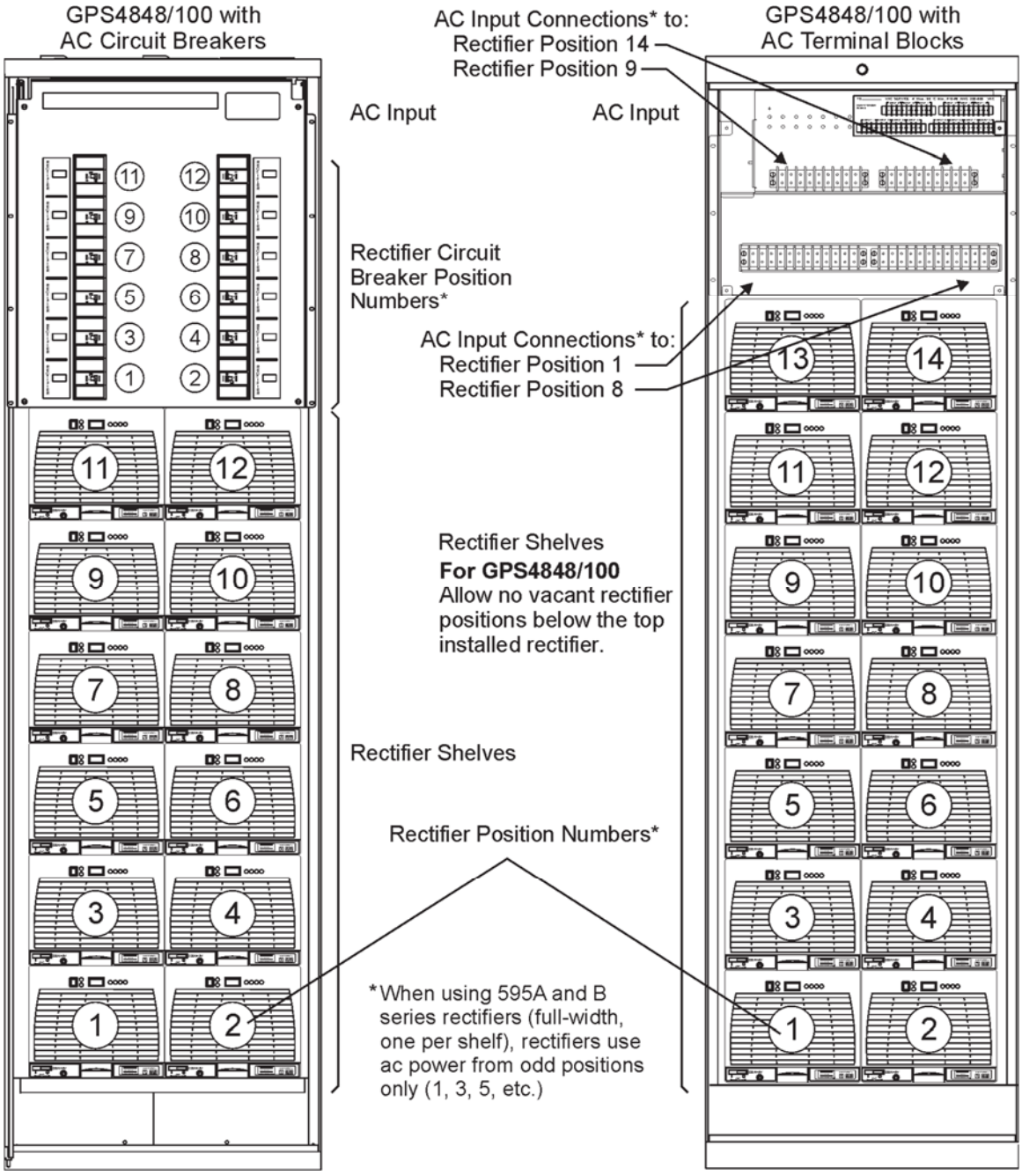
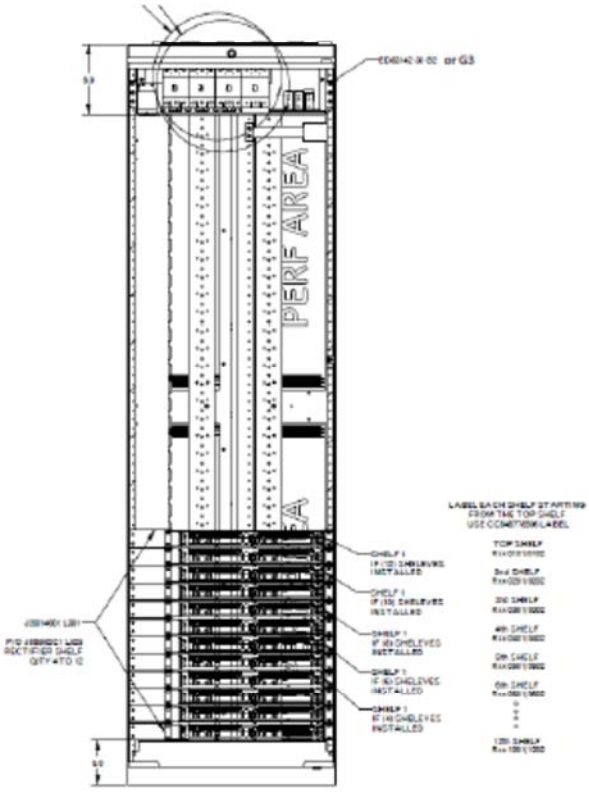


Figure 7-2: GPS 4848/100 Dual Shelf Rectifier Positions

Rectifier Positions, continued

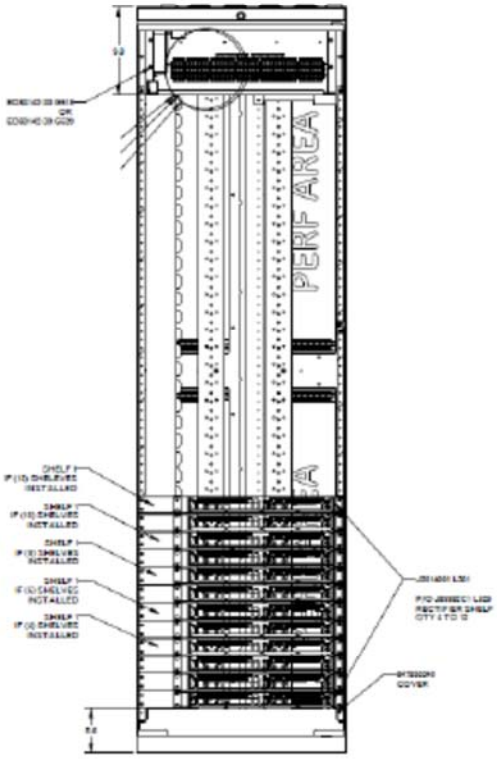
GPS 4830
with
Bulk Feed AC Circuit Breakers



Left-most Breaker Feeds

Top Shelf R 0101 & R 0102 (A-suffix)
or
Top 2 Shelves R 0101 to R 0202 (B-suffix)

GPS 4830
with
AC Terminal Strip Feed



Left-most Circuit Feeds

Top Shelf R 0101 & R 0102 (A-suffix)
or
Top 2 Shelves R 0101 to R 0202 (B-suffix)

Figure 7-3: GPS 4830 Rectifier Positions and AC Input Positions

Rectifier Positions, continued

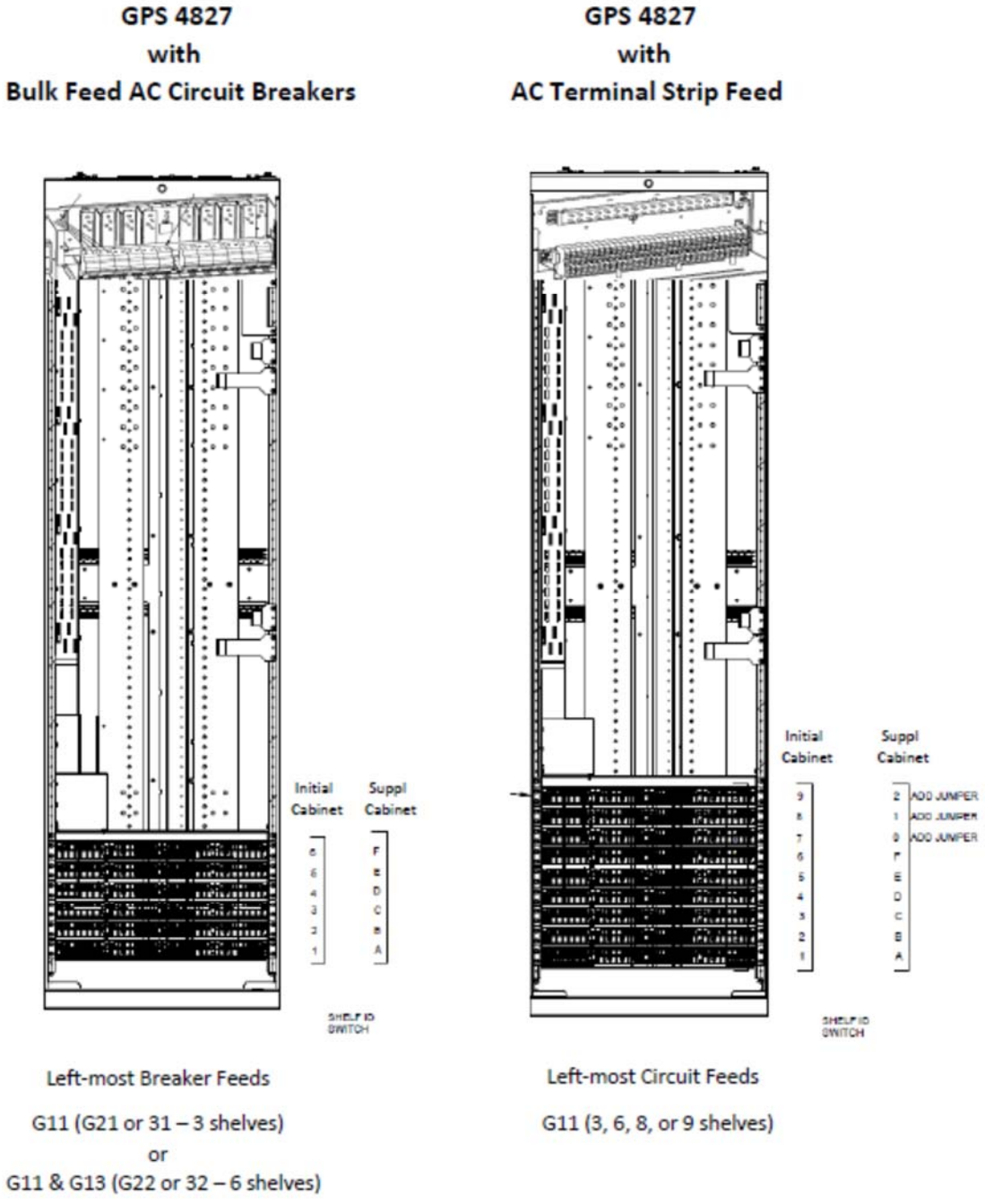


Figure 7-4: GPS 4827 Rectifier Positions and AC Input Positions

AC Input Panels Cross Reference

Table 7-B1: AC Panels Cross Reference – GPS 4848/100

	Vac	AC Feeds	Rectifiers	ED83142-30	H569-434 GPS 4848/100
AC Circuit Breaker Panels - 595LT Rectifiers					
	208/240	2	4A	G3	G320
	208/240	2	6	G4	G321
	208/240	4	12	G25	G335
	480	1	4A	G2	G322
	480	2	6	G4	G323
	480	4	12	G24	G334
65KIC	480	2	4A	G10	G370
65KIC	480	2	6	G11	G371
AC Terminal Strip Panels - 595LT Rectifiers					
	208/240	4	4	G5	G324
	208/240	6	6	G5	G325
	208/240	8	8	G18	G331
	208/240	12	12	G26	G329
	208/240	14	14	G26	G333, G433
	480	4	4	G5	G326
	480	6	6	G5	G327
	480	8	8	G18	G330
	480	12	12	G26	G328
	480	14	14	G26	G332, G432
Distribution Only Panels, no AC					
1200A	-	-	-	None	G28, G428
4800A	-	-	-	None	G29, G429, G430

AC Input Panels Cross Reference, continued

Table 7-B2: AC Panels Cross Reference – GPS 4830

Vac	AC Feeds	Rectifiers	ED83142-30	H569-4830 GPS 4830
AC Circuit Breaker Panels – GP100 Series Rectifiers				
480	1	8	G2; 4-H	G334A
		16	G2; 4-J	G334B
	2	12	G3; 6-H	G346A
		24	G3; 6-J	G346B
AC Terminal Strip Panels – GP100 Series Rectifiers				
480	4	8	G-518	G304A
	2			G304B
	6	12		G306A
	3			G306B
	8	16		G308A
	4			G308B
	10	20		G310A
	5			G310B
	12	24		G312A
	6			G312B

AC Input Panels Cross Reference, continued

Table 7-B3: AC Panels Cross Reference – GPS 4827

Vac	AC Feeds	Rectifiers	ED83142-30	H569-4827 GPS 4827
AC Circuit Breaker Panels – NE050AC48ATEZ Rectifiers				
208/240	1	12	G7	G21
	2	24	G28	G22
AC Circuit Breaker Panels – NE075AC48ATEZ Rectifiers				
208/240	1	12	G7	G31
480+N			G7+N kit	G31+N kit
208/240	2	24	G28	G32
480+N			G28+N kit	G32+N kit
AC Terminal Strip Panels – NE050AC48ATEZ Rectifiers				
208/240	12@20A	12	G20	G26
	6@40A			
	24@20A	24	G27	G27
	12@40A			
	8@60A			
	36@20A	36		G28
	18@40A			
AC Terminal Strip Panels – NE075AC48ATEZ Rectifiers				
208/240	12@30A	12	G20	G36
	6@60A			
277+N	12@ 25/30A			
	6@50A			
208/240	24@30A	24	G27	G37
	12@60A			
277+N	24@ 25/30A			
	12@50A			
208/240	36@30A	36		G38, G38W
	18@60A			
277+N	36@ 25/30A			
	18@50A			
208/240	32@30A	32		G308, G308W
	16@60A			
277+N	32@ 25/30A			
	16@50A			

AC Input Panels

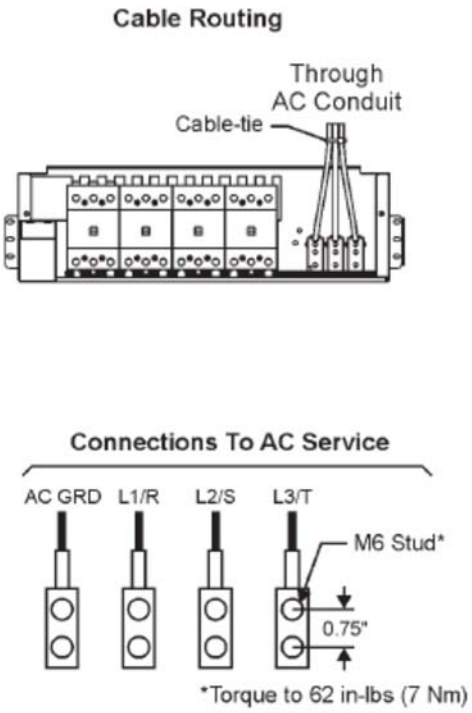
Wiring Options

1 Input at 100A, 380 VAC 3-Phase, 3-Wire Service + PE 4 Rectifiers (H569-434 G322)	
1 Conduit	
Wire	(3) 2 AWG (1) 6 AWG Ground
Panel Board Breaker	(1) 125A 3-pole
Conduit Size	(1) 1-1/2" (THHN 75°C min)

1 Input at 80A, 480 VAC 3-Phase, 3-Wire Service + PE 4 Rectifiers (H569-434 G322)	
1 Conduit	
Wire	(3) 2 AWG (1) 8 AWG Ground
Panel Board Breaker	(1) 100A 3-pole
Conduit Size	(1) 1-1/2" (THHN 75°C min)

1 Input at 64A, 480 VAC 3-Phase, 3-Wire Service + PE 4 Internal 25A circuit breakers 8 Rectifiers (H569-4830 G334A)	
1 Conduit	
Wire	(3) 2 AWG (1) 8 AWG Ground
Panel Board Breaker	(1) 80A 3-pole
Conduit Size	(1) 1-1/2" (THHN 75°C min)

1 Input at 128A, 480 VAC 3-Phase, 3-Wire Service + PE 4 Internal 50A circuit breakers 16 Rectifiers (H569-4830 G334B)	
1 Conduit	
Wire	(3) 2/0 AWG (1) 4 AWG Ground
Panel Board Breaker	(1) 175A 3-pole
Conduit Size	(1) 2" (THHN 75°C min)



Provided

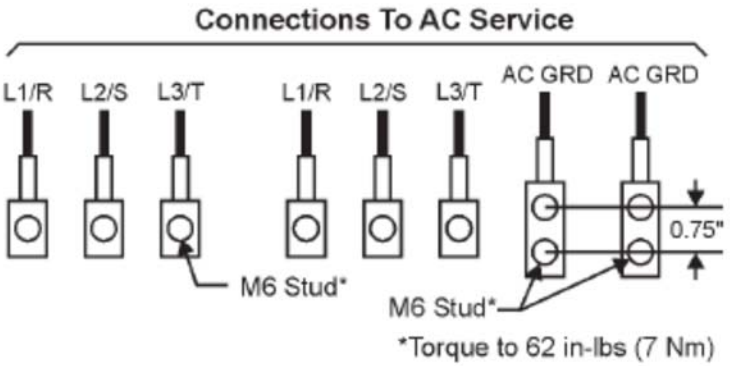
Lug	Qty	Comcode	Part
8 ga	1	406338343	WP91412 L103
6 ga	1	406338442	WP91412 L110
2 ga	3	406338673	WP91412 L122

Figure 7-5: ED83142-30 Group 2
(H569-434 G322: AC Input Panel for 595A or LTA Series Rectifiers or
H569-4830 G334A or G334B: AC Input Panel for GP100 Series Rectifiers)

AC Input Panels, continued

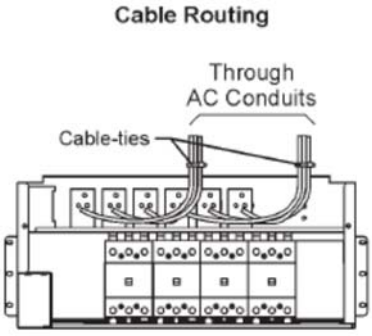
Wiring Options

2 Inputs at 80A each, 200 VAC 3-Phase, 3-Wire Service + PE 4 Rectifiers (H569-434 G320)	
2 Conduits	
Wire	(6) 2 AWG (2) 8 AWG Ground
Panel Board Breaker	(2) 100A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
1 Conduit	
Wire	(6) 1/0 AWG (1) 6 AWG Ground
Panel Board Breaker	(2) 100A 3-pole
Conduit Size	(1) 2” (THHN 75°C min)



2 Inputs at 48A each, 480 VAC 3-Phase, 3-Wire Service + PE 6 Internal 25A circuit breakers 12 Rectifiers (H569-4830 G346A)	
Wire	(6) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(2) 60A 3-pole
Conduit Size	(2) 1” (THHN 75°C min)

2 Inputs at 96A each, 480 VAC 3-Phase, 3-Wire Service + PE 6 Internal 50A circuit breakers 24 Rectifiers (H569-4830 G346B)	
Wire	(6) 2 AWG (2) 8 AWG Ground
Panel Board Breaker	(2) 125A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)



Provided

Lug	Qty	Comcode	Part
6 ga	2	406338442	WP91412 L110
2 ga	6	407784255	54107UB (T&B)
1/0 ga 90°	6	400831459	54152UB (T&B)

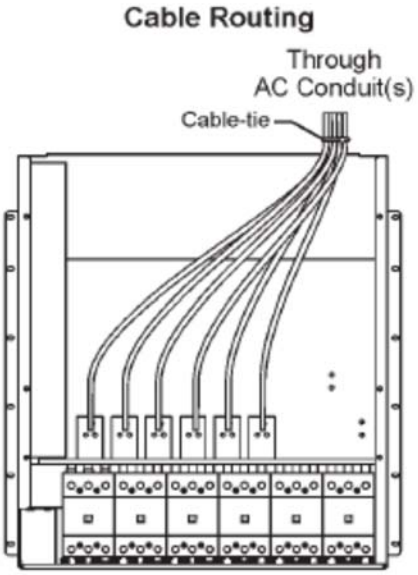
Figure 7-6: ED83142-30 Group 3
(H569-434 G320: AC Input Panel for 595B or LTB Series Rectifiers or
H569-4830 G346A or G346B: AC Input Panel for GP100 Series Rectifiers)

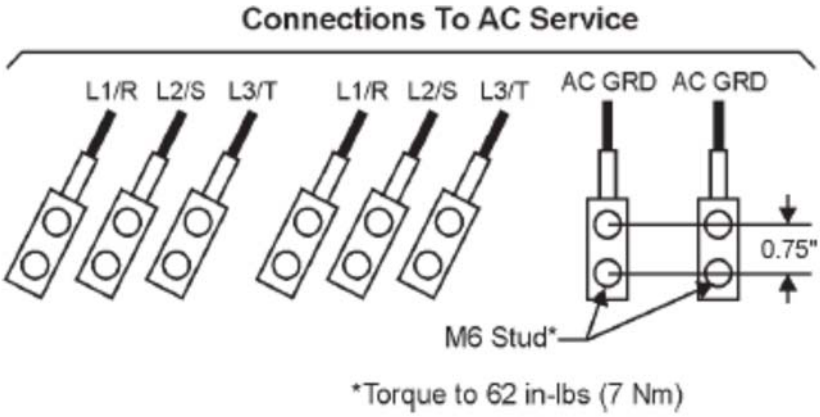
AC Input Panels, continued

Wiring Options

2 Inputs at 60A each, 480 VAC 3-Phase, 3-Wire Service + PE 6 Rectifiers (H569-434 G321, G323)	
1 Conduit	
Wire	(6) 4 AWG (1) 8 AWG Ground
Panel Board Breaker	(2) 70A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)
2 Conduits	
Wire	(6) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(2) 70A 3-pole
Conduit Size	(2) 1” (THHN 75°C min)

2 Inputs at 120A each, 200 VAC 3-Phase, 3-Wire Service + PE 6 Rectifiers (H569-434 G321, G323)	
2 Conduits	
Wire	(6) 1/0 AWG (2) 6 AWG Ground
Panel Board Breaker	(2) 150A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)





Provided

Lug	Qty	Comcode	Part
8 ga	2	406338343	WP91412 L103
6 ga	2	406338442	WP91412 L110
2 ga	6	406338673	WP91412 L122
2/0 ga	6	406338764	WP91412 L130

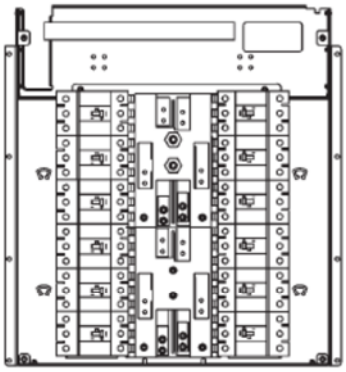
Figure 7-7: ED83142-30 Group 4
(H569-434 G321 or G323: AC Input Panel for 595A, B, LTA, or LTB Series Rectifiers)

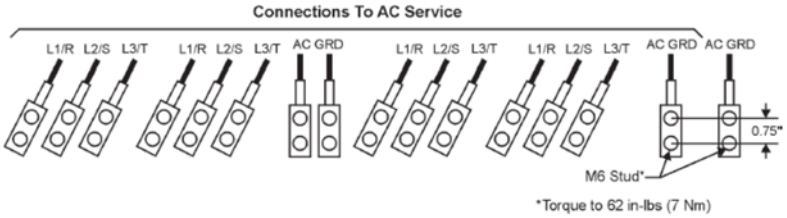
AC Input Panels, continued

Wiring Options

4 Inputs at 60A each, 480 VAC 3-Phase, 3-Wire Service + PE 12 Rectifiers ED83142-30 G24 (H569-434 G334)	
2 Conduits	
Wire	(12) 4 AWG (2) 8 AWG Ground
Panel Board Breaker	(4) 70A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
4 Conduits	
Wire	(12) 6 AWG (4) 8 AWG Ground
Panel Board Breaker	(4) 70A 3-pole
Conduit Size	(4) 1” (THHN 75°C min)

4 Inputs at 120A each, 200 VAC 3-Phase, 3-Wire Service + PE 12 Rectifiers ED83142-30 G25 (H569-434 G335)	
4 Conduits	
Wire	(12) 1/0 AWG (4) 6 AWG Ground
Panel Board Breaker	(4) 150A 3-pole
Conduit Size	(4) 1-1/2” (THHN 75°C min)





Provided

Lug	Qty	Comcode	Part
8 ga	2	406338343	WP91412 L103 (ED83142-30 G24 only)
6 ga	4	406338442	WP91412 L110
2 ga	12	406338673	WP91412 L122 (ED83142-30 G24 only)
2/0 ga	12	406338764	WP91412 L130

Figure 7-8: ED83142-30 Groups 24 or 25
(H569-434 G334 or G335: AC Input Panel for 595LTA or LTB Series Rectifiers)

AC Input Panels, continued

Wiring Options

4 Inputs at 40A each, 200 VAC 3-Phase, 3-Wire Service + PE 4 Rectifiers (H569-434 G324)	
2 Conduits	
Wire	(12) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(4) 50A 3-pole
Conduit Size	(2) 1” (THHN 75°C min)
4 Conduits	
Wire	(12) 8 AWG (4) 8 AWG Ground
Panel Board Breaker	(4) 50A 3-pole
Conduit Size	(4) 1” (THHN 75°C min)

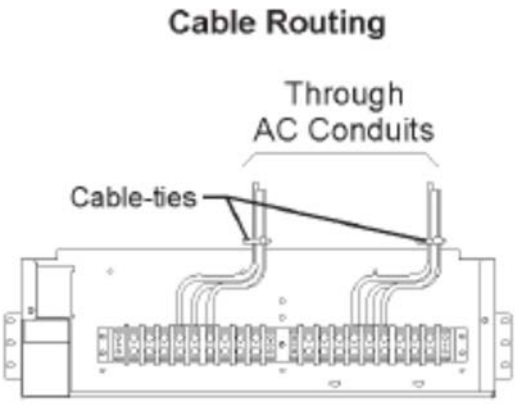
4 Inputs at 25A each, 380 VAC or 20A each, 480 VAC 3-Phase, 3-Wire Service + PE 4 Rectifiers (H569-434 G326)	
1 Conduit – 480V	
Wire	(12) 8 AWG (1) 8 AWG Ground
Panel Board Breaker	(4) 25A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)
1 Conduit – 380 or 480V	
Wire	(12) 6 AWG (1) 8 AWG Ground
Panel Board Breaker	(4) 30A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)
2 Conduits – 480V	
Wire	(12) 10 AWG (2) 8 AWG Ground
Panel Board Breaker	(4) 25A 3-pole
Conduit Size	(2) 1” (THHN 75°C min)
2 Conduits – 380 or 480V	
Wire	(12) 10 AWG (2) 8 AWG Ground
Panel Board Breaker	(4) 30A 3-pole
Conduit Size	(2) 1” (THHN 75°C min)

6 Inputs at 25A each, 380 VAC or 20A each, 480 VAC 3-Phase, 3-Wire Service + PE 6 Rectifiers (H569-434 G327)	
1 Conduit – 480V	
Wire	(18) 8 AWG (1) 8 AWG Ground
Panel Board Breaker	(6) 25A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)
1 Conduit – 380 or 480V	
Wire	(18) 6 AWG (1) 8 AWG Ground
Panel Board Breaker	(6) 30A 3-pole
Conduit Size	(1) 2” (THHN 75°C min)
2 Conduits – 480V	
Wire	(18) 10 AWG (2) 8 AWG Ground
Panel Board Breaker	(6) 25A 3-pole
Conduit Size	(2) 1” (THHN 75°C min)
2 Conduits – 380 or 480V	
Wire	(18) 8 AWG (2) 8 AWG Ground
Panel Board Breaker	(6) 30A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
6 Conduits – 480V	
Wire	(18) 10 AWG (6) 8 AWG Ground
Panel Board Breaker	(6) 25A 3-pole
Conduit Size	(6) 1” (THHN 75°C min)
6 Conduits – 380 or 480V	
Wire	(18) 10 AWG (6) 8 AWG Ground
Panel Board Breaker	(6) 30A 3-pole
Conduit Size	(6) 1” (THHN 75°C min)

6 Inputs at 40A each, 200 VAC 3-Phase, 3-Wire Service + PE 6 Rectifiers (H569-434 G325)	
2 Conduits	
Wire	(18) 4 AWG (2) 8 AWG Ground
Panel Board Breaker	(6) 50A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
6 Conduits	
Wire	(18) 8 AWG (6) 8 AWG Ground
Panel Board Breaker	(6) 50A 3-pole
Conduit Size	(6) 1” (THHN 75°C min)

Figure 7-9: ED83142-30 Group 5 (H569-434 G324, G325, G326, or G327: AC Input Panel for 595A, B, LTA, or LTB Series Rectifiers)

AC Input Panels, continued



Provided

Lug	Qty	Comcode	Part
10 ga	18	406338145	WP91412 L93
8 ga	6	406338343	WP91412 L103
8 ga	18	405347402	WP91412 L1
6 ga	18	407334671	WP91412 L171

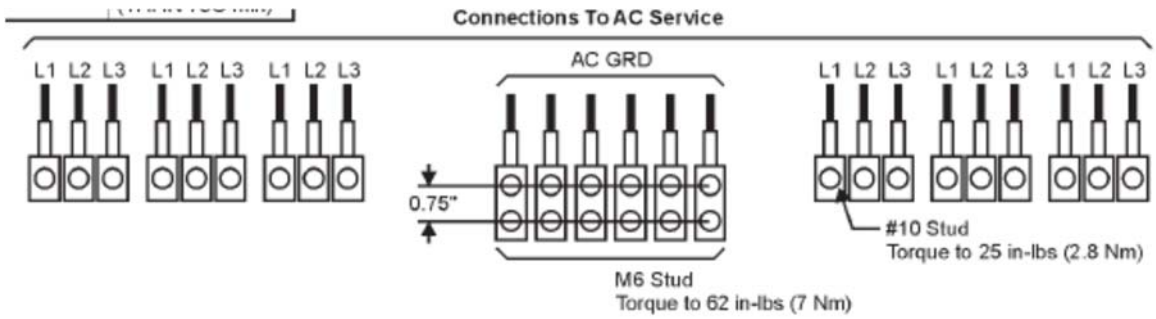


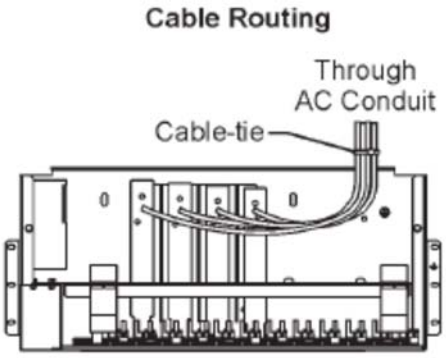
Figure 7-9A: ED83142-30 Group 5
(H569-434 G324, G325, G326, or G327:
AC Input Panel for 595A, B, LTA, or LTB Series Rectifiers)

AC Input Panels, continued

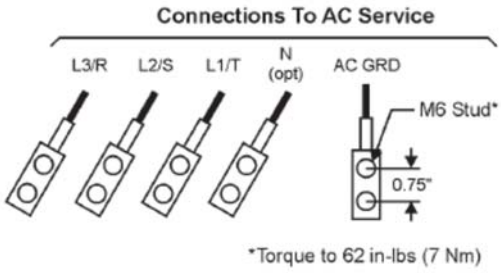
Wiring Options

1 Input at 104A, 200 VAC 3-Phase, 3-Wire Service + PE 12 Rectifiers (H569-4827 G21)	
1 Conduit	
Wire	(3) 1/0 AWG (1) 6 AWG Ground
Panel Board Breaker	(1) 150A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)

1 Input at 74.8A, 480 VAC+N 3-Phase,4-Wire Service + PE 12 Rectifiers (H569-4827 G31 with 848233862, phase-to-N kit; See Figure 7-19)	
1 Conduit	
Wire	(4) 2 AWG (1) 6 AWG Ground
Panel Board Breaker	(1) 100A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)



1 Input at 152A each, 200 VAC 3-Phase, 3-Wire Service + PE 12 Rectifiers (H569-4827 G31)	
1 Conduit	
Wire	(3) 4/0 AWG (1) 6 AWG Ground
Panel Board Breaker	(1) 200A 3-pole
Conduit Size	(1) 2” (THHN 75°C min)



Provided

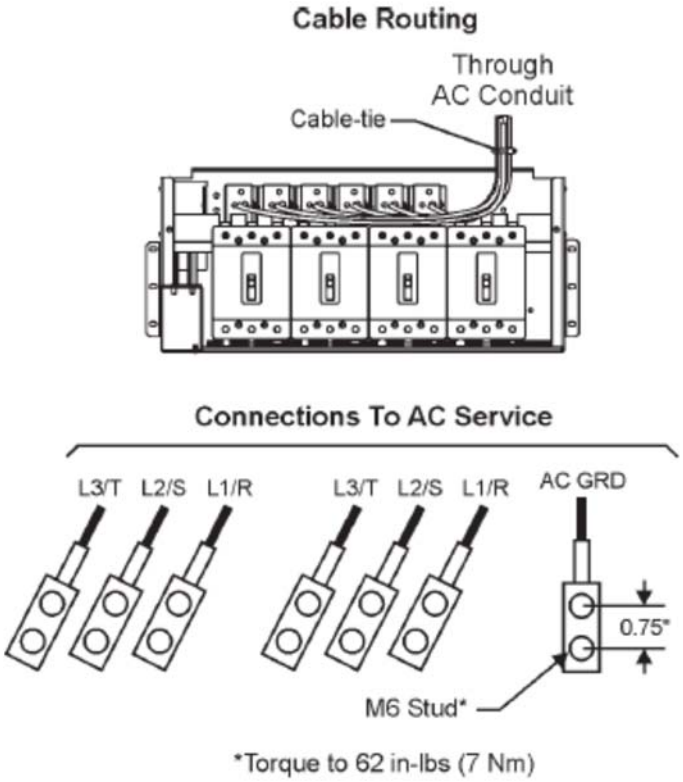
Lug	Qty	Comcode	Part
6 ga	1	406338442	WP91412 L110
1/0 ga 45°	4	406424506	WP91412 L139
4/0 ga 45°	4	450051615	WP91412 L171 or YA28L-2TC14E2-45

Figure 7-10: ED83142-30 Group 7 (H569-4827 G21 or G31: AC Input Panel for NE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

AC Input Panels, continued

Wiring Options

2 Inputs at 50A each, 380 VAC or 40A each, 480 VAC 3-Phase, 3-Wire Service + PE 4 Rectifiers (H569-4827 G370)	
1 Conduit	
Wire	(6) 2 AWG (1) 8 AWG Ground
Panel Board Breaker	(2) 80A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)
2 Conduits	
Wire	(6) 8 AWG (2) 8 AWG Ground
Panel Board Breaker	(2) 50A 3-pole
Conduit Size	(1) 1” (THHN 75°C min)



Provided

Lug	Qty	Comcode	Part
8 ga	1	406338343	WP91412 L103
2 ga 90°	6	407784255	54107UB (T&B)

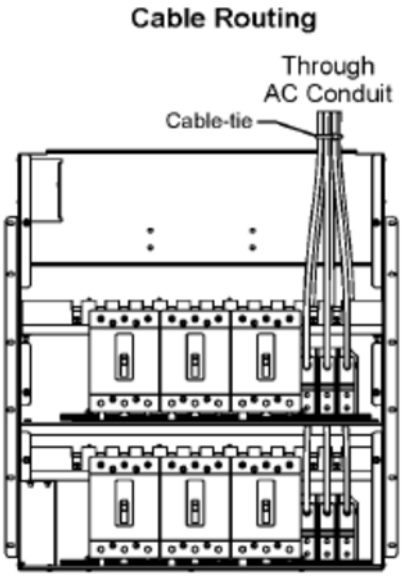
Figure 7-12: ED83142-30 Group 10
(H569-434 G370: AC Input Panel for 595A or LTA Series Rectifiers)

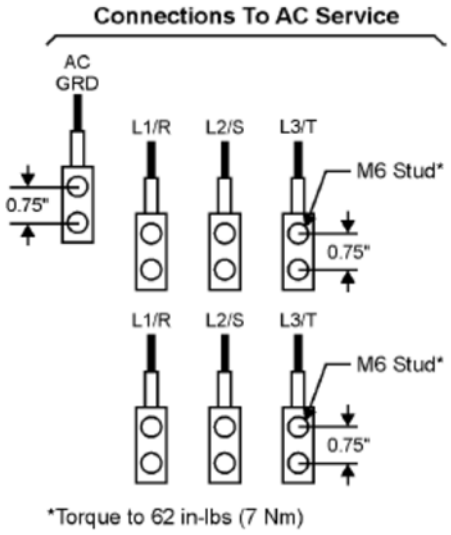
AC Input Panels, continued

Wiring Options

2 Inputs at 75A each, 380 VAC or 60A each, 480 VAC 3-Phase, 3-Wire Service + PE 6 Rectifiers (H569-434 G371)	
1 Conduit	
Wire	(6) 2 AWG (1) 8 AWG Ground
Panel Board Breaker	(2) 90A 3-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)

1 Input at 150A, 380 VAC or 120A, 480 VAC 3-Phase, 3-Wire Service + N + PE 6 Rectifiers (H569-434 G371, requires 848517272 cable assembly)	
1 Conduit	
Wire	(3) 4/0 AWG (1) 6 AWG Ground
Panel Board Breaker	(1) 200A 3-pole
Conduit Size	(1) 2” (THHN 75°C min)





Provided

Lug	Qty	Comcode	Part
8 ga	1	406338343	WP91412 L103
6 ga	1	406338442	WP91412 L110
2 ga	6	406338673	WP91412 L122
4/0 ga	3	406434126	WP91412 L153

Figure 7-13: ED83142-30 Group 11
(H569-434 G371: AC Input Panel for 595A or LTA Series Rectifiers)

AC Input Panels, continued

Wiring options

8 Inputs at 40A each, 200 VAC 3 Phase, 3-Wire Service + PE 8 Rectifiers (H569-434 G331)	
3 Conduits	
Wire	(24) 6 AWG (3) 8 AWG Ground
Panel Board Breaker	(8) 50A 3-pole
Conduit Size	(2) 1-1/2", (1) 1" (THHN 75°C min)
4 Conduits	
Wire	(24) 6 AWG (4) 8 AWG Ground
Panel Board Breaker	(8) 50A 3-pole
Conduit Size	(4) 1" (THHN 75°C min)
8 Conduits	
Wire	(24) 8 AWG (8) 8 AWG Ground
Panel Board Breaker	(8) 50A 3-pole
Conduit Size	(8) 1" (THHN 75°C min)

8 Inputs at 25A each, 380 VAC or 20A each, 480 VAC 3 Phase, 3-Wire Service + PE 8 Rectifiers (H569-434 G330)	
2 Conduits – 480V	
Wire	(24) 8 AWG (2) 8 AWG Ground
Panel Board Breaker	(8) 25A 3-pole
Conduit Size	(2) 1-1/2" (THHN 75°C min)
*2 Conduit – 380 or 480V	
Wire	(24) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(8) 30A 3-pole
Conduit Size	(2) 1-1/2" (THHN 90°C min)
2 Conduits – 380 or 480V	
Wire	(24) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(8) 30A 3-pole
Conduit Size	(2) 1-1/2" (THHN 75°C min)
4 Conduits – 480V	
Wire	(24) 10 AWG (4) 8 AWG Ground
Panel Board Breaker	(8) 25A 3-pole
Conduit Size	(4) 1" (THHN 75°C min)
4 Conduits – 380 or 480V	
Wire	(24) 10 AWG (4) 8 AWG Ground
Panel Board Breaker	(8) 30A 3-pole
Conduit Size	(4) 1" (THHN 75°C min)

*Option requires the use of 90° Listed cable and connectors throughout.

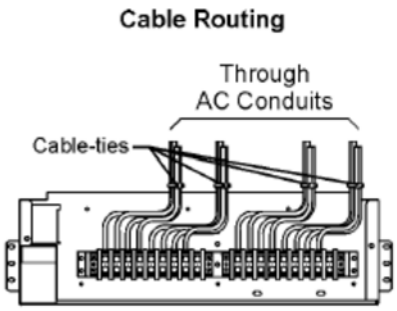
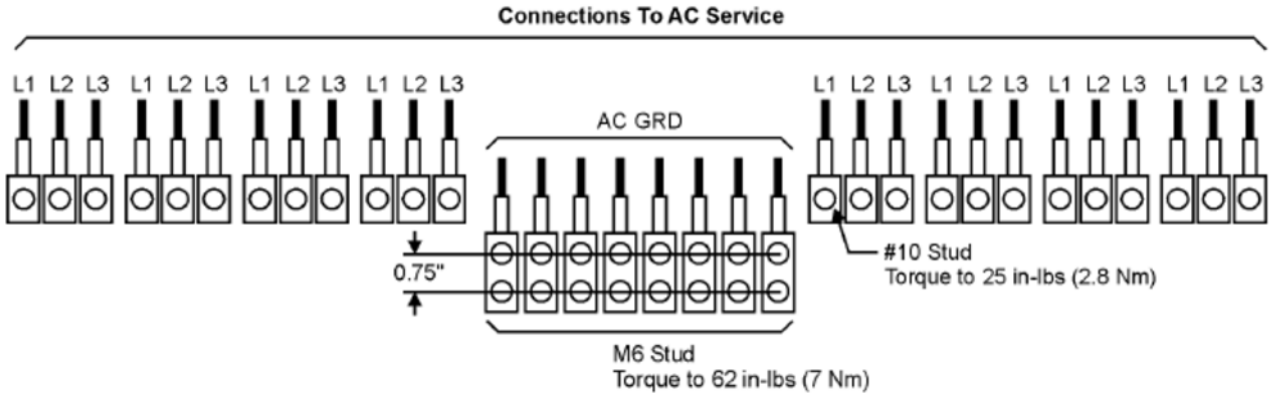


Figure 7-14: ED83142-30 Group 18
(H569-434 330 or G331: AC Input Panel for 595A, B, LTA, or LTB Series Rectifiers)

AC Input Panels, continued



Provided

Lug	Qty	Comcode	Part
8 ga	8	406338343	WP91412 L103
6 ga	24	450050820	WP91412 L200
8 ga	24	450050821	WP91412 L201
6 ga	8	406338442	WP91412 L110

Figure 7-14A: ED83142-30 Group 18
(H569-434 330 or G331: AC Input Panel for 595A, B, LTA, or LTB Series Rectifiers)

AC Input Panels, continued

Wiring Options

Dual Feed Inputs (A-suffix) X AC Feeds at 16A each, 480 VAC (H569-4830 G304A-G312A)		
Per Rectifier Shelf		
Wire	(3) 10 AWG (1) 10 AWG Ground per conduit	
Panel Board Breaker	(1) 20A 3-pole	
Conduit Size (per panel)	G304A	(1) 1” (THHN 75°C min)
	G306A	(1) 1-1/2” (THHN 75°C min)
	G308A	(2) 1” (THHN 75°C min)
	G310A	
	G312A	(3) 1” (THHN 75°C min)

Quad Feed Inputs (B-suffix) X AC Feeds at 32A each, 480 VAC (H569-4830 G304B-G312B)		
Per Rectifier Shelf Pair		
Wire	(3) 8 AWG (1) 8 AWG Ground per conduit	
Panel Board Breaker	(1) 40A 3-pole	
Conduit Size (per panel)	G304B	(1) 1” (THHN 75°C min)
	G306B	(1) 1-1/2” (THHN 75°C min)
	G308B	(2) 1” (THHN 75°C min)
	G310B	(2) 1-1/2” (THHN 75°C min)
	G312B	(3) 1” (THHN 75°C min)

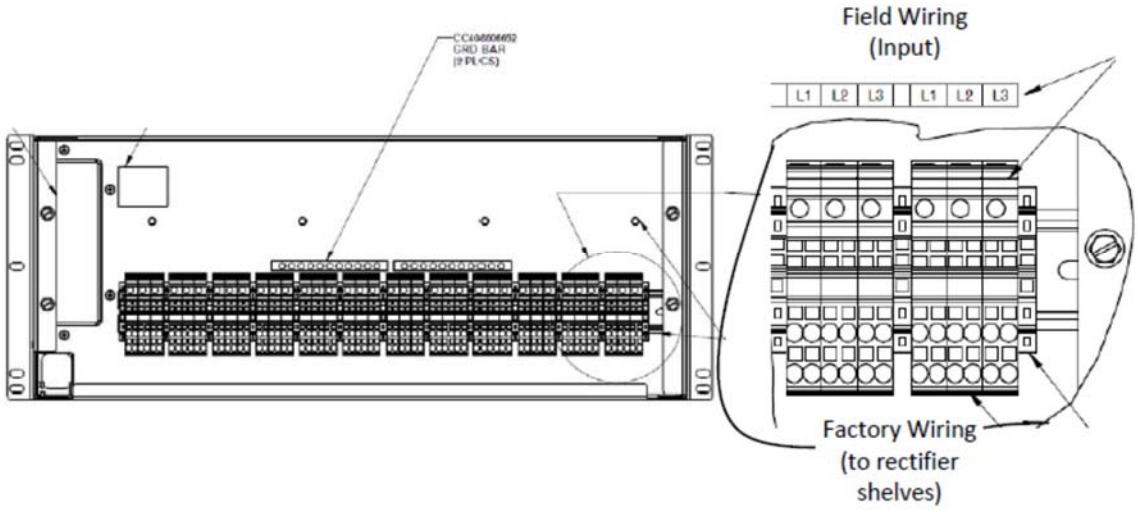


Figure 7-15: ED83142-30 Group 518
(H569-4830 G304A/B to G312A/B:
AC Input Panel for GP100 Series Rectifiers;
A=Dual Feed, B=Quad Feed)

AC Input Panels, continued

Wiring Options

12 Inputs at 25A each, 380 VAC or 20A each, 480 VAC 3-Phase, 3-Wire Service + PE 12 Rectifiers (H569-434 G328)	
2 Conduits – 480V	
Wire	(36) 8 AWG (2) 8 AWG Ground
Panel Board Breaker	(12) 25A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
2 Conduits – 380 or 480V	
Wire	(36) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(12) 30A 3-pole
Conduit Size	(2) 2” (THHN 75°C min)
4 Conduits – 480V	
Wire	(36) 10 AWG (4) 8 AWG Ground
Panel Board Breaker	(12) 25A 3-pole
Conduit Size	(4) 1” (THHN 75°C min)
4 Conduits – 380 or 480V	
Wire	(36) 8 AWG (4) 8 AWG Ground
Panel Board Breaker	(12) 30A 3-pole
Conduit Size	(4) 1-1/2” (THHN 75°C min)
6 Conduits – 380 or 480V	
Wire	(36) 10 AWG (6) 8 AWG Ground
Panel Board Breaker	(12) 30A 3-pole
Conduit Size	(6) 1” (THHN 75°C min)

14 Inputs at 25A each, 380 VAC or 20A each, 480 VAC 3-Phase, 3-Wire Service + PE 14 Rectifiers (H569-434 G332, G432)	
2 Conduits – 480V	
Wire	(42) 8 AWG (2) 8 AWG Ground
Panel Board Breaker	(14) 25A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
2 Conduits – 380 or 480V	
Wire	(42) 6 AWG (2) 8 AWG Ground
Panel Board Breaker	(14) 30A 3-pole
Conduit Size	(2) 2” (THHN 75°C min)
5 Conduits – 480V	
Wire	(42) 10 AWG (5) 8 AWG Ground
Panel Board Breaker	(14) 25A 3-pole
Conduit Size	(5) 1” (THHN 75°C min)
5 Conduits – 380 or 480V	
Wire	(42) 8 AWG (5) 8 AWG Ground
Panel Board Breaker	(14) 30A 3-pole
Conduit Size	(4) 1-1/2”, (1) 1” (THHN 75°C min)
7 Conduits – 380 or 480V	
Wire	(42) 10 AWG (7) 8 AWG Ground
Panel Board Breaker	(14) 30A 3-pole
Conduit Size	(7) 1” (THHN 75°C min)

12 Inputs at 40A each, 200 VAC 3-Phase, 3-Wire Service + PE 12 Rectifiers (H569-434 G329)	
4 Conduits	
Wire	(36) 4 AWG (4) 8 AWG Ground
Panel Board Breaker	(12) 50A 3-pole
Conduit Size	(4) 1-1/2” (THHN 75°C min)
6 Conduits	
Wire	(36) 6 AWG (6) 8 AWG Ground
Panel Board Breaker	(12) 50A 3-pole
Conduit Size	(6) 1” (THHN 75°C min)

14 Inputs at 40A each, 200 VAC 3 Phase, 3-Wire Service + PE 14 Rectifiers (H569-434 G333, G433)	
7 Conduits	
Wire	(42) 6 AWG (7) 8 AWG Ground
Panel Board Breaker	(14) 50A 3-pole
Conduit Size	(7) 1” (THHN 75°C min)

Figure 7-16: ED83142-30 Group 26 (H569-434 G328, G329, G332, G333, G432, or G433: AC Input Panel for 595LTA, or LTB Series Rectifiers)

AC Input Panels, continued

Provided

Lug	Qty	Comcode	Part
6 ga	7	406338442	WP91412 L110
8 ga	42	450050821	WP91412 L201
6 ga	42	450050820	WP91412 L200
8 ga	7	406338343	WP91412 L103

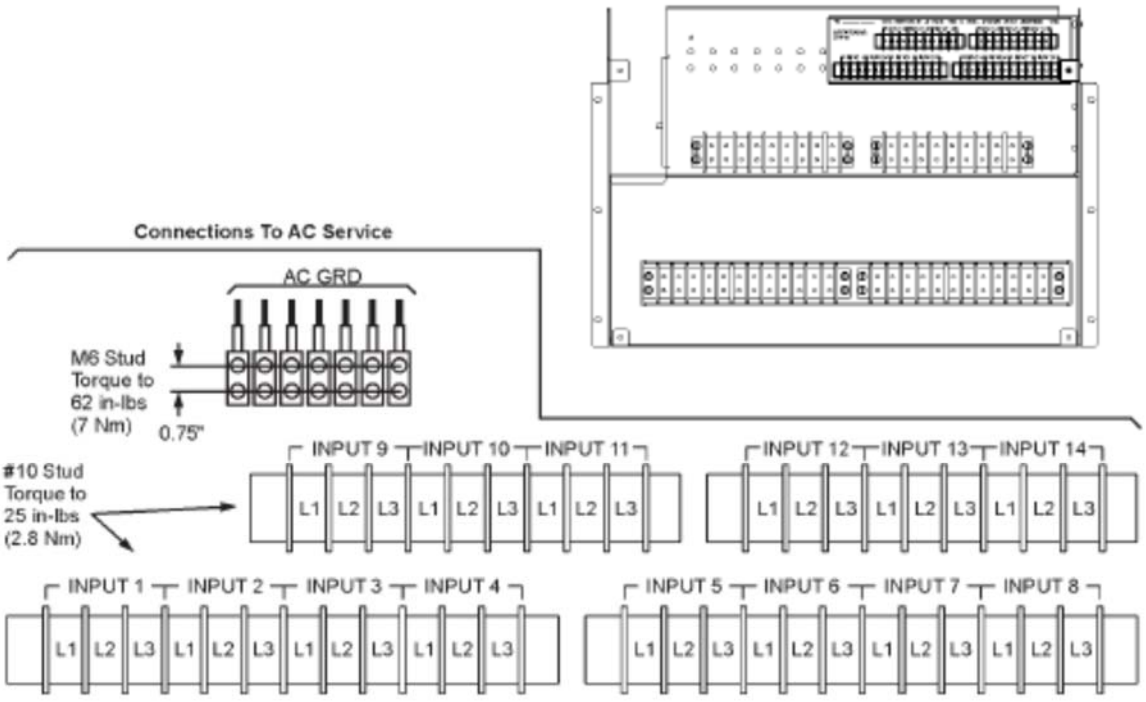


Figure 7-16A: ED83142-30 Group 26
(H569-434 G328, G329, G332, G333, G432, or G433:
AC Input Panel for 595LTA, or LTB Series Rectifiers)

AC Input Panels, continued

Wiring Options

1-Phase, 2-Wire Service + PE 12 NE050AC48ATEZ Rectifiers (H569-4827 G26)	
12 Inputs at 15A each, 208/240 VAC	
1 Conduit	
Wire	(24) 10 AWG (1) 10 AWG Ground
Panel Board Breaker	(12) 20A 2-pole
Conduit Size	(1) 1-1/2” (THHN 75°C min)
2 Conduits	
Wire	(24) 10 AWG (2) 10 AWG Ground
Panel Board Breaker	(12) 20A 2-pole
Conduit Size	(2) 1” (THHN 75°C min)
3 Conduits	
Wire	(24) 12 AWG (3) 12 AWG Ground
Panel Board Breaker	(12) 20A 2-pole
Conduit Size	(3) 1” (THHN 75°C min)

1-Phase, 2-Wire Service + PE 24 NE050AC48ATEZ Rectifiers (H569-4827 G27)	
24 Inputs at 15A each, 208/240 VAC	
2 Conduits	
Wire	(48) 10 AWG (2) 10 AWG Ground
Panel Board Breaker	(24) 20A 2-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
4 Conduits	
Wire	(48) 10 AWG (4) 10 AWG Ground
Panel Board Breaker	(24) 20A 2-pole
Conduit Size	(4) 1” (THHN 75°C min)
6 Conduits	
Wire	(48) 12 AWG (6) 12 AWG Ground
Panel Board Breaker	(24) 20A 2-pole
Conduit Size	(6) 1” (THHN 75°C min)
12 Inputs at 30A each, 208/240 VAC	
4 Conduits	
Wire	(24) 8 AWG (4) 12 AWG Ground
Panel Board Breaker	(12) 40A 2-pole
Conduit Size	(4) 1” (THHN 75°C min)
8 Inputs at 45A each, 208/240 VAC	
8 Conduits	
Wire	(16) 6 AWG (8) 6 AWG Ground
Panel Board Breaker	(8) 60A 2-pole
Conduit Size	(8) 1” (THHN 75°C min)

1-Phase, 2-Wire Service + PE 36 NE050AC48ATEZ Rectifiers (H569-4827 G28)	
36 Inputs at 15A each, 208/240 VAC	
3 Conduits	
Wire	(72) 10 AWG (3) 10 AWG Ground
Panel Board Breaker	(36) 20A 2-pole
Conduit Size	(3) 1-1/2” (THHN 75°C min)
6 Conduits	
Wire	(72) 10 AWG (6) 10 AWG Ground
Panel Board Breaker	(36) 20A 2-pole
Conduit Size	(6) 1” (THHN 75°C min)
9 Conduits	
Wire	(72) 12 AWG (9 12 AWG Ground
Panel Board Breaker	(36) 20A 2-pole
Conduit Size	(9) 1” (THHN 75°C min)
18 Inputs at 30A each, 208/240 VAC	
6 Conduits	
Wire	(36) 8 AWG (6) 8 AWG Ground
Panel Board Breaker	(18) 40A 2-pole
Conduit Size	(6) 1” (THHN 75°C min)

Figure 7-17: ED83142-30 Groups 20 or 27 (H569-4827 G26, G27, or G28: AC Input Panel forNE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

AC Input Panels, continued

Wiring Options

1-Phase, 2-Wire Service + PE 12 NE075AC48ATEZ Rectifiers (H569-4827 G36)	
12 Inputs at 22A each, 208/240 VAC	
2 Conduits	
Wire	(24) 6 AWG (2) 6 AWG Ground
Panel Board Breaker	(12) 30A 2-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
3 Conduits	
Wire	(24) 8 AWG (3) 8 AWG Ground
Panel Board Breaker	(12) 30A 2-pole
Conduit Size	(3) 1” (THHN 75°C min)
4 Conduits	
Wire	(24) 10 AWG (4) 10 AWG Ground
Panel Board Breaker	(12) 30A 2-pole
Conduit Size	(4) 1” (THHN 75°C min)
12 Input at 18.7A each, 277 VAC	
2 Conduits	
Wire	(24) 6 AWG (2) 6 AWG Ground
Panel Board Breaker	(12) 25/30A 1-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)
3 Conduits	
Wire	(24) 8 AWG (3) 8 AWG Ground
Panel Board Breaker	(12) 25/30A1-pole
Conduit Size	(3) 1” (THHN 75°C min)
3 Conduits	
Wire	(24) 10 AWG (3) 10 AWG Ground
Panel Board Breaker	(12) 25 1-pole
Conduit Size	(3) 1” (THHN 75°C min)
4 Conduits	
Wire	(24) 10 AWG (4) 10 AWG Ground
Panel Board Breaker	(12) 30A 1-pole
Conduit Size	(4) 1” (THHN 75°C min)

1-Phase, 2-Wire Service + PE 24 NE0750AC48ATEZ Rectifiers (H569-4827 G37)	
24 Inputs at 22A each, 208/240 VAC	
3 Conduits	
Wire	(48) 6 AWG (3) 6 AWG Ground
Panel Board Breaker	(24) 30A 2-pole
Conduit Size	(3) 2” (THHN 75°C min)
4 Conduits	
Wire	(48) 6 AWG (4) 6 AWG Ground
Panel Board Breaker	(24) 30A 2-pole
Conduit Size	(4) 1-1/2” (THHN 75°C min)
6 Conduits	
Wire	(48) 8 AWG (6) 8 AWG Ground
Panel Board Breaker	(24) 30A 2-pole
Conduit Size	(6) 1” (THHN 75°C min)
12 Inputs at 44A each, 208/240 VAC	
6 Conduits	
Wire	(24) 6 AWG (6) 6 AWG Ground
Panel Board Breaker	(12) 60A 2-pole
Conduit Size	(6) 1” (THHN 75°C min)
24 Inputs at 18.7A each, 277 VAC	
3 Conduits	
Wire	(48) 6 AWG (3) 6 AWG Ground
Panel Board Breaker	(24) 25/30A 1-pole
Conduit Size	(3) 2” (THHN 75°C min)
4 Conduits	
Wire	(48) 6 AWG (4) 6 AWG Ground
Panel Board Breaker	(24) 25/30A 1-pole
Conduit Size	(4) 1-1/2” (THHN 75°C min)

6 Conduits	
Wire	(48) 8 AWG (6) 8 AWG Ground
Panel Board Breaker	(24) 25/30A 1-pole
Conduit Size	(6) 1” (THHN 75°C min)
12 Input at 37.4A each, 277 VAC	
6 Conduits	
Wire	(24) 6 AWG (6) 6 AWG Ground
Panel Board Breaker	(12) 50A 1-pole
Conduit Size	(6) 1” (THHN 75°C min)

Figure 7-17A: ED83142-30 Groups 20 or 27 (H569-4827 G36, or G37: AC Input Panel forNE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

AC Input Panels, continued

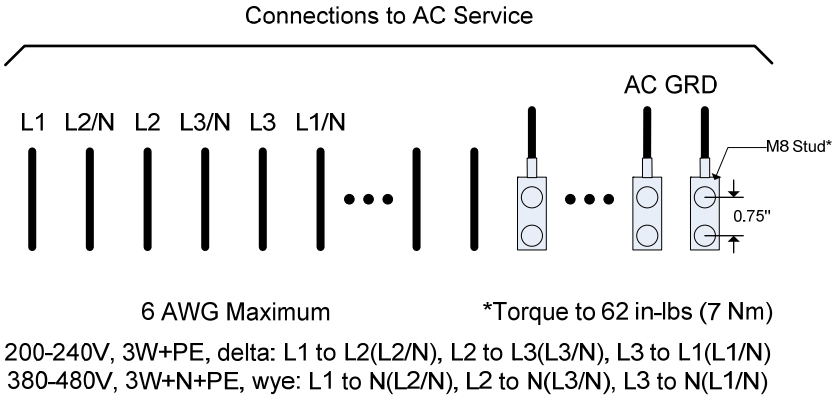
Wiring Options

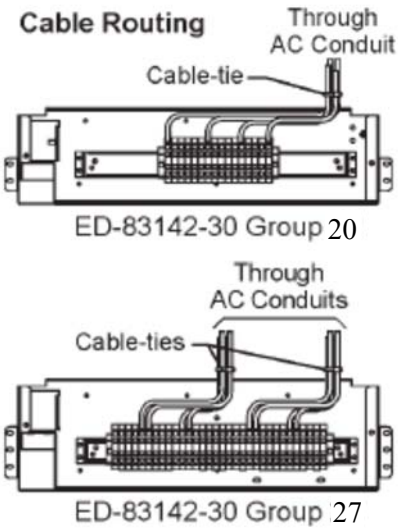
1-Phase, 2-Wire Service + PE 36 NE075AC48ATEZ Rectifiers (H569-4827 G38, G38W)	
36 Inputs at 22A each, 208/240 VAC	
4 Conduits	
Wire	(72) 6 AWG (4) 6 AWG Ground
Panel Board Breaker	(36) 30A 2-pole
Conduit Size	(4) 2” (THHN 75°C min)
9 Conduits	
Wire	(72) 8 AWG (9) 8 AWG Ground
Panel Board Breaker	(36) 30A 2-pole
Conduit Size	(9) 1” (THHN 75°C min)
18 Inputs at 44A each, 208/240 VAC	
9 Conduits	
Wire	(36) 6 AWG (9) 6 AWG Ground
Panel Board Breaker	(18) 60A 2-pole
Conduit Size	(9) 1” (THHN 75°C min)
36 Inputs at 18.7A each, 277 VAC	
4 Conduits	
Wire	(72) 6 AWG (4) 6 AWG Ground
Panel Board Breaker	(36) 25/30A 1-pole
Conduit Size	(4) 2” (THHN 75°C min)
18 Inputs at37.4A each, 277 VAC	
9 Conduits	
Wire	(36) 6 AWG (9) 6 AWG Ground
Panel Board Breaker	(18) 50A 1-pole
Conduit Size	(9) 1” (THHN 75°C min)

1 Phase, 2-Wire Service + PE 32 NE075AC48ATEZ Rectifiers (H569-4827 G308, G308W)	
32 Inputs at 22A each, 208/240 VAC	
4 Conduits	
Wire	(64) 6 AWG (4) 6 AWG Ground
Panel Board Breaker	(32) 30A 2-pole
Conduit Size	(4) 2” (THHN 75°C min)
8 Conduits	
Wire	(64) 8 AWG (8) 8 AWG Ground
Panel Board Breaker	(32) 30A 2-pole
Conduit Size	(8) 1” (THHN 75°C min)
16 Inputs at 44A each, 208/240 VAC	
8 Conduits	
Wire	(32) 6 AWG (8) 6 AWG Ground
Panel Board Breaker	(16) 60A 2-pole
Conduit Size	(8) 1” (THHN 75°C min)
32 Inputs at 18.7A each, 277 VAC	
4 Conduits	
Wire	(64) 6 AWG (4) 6 AWG Ground
Panel Board Breaker	(32) 25/30A 1-pole
Conduit Size	(4) 2” (THHN 75°C min)
16 Inputs at 37.4A each, 277 VAC	
8 Conduits	
Wire	(32) 6 AWG (8) 6 AWG Ground
Panel Board Breaker	(16) 50A 1-pole
Conduit Size	(8) 1” (THHN 75°C min)

Figure 7-17B: ED83142-30 Groups 20 or 27 (H569-4827 G38, G38W, G308 or G308W: AC Input Panel forNE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

AC Input Panels, continued





Note: To minimize phase imbalance voltage potentials between each 3W+PE and 3W+N+PE field-wiring terminal block group, use feeds from the same transformer source.

Figure 7-17C: ED83142-30 Groups 20 or 27 (H569-4827 G26, G27, G28, G36, G37, G38, G38W, G308, or G308W: AC Input Panel forNE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

AC Input Panels, continued

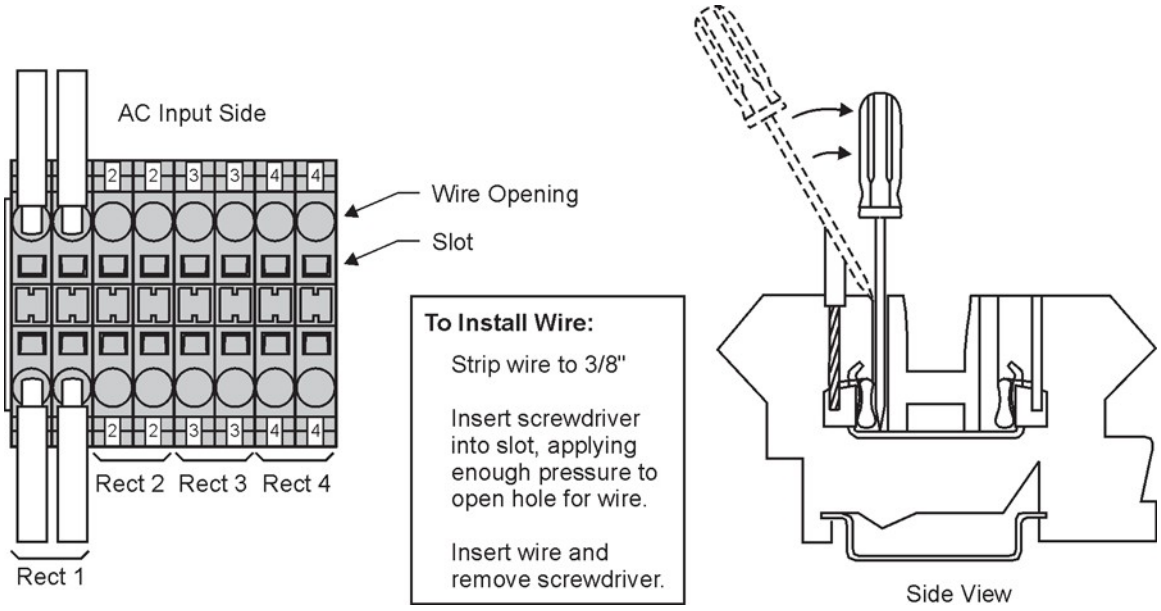


Figure 7-17D: Wire Termination for ED83142-30 Groups 20 or 27 (H569-4827 G26, G27, G28, G36, G37, G38, G38W, G308, or G308W: AC Input Panel for NE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

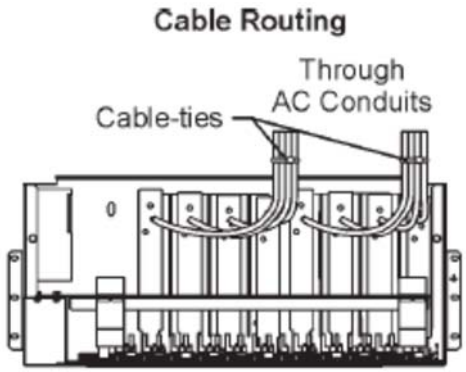
AC Input Panels, continued

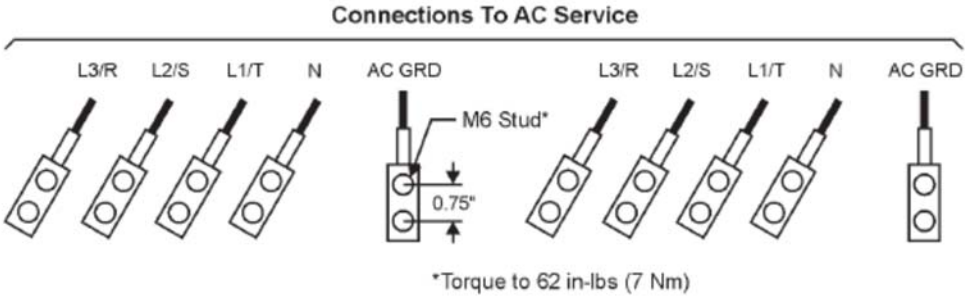
Wiring Options

2 Inputs at 104A each, 200 VAC 3-Phase, 3-Wire Service + PE 24 Rectifiers (H569-4827 G22)	
2 Conduits	
Wire	(6) 1/0 AWG (2) 6 AWG Ground
Panel Board Breaker	(2) 150A 3-pole
Conduit Size	(2) 1-1/2” (THHN 75°C min)

2 Inputs at 74.8A, 480 VAC 3-Phase, 3-Wire Service + N + PE 24 Rectifiers (H569-4827 G32 with 848698783, phase-to-N kit; See Figure 7-19)	
2 Conduits	
Wire	(8) 2 AWG (2) 6 AWG Ground
Panel Board Breaker	(2) 100A 3-pole+N
Conduit Size	(2) 1-1/2” (THHN 75°C min)

2 Inputs at 152A each, 200 VAC 3-Phase, 3-Wire Service + PE 24 Rectifiers (H569-4827 G32)	
2 Conduits	
Wire	(6) 4/0 AWG (2) 6 AWG Ground
Panel Board Breaker	(2) 200A 3-pole
Conduit Size	(2) 2” (THHN 75°C min)





Provided

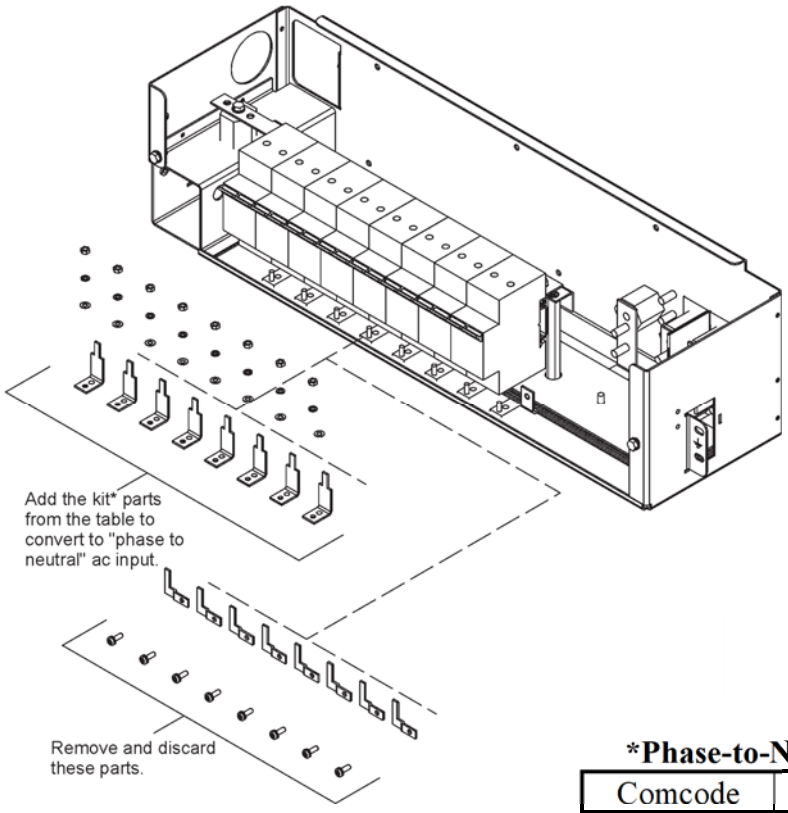
Lug	Qty	Comcode	Part
6 ga	2	406338442	WP91412 L110
1/0 ga 45°	8	406424506	WP91412 L139
4/0 ga 45°	8	450051615	WP91412 L171 or YA28L-2TC14E2-45

Figure 7-18: ED83142-30 Group 28
(H569-4827 G22 or G32: AC Input Panel for NE050AC48ATEZ or NE075AC48ATEZ Series Rectifiers)

AC Input Panels, continued

Field Modification of the 1-Phase Circuit Breaker AC Panel for use with Phase-Neutral Input Circuits - ED83142-30 G7 or G28

For ED83142-30 G7 or G28 only:
When connecting the AC panels to a 380-480V, 3W+N+PE source, where neutral is required to obtain the correct 176-277Vac L-N input voltage for each rectifier position, the panels must be converted from their factory-shipped phase-to-phase rectifier connection to a phase-to-neutral connection.
Order kits per the table that follows and modify the panel as shown in Figure 7-19.



***Phase-to-Neutral Kits**

Comcode	ED83142-30
848233862	G7
848698783	G28

Figure 7-19: Neutral AC Input for ED83142-30 Groups 7 or 28 (H569-4827 G31 or G32 with 480V 3-Phase, 4-wire (3W + N + PE) AC Input)

Bottom Cable Feed Options for GPS 4848/100 Systems

Standard cabinets are designed so that AC, battery, and DC load cables are routed through the top of the cabinet, as a top-feed system, However, cabinets, using the ED83142-30 G26 AC panel, can also, be configured as a bottom-feed system, with the cabling routed through the bottom of the cabinet (See Figure 7-20). For the AC inputs from the bottom of the cabinet, this panel has a 2-inch diameter hole in the back of its chassis to accept a 90° conduit fitting. Suffixes added to the "G26" indicate the cabling arrangements as listed below:

AC Panel Suffix	Cabling Arrangement	
	AC	Battery and DC Load
A	Through bottom of cabinet	Through bottom of cabinet
B	Through bottom of cabinet	Through top of cabinet
C	Through top of cabinet	Through bottom of cabinet

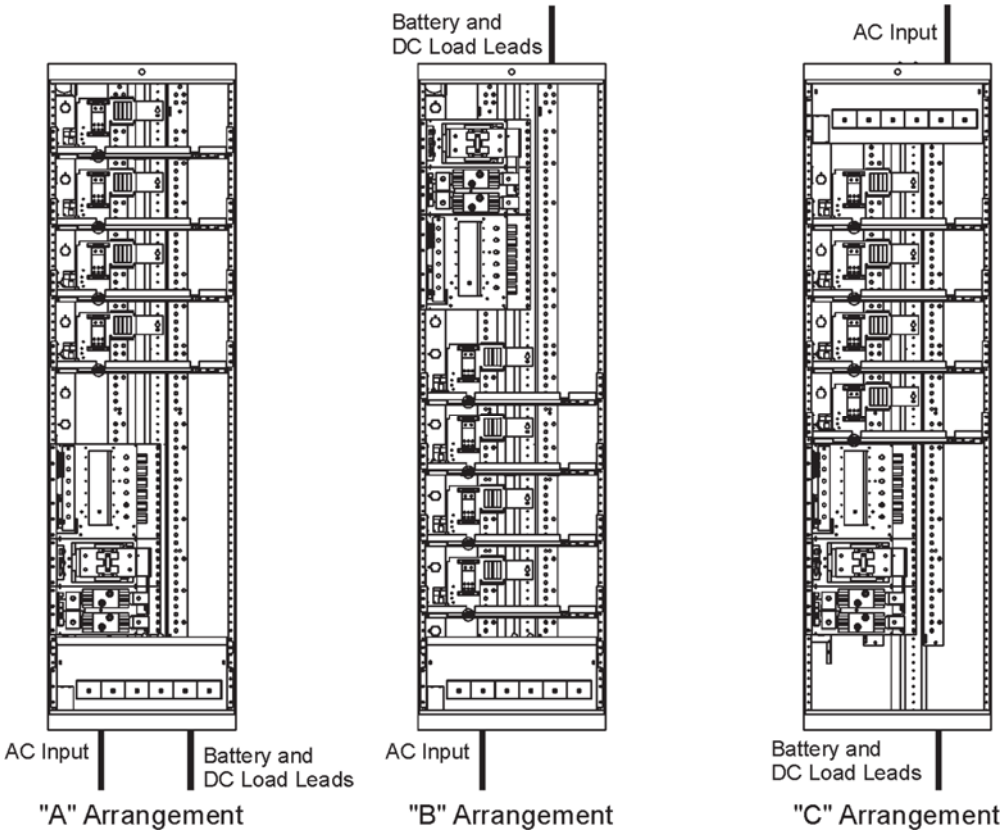


Figure 7-20: Bottom Cable Feed Option for GPS4848/100

Completing the AC Connection

Completing the AC Connection	
Step	**Action**
1	Terminate earth ground to the appropriate termination point. Terminate lines 1, 2, 3, and neutral (if provided) to the appropriate termination points.
2	Verify that there are no shorts or bad contacts in the service cables.
3	Turn the main ac circuit breaker ON.
4	Use an ac voltmeter to check that the proper phase-to-phase or phase-to-neutral ac voltage is present at the input to the ac panel.
5	Replace the ac panel front cover. If the ac panel is equipped with rectifier circuit breakers, mark the ac panel front cover label with rectifier position numbers (they may already be factory-marked). See Figure 7-2.
6	**Do not** turn the rectifier circuit breakers ON.
7	Turn OFF the main ac circuit breaker.

Notes

8 DC Distribution Assembly and Connections

Overview

DC (load) distribution panels offer either fuses (US or DIN styles) or circuit breakers (US or DIN styles). Fuse panels are available with protectors from 1 to 800 amps, and circuit breaker panels are available with protectors from 3 to 800 amps. Some of the larger protectors (100 amperes and above) have load monitoring shunts in each load protector path. When using remote peripheral monitoring modules (RPMs) with the Galaxy Millennium II Controller, measurement of these loads is available for history and sizing.

The dc distribution panels may be equipped with a ground return bar for connecting the load returns internal to the cabinet, or external ground return bars may be used.

All distribution panels except for the smallest GMT fuse panels may be equipped with a low voltage load disconnect (LVLD) contactor for load-shedding applications.

Each panel is equipped with an alarm card that communicates to the controller any operated fuse or circuit breaker and provides a visual LED that indicates an operated protector.

Note: Panels for DC distribution are white; battery connection panels are blue.

⚠ Warning

Turn off dc breaker and remove dc fuses before making connections.

DC Distribution Panels Cross Reference

Table 8-A: DC Distribution Panels Cross Reference

Fuse or CB	Pos.	Height (in.)	ED83143-31	H569-434 GPS4848/ 100	H569-4827 GPS 4827	H569-4830 GPS 4830
CB/Fuse Small - TPS	14	6	11	N/A	N/A	N/A
CB/Fuse Small - TPS	22	9	12	N/A	N/A	N/A
CB Large	3	6	2	42, 42A, 106, 106A, 107, 107A, 108, 108A, 109, 109A	42, 42A	42, 42A
CB Large	5	9	5	48, 48A, 110, 110A, 111, 111A, 112, 112A, 113, 113A	48, 48A	48, 48A
CB Large	6	12	1	43, 43A, 101, 101A, 102, 102A, 103, 103A, 104, 104A	43, 43A	43, 43A
CB Bullet	10	6	15	96, 96A	96, 96A	96, 96A
CB Bullet	14	6	16	97, 97A	97, 97A	97, 97A
CB Bullet	22	9	17	98, 98A	98, 98A	98, 98A
Fuse Medium	10	6	53	52, 52A	52, 52A	52, 52A
Fuse Large	2	6	56, 72	59, 59A	59, 59A	59, 59A
Fuse Large	2	9	55	53, 53A	53, 53A	53, 53A
Fuse Large	5	9	54	54, 54A	54, 54A	54, 54A
CB DIN Small	14	6	71	60, 60A	60, 60A	60, 60A
CB DIN Large	10	6	71	61, 61A	61, 61A	61, 61A
Fuse DIN 10 x 38mm	14	6	71	65, 65A	65, 65A	65, 65A
Fuse DIN 14 x 51mm	10	6	71	66, 66A	66, 66A	66, 66A
Fuse DIN NH00	8	6	22	67, 67A	67, 67A	67, 67A
Fuse DIN NH2	2	6	21	68, 68A	68, 68A	68, 68A
Small Fuse, 6-GMT	6	0	58	58	58	58
Blank Panel	-	3	JD	93	93	93
Blank Panel	-	6	JA	90	90	90
Blank Panel	-	9	JB	91	91	91
Blank Panel	-	12	JC	92	92	92

Connecting Loads

Cable Routing Strategy

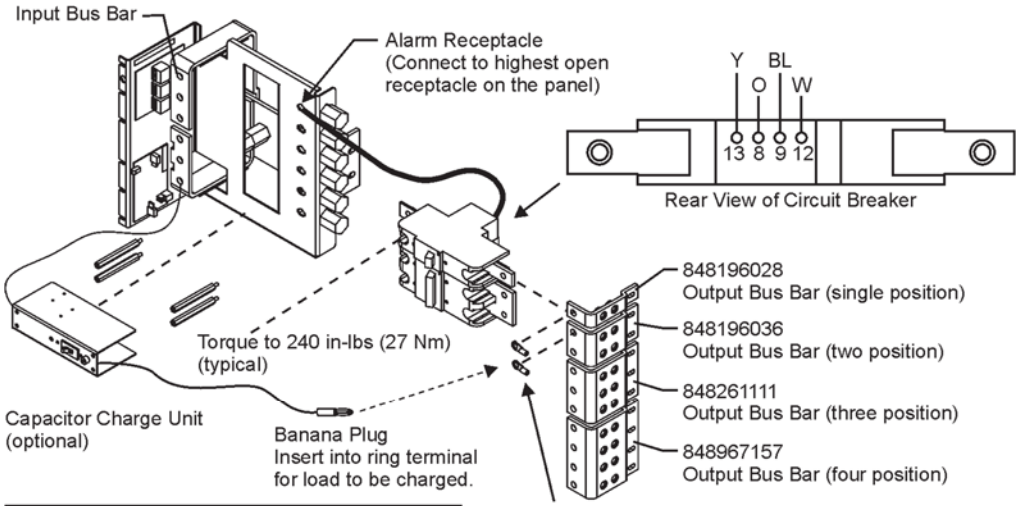
As with any power system, cabinet positioning with respect to cable racks, batteries, and the AC service is very important in order to ensure easy installation, proper maintenance, and graceful growth of the system in the future.

Each cabinet is arranged to separate ac leads from dc leads to minimize electrical noise transmitted to the load. Run ac cable in an ac conduit mounted above the front of the cabinet. Route dc leads along a cable rack above the back of the cabinet. Review Figure 5-15 for various cable rack arrangements.

Capacitor Charge Unit

ED83143-31 Groups 1 and 5 may also be equipped with a Capacitor Charge Unit (refer to Figure 8-1 to mount this unit on the panel). The Group 5 has 5 circuit breaker positions. One position is not available if the capacitor charge unit is mounted.

To use the Capacitor Charge Unit, follow the instructions silk-screened on the unit.



Circuit Breaker Kits			
Comcode	Amps	Description	Pos.
108908187	125	KS22012 L13 e/w L104	1
108908179	150	KS22012 L14 e/w L104	1
108908195	175	KS22012 L15 e/w L104	1
108908203	225	KS22012 L17 e/w L104	1
108908211	300	KS22012 L43 e/w L104	2
108908237	400	KS22012 L44 e/w L104	2
108908229	500	KS22012 L45 e/w L104	3
108908252	600	KS22012 L46 e/w L104	3
108984782	800	KS22012 L81 e/w L104	4

Figure 8-1: Installation of Large Circuit Breakers and Capacitor Charge Unit

Connecting Loads, continued

Mounting Large Circuit Breakers

The circuit breaker panels may require the circuit breakers to be mounted. See Figure 8-1 for the installation procedure.

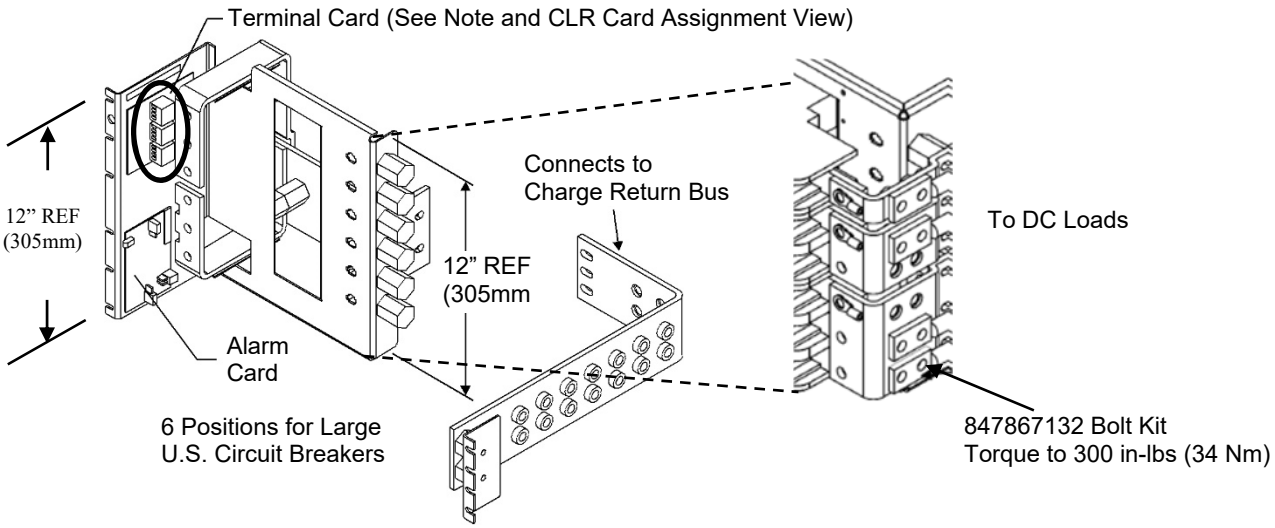
Caution: Turn OFF breaker before beginning procedure.

Mounting Large Circuit Breakers	
Step	**Action**
1	Install alarm wires and load shunt wires to circuit breaker. **Plug cable onto the highest open receptacle on the panel.**
2	Secure the breaker to the input bus bar with the 3/8" hardware provided.
3	Secure the output bus bar to the plastic standoffs with the M6 screws provided.
4	Secure the breaker to the output bus bar with the 3/8" hardware provided.
5	Place the ring terminal provided between the bus bar and the securing hardware.
6	Turn ON the breaker and verify that plant voltage is measured at the expected positions of the CLR card terminal block. Refer to Figures 8-2 through 8-4 for the breaker assignments on the CLR card terminal block. Reseat the W and Y shunt wires into the rear of the breaker or this cable set's receptacle wiring to correct any problem BEFORE connecting a load to the breaker. When satisfied that the shunt pair is correctly run through the CLR card, turn the breaker OFF.

Mounting Small Plug-in Circuit Breakers and Fuses

Mounting Small Plug-in Circuit Breakers and Fuses	
Step	**Action**
1	Turn off circuit breakers. Ensure no fuses are installed in fuse holders.
2	Snap circuit breakers or fuse holders onto panel. Circuit breakers and fuses may be mixed on the same panel.

Distribution Panels



Large Circuit Breaker Kits for Groups 1, 4, 101, and 104			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
108908187	125	1	2
108908179	150	1	1/0
108908195	175	1	2/0
108908203	225	1	4/0
108908211	300	2	(2) 4/0*
108908237	400	2	(2) 4/0*
108908229	500	3	(3) 4/0*
108908252	600	3	(3) 4/0*
108984782	800	4	(4) 4/0*
*Cables must be the same length and terminate at a common at each end.			

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
For 1, 2, or 3-position breakers (double-hole load and return lugs)					
406338665	load	2	--	35	847867132
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	

Note
Jumper straps (J1 to J3) on the CLR card shall be left in the factory default 5-12 position for use with ABB Power Shunt RPM monitoring. Move these jumper straps to the "Bypass" 1-8 position to permit shunt monitoring with non-ABB equipment. Protection for this wiring must be provided by the user when these current-limiting resistors are bypassed.

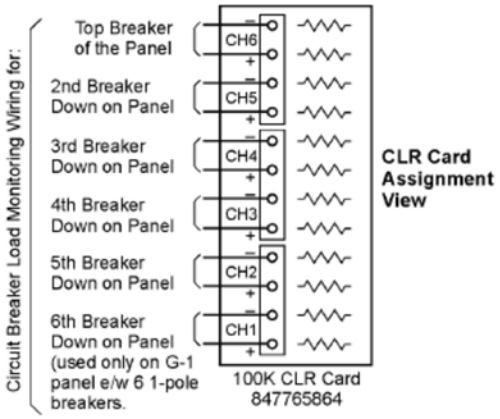
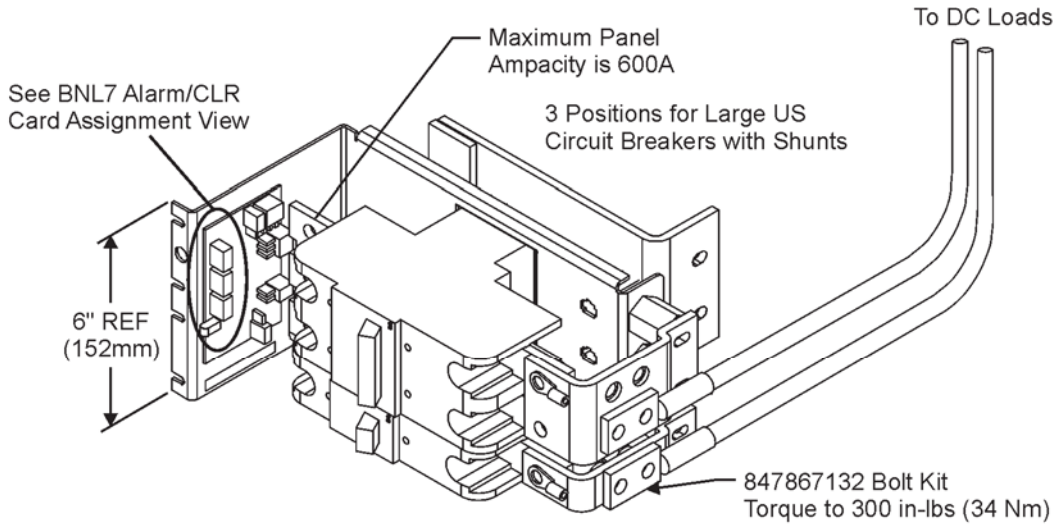


Figure 8-2: ED83143-31 Group 1 (H469-434/4827/4830 G43/A, G101/A, G102/A, G103/A, or G104/A) 1200A (800A e/w LVLD) DC Distribution Panel

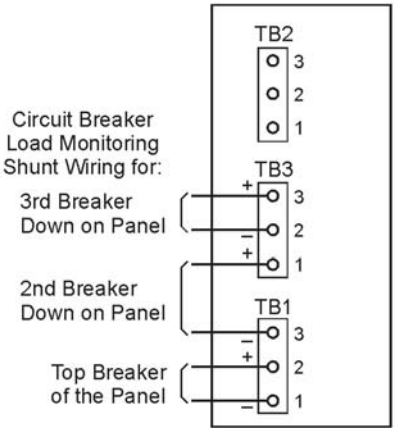
Distribution Panels, continued



Large Circuit Breaker Kits for Group 2			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
108908187	125	1	2
108908179	150	1	1/0
108908195	175	1	2/0
108908203	225	1	4/0
108908211	300	2	(2) 4/0*
108908237	400	2	(2) 4/0*
108908229	500	3	(3) 4/0*
108908252	600	3	(3) 4/0*

*Cables must be the same length and terminated at a common point at each end.

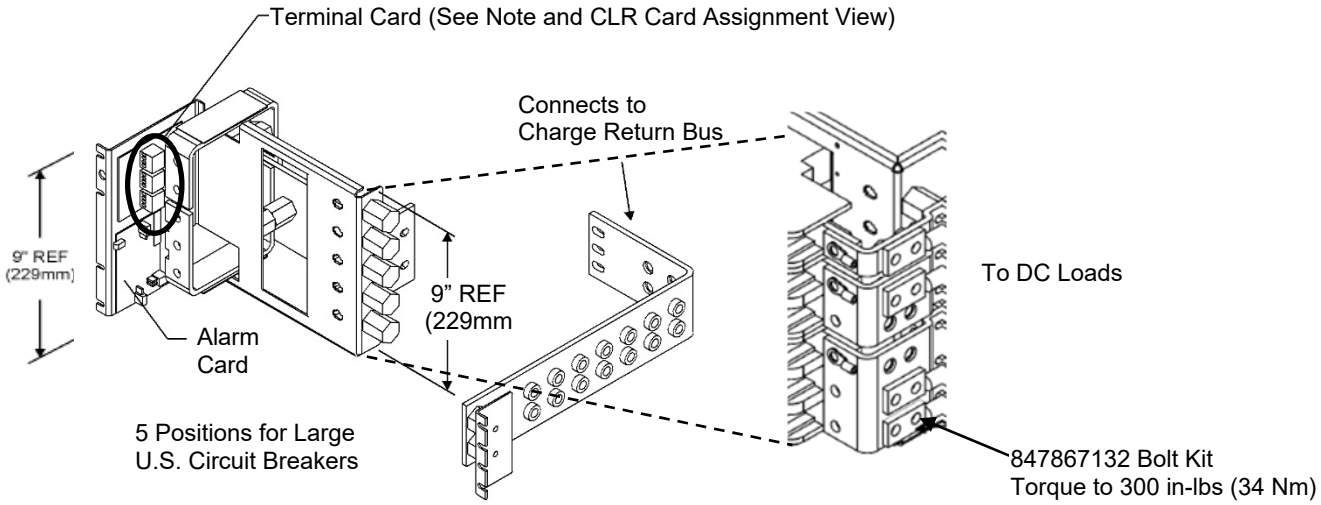
Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	M10 Hardware Kit (Grade 2)
For 1, 2, or 3-position breakers (double-hole load and return lugs)					
406338665	load	2	--	35	847867132
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	



BNL7
Alarm/CLR Card
CLR Assignment View

Figure 8-3: ED83143-31 Group 2 (H469-434/4827/4830 G42/A, G106/A, G107/A, G108/A, or G109/A) 600A DC Distribution Panel

Distribution Panels, continued



Large Circuit Breaker Kits for Groups 1, 4, 101, and 104			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
108908187	125	1	2
108908179	150	1	1/0
108908195	175	1	2/0
108908203	225	1	4/0
108908211	300	2	(2) 4/0*
108908237	400	2	(2) 4/0*
108908229	500	3	(3) 4/0*
108908252	600	3	(3) 4/0*
108984782	800	4	(4) 4/0*
*Cables must be the same length and terminate at a common at each end			

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
For 1, 2, or 3-position breakers (double-hole load and return lugs)					
406338665	load	2	--	35	847867132
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	

Note
Jumper straps (J1 to J3) on the CLR card shall be left in the factory default 5-12 position for use with ABB Power Shunt RPM monitoring. Move these jumper straps to the "Bypass" 1-8 position to permit shunt monitoring with non-ABB equipment. Protection for this wiring must be provided by the user when these current-limiting resistors are bypassed.

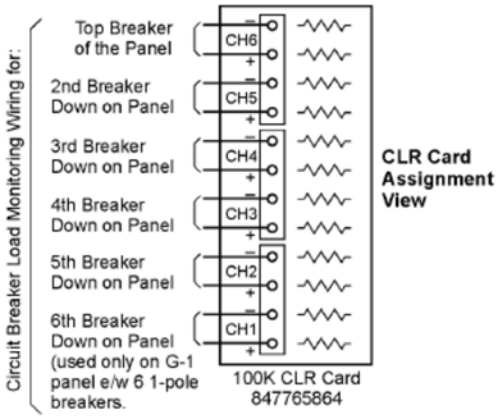
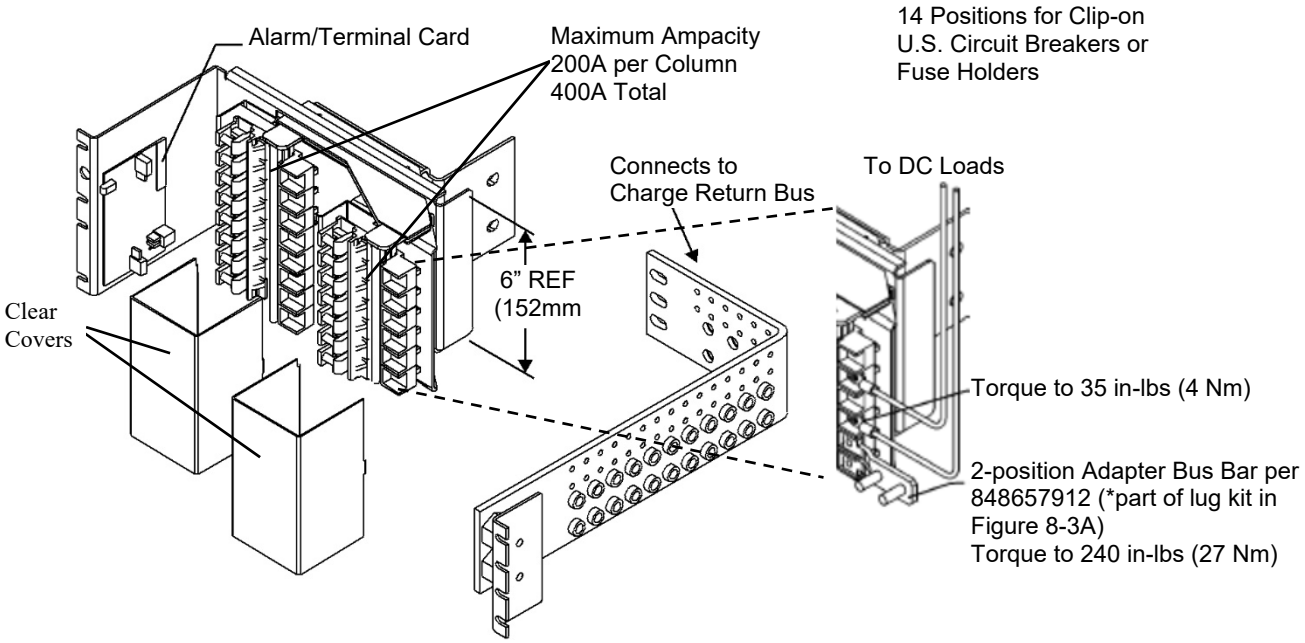


Figure 8-4: ED83143-31 Group 5 (H469-434/4827/4830 G48/A, G110/A, G111/A, G112/A, or G113/A) 1000A (800A e/w LVLD) DC Distribution Panel

Distribution Panels, continued



Clip-in Circuit Breakers for Group 11			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
407098417	3	1	10
407098425	5	1	10
407098433	10	1	10
407098458	15	1	10
407098474	20	1	10
407098482	25	1	10
407098490	30	1	10
407245448	40	1	8
407098516	45	1	8
407098524	50	1	8
407098532	60	2	6
407098540	70	2	6
407098557	80	2	4
407098565	90	2	4
407098573	100	2	2

TPS Clip-in Fuses for Group 11			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
CC408653406	holder	1	14
406700567	3	1	14
406700583	5	1	14
406700591	6	1	14
406700609	10	1	14
406700617	15	1	14
406700625	20	1	12
406700633	25	1	10
406700641	30	1	10
406700658	40	1	8
406700674	50	1	8
406700682	60	1	8

Figure 8-5: ED83143-31 Group 11 (H469-434/4827/4830 G11) 14-position 400A DC Distribution Panel

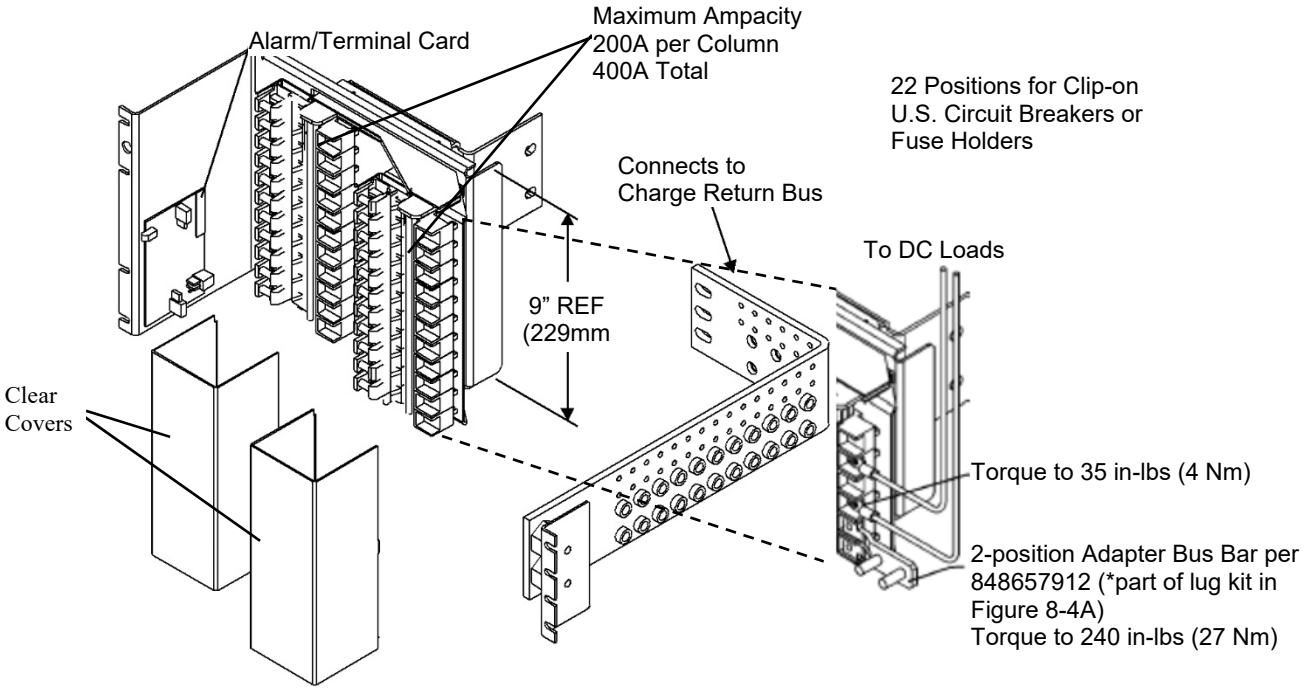
Distribution Panels, continued

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
For 1-position breakers or fuses (single-hole load, double-hole and return lugs)					
406338145	load	14-10	14-10	6	provided
405356171	rtn	14-10	14-10	6	848201919
405347402	load	8	8	10	provided
405348178	rtn	8	8	10	848201919
407334671	load	6	6	16	provided
406338400	rtn	6	6	16	848201919
405347543	load	4	4	25	provided
405347576	rtn	4	4	25	848201919
848155818	Saddler jumper to allow 2-position 60 and 70-amp breakers to be used with single-hole lugs.				
For 1-position breakers (double-hole load and return lugs)					
847301702*	load	6	6	16	provided
	rtn	6	6	16	847867124
847659620*	load	4	4	25	provided
	rtn	4	4	25	847867124
847301447*	load	2	--	35	provided
	rtn	2	--	35	847867124
848111175*	load	--	2	--	provided
	rtn	--	2	--	847867124

*2-position lug kits include double-hole load and return lugs and associated hardware, and adapter bus bar.

Figure 8-5A: ED83143-31 Group 11 DC Distribution Panel, Lugs and Hardware Table

Distribution Panels, continued



Clip-in Circuit Breakers for Group 12			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
407098417	3	1	10
407098425	5	1	10
407098433	10	1	10
407098458	15	1	10
407098474	20	1	10
407098482	25	1	10
407098490	30	1	10
407245448	40	1	8
407098516	45	1	8
407098524	50	1	8
407098532	60	2	6
407098540	70	2	6
407098557	80	2	4
407098565	90	2	4
407098573	100	2	2

TPS Clip-in Fuses for Group 12			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
CC408653406	holder	1	14
406700567	3	1	14
406700583	5	1	14
406700591	6	1	14
406700609	10	1	14
406700617	15	1	14
406700625	20	1	12
406700633	25	1	10
406700641	30	1	10
406700658	40	1	8
406700674	50	1	8
406700682	60	1	8

Figure 8-6: ED83143-31 Group 12 (H469-434/4827/4830 G12) 22-position 400A DC Distribution Panel

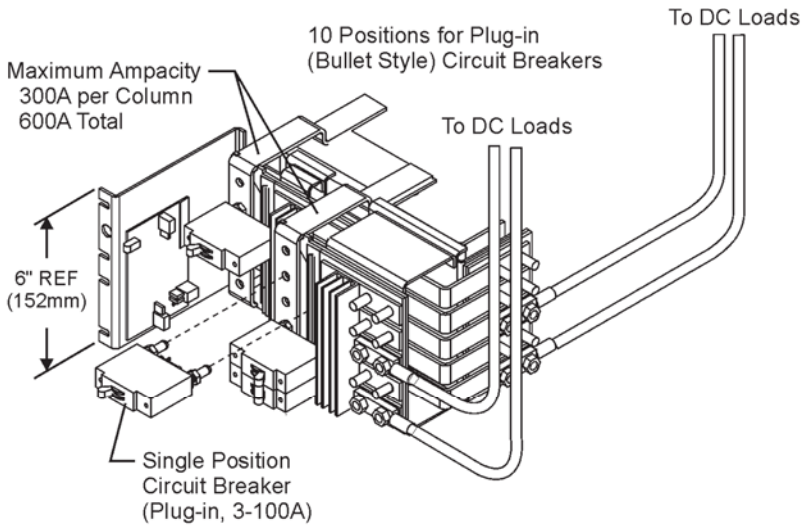
Distribution Panels, continued

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
For 1-position breakers or fuses (single-hole load, double-hole and return lugs)					
406338145	load	14-10	14-10	6	provided
405356171	rtn	14-10	14-10	6	848201919
405347402	load	8	8	10	provided
405348178	rtn	8	8	10	848201919
407334671	load	6	6	16	provided
406338400	rtn	6	6	16	848201919
405347543	load	4	4	25	provided
405347576	rtn	4	4	25	848201919
848155818	Saddler jumper to allow 2-position 60 and 70-amp breakers to be used with single-hole lugs.				
For 1-position breakers (double-hole load and return lugs)					
847301702*	load	6	6	16	provided
	rtn	6	6	16	847867124
847659620*	load	4	4	25	provided
	rtn	4	4	25	847867124
847301447*	load	2	--	35	provided
	rtn	2	--	35	847867124
848111175*	load	--	2	--	provided
	rtn	--	2	--	847867124

*2-position lug kits include double-hole load and return lugs and associated hardware, and adapter bus bar.

Figure 8-6A: ED83143-31 Group 12 DC Distribution Panel, Lugs and Hardware Table

Distribution Panels, continued



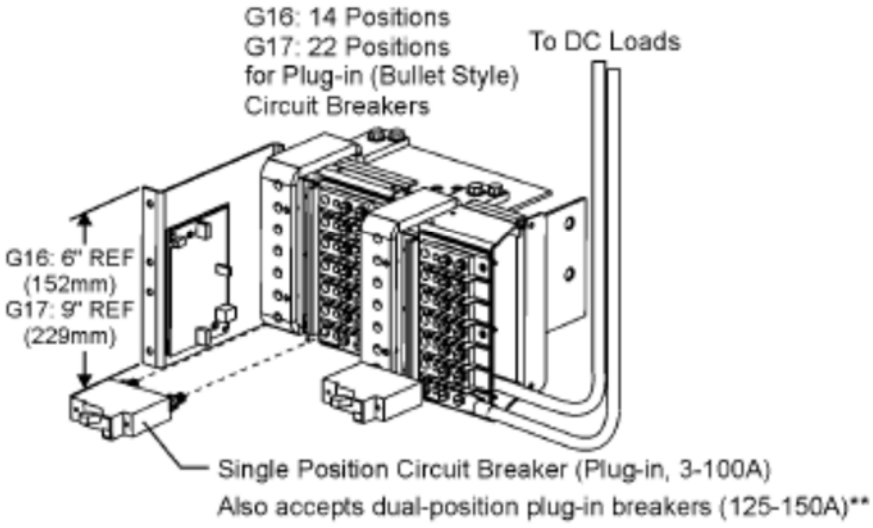
Plug-In Bullet Style Circuit Breakers for Group 15			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
407998137	3	1	14
407998145	5	1	14
407998152	10	1	14
407998160	15	1	14
407998178	16	1	12
407998186	20	1	12
407998194	25	1	10
407998202	30	1	10
407998210	45	1	8
407998228	50	1	8
407998236	60	1	6
407998244	70	1	6
407998251	80	1	4
407998269	90	1	4
407998277	100	1	2

Note: The breaker positions on the G-15 Bullet CB panel are 1 inch wide, prohibiting the use of double width 125A or 150A breakers which require ¾ inch wide breaker positions.

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
For 1-position breakers (double-hole load and return lugs)					
407890771	load/rtn	14-10	14-10	6	848408266
406338269	load/rtn	8	8	10	
406332841	load/rtn	6	6	16	
406332940	load/rtn	4	4	25	
407726041	load/rtn	--	2	--	
406335665	load/rtn	2	--	35	

Figure 8-7: ED83143-31 Group 15 (H469-434/4827/4830 G96, 96A) 10-position 510A DC Distribution Panel

Distribution Panels, continued



Plug-in Bullet Style Circuit Breakers for Groups 16 or 17			
Comcode	Size (A)	Breaker Positions	Wire Ga (min)
407998137	3	1	14
407998145	5	1	14
407998152	10	1	14
407998160	15	1	14
407998178	61	1	12
407998186	20	1	12
407998194	25	1	10
407998202	30	1	10
407998210	45	1	8
407998228	50	1	8
407998236	60	1	6
407998244	70	1	6
407998251	80*	1*	4
407998269	90*	1*	4
407998277	100*	1*	2
408185353	125**	2**	2
408185346	150**	2**	1/0

*Breakers larger than 70A require that an adjacent position on either side to be left unpopulated for heat dissipation purposes if loaded at >80% capacity.

**125A and 150A double-pole breakers require an adapter bus kit, per 848631479, jumper two positions together prior to lug termination.

Figure 8-8: ED83143-31 Group 16 14-position (H469-434/4827/4830 G97, 97A) and Group 17 22-position (H469-434/4827/4830 G98, 98A) 600A DC Distribution Panels

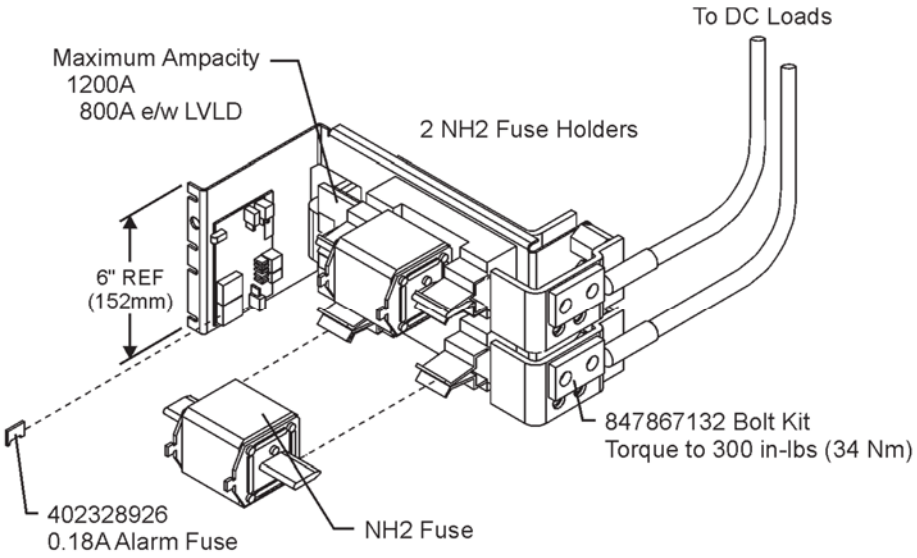
Distribution Panels, continued

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
For 1-position breakers or fuses (single-hole load, double-hole and return lugs)					
405356171	load	14-10	14-10	6	provided
405356171	rtn	14-10	14-10	6	848201919
405348178	load	8	8	10	provided
405348178	rtn	8	8	10	848201919
406338400	load	6	6	16	provided
406338400	rtn	6	6	16	848201919
405347576	load	4	4	25	provided
405347576	rtn	4	4	25	848201919
405348202	load	2	--	35	provided
405348202	rtn	2	--	35	848201919
405347683	load	--	2	--	provided
405347683	rtn	--	2	--	848201919
407817568	load	1/0	--	50	provided
407817568	rtn	1/0	--	50	848201919
407817550	load	2/0***	1/0***	70***	provided
407817550	rtn	2/0***	1/0***	70***	848201919
407817576	load	--	2/0***	--	provided
407817576	rtn	--	2/0***	--	848201919

***Only 5 return lugs of the indicated size will fit on the internal panel return bus.

Figure 8-8A: ED83143-31 Group 16 and Group 17 DC Distribution Panels, Lugs and Hardware Table

Distribution Panels, continued

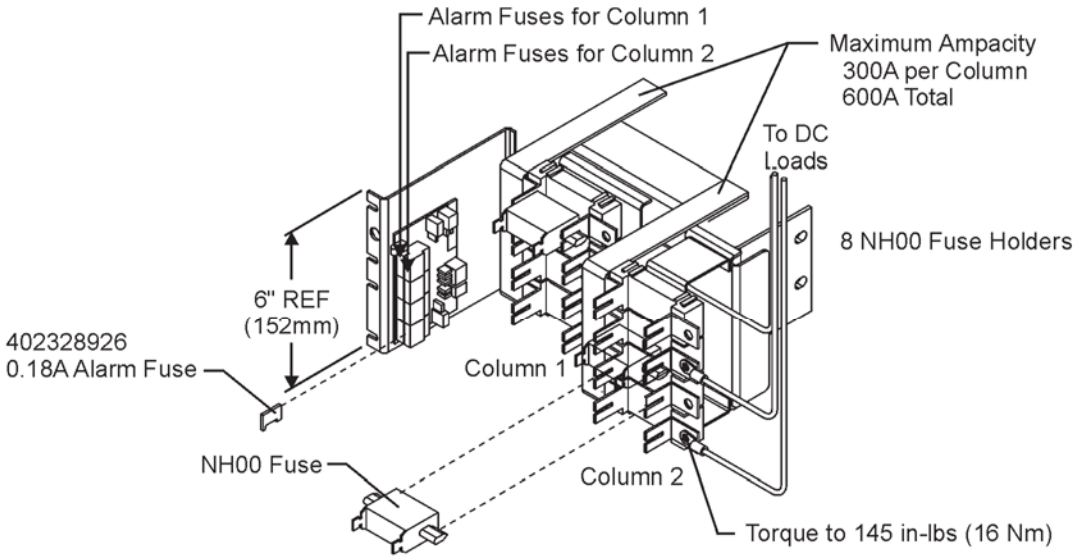


NH2 DIN Fuses for Group 21	
Comcode	Size (A)
402328926	0.18A Alarm Fuse
Fuses must be provided by the customer. Panels are agency approved with Class gL - Class gG fuses.	

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	M10 Hardware Kit (Grade 2)
406338269	load	8	8	10	847867132
	rtn	8	8	10	
406332841	load	6	6	16	
	rtn	6	6	16	
406332940	load	4	4	25	
	rtn	4	4	25	
406338665	load	2	--	35	
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	

Figure 8-9: ED83143-31 Group 21 (H469-434/4827/4830 G68, 68A) 1200A (800A e/w LVLD) DC Distribution Panel

Distribution Panels, continued

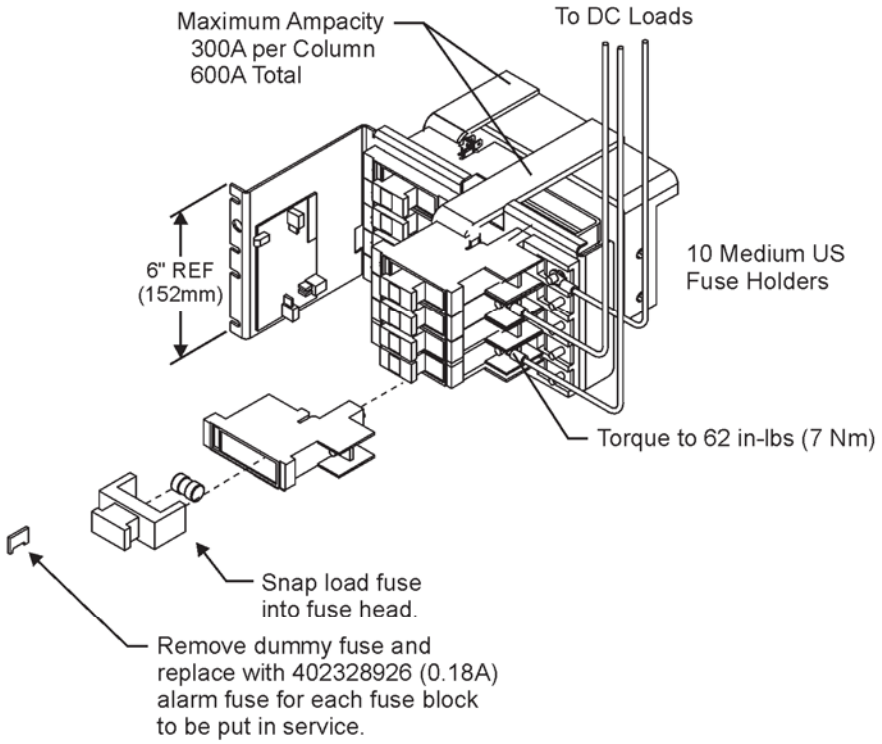


NH00 DIN Fuses for Group 22	
Comcode	Size (A)
402328926	0.18A Alarm Fuse
Fuses must be provided by the customer. Panels are agency approved with Class gL - Class gG fuses.	

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
406338210	load	8	8	10	provided
	rtn	8	8	10	847867124
406338376	load	6	6	16	provided
	rtn	6	6	16	847867124
406338483	load	4	4	25	provided
	rtn	4	4	25	847867124
406338616	load	2	--	35	provided
	rtn	2	--	35	847867124
407334697	load	--	2	--	provided
	rtn	--	2	--	847867124
406434514	load	1/0	--	50	provided
	rtn	1/0	--	50	847867124
406338822	load	2/0	1/0	70	provided
	rtn	2/0	1/0	70	847867124
406434076	load	--	4/0	--	provided
	rtn	--	4/0	--	847867124
406338772	load	--	4/0	--	provided
	rtn	--	4/0	--	847867124
406434167	load	--	4/0	120	provided
	rtn	--	4/0	120	847867124

Figure 8-10: ED83143-31 Group 22 (H469-434/4827/4830 G67, 67A) 600A DC Distribution Panel

Distribution Panels, continued

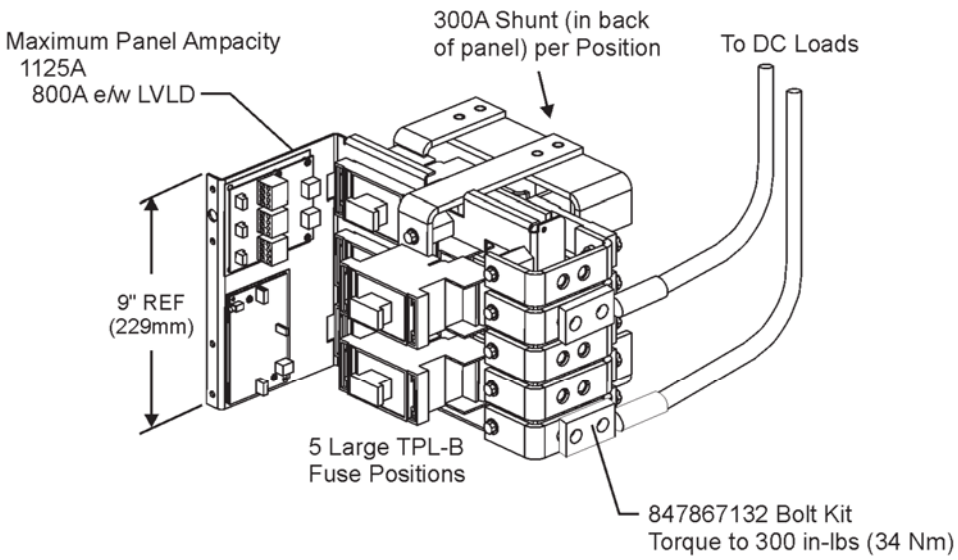


Medium Fuses for Group 53		
Comcode	Size (A)	Wire Ga (min)
402328926	0.18A Alarm Fuse	
406700567	3	10
406700583	5	10
406700591	6	10
406700609	10	10
406700617	15	10
406700625	20	10
406700633	25	10
406700641	30	10
406700658	40	8
406700674	50	8
406700682	60	6
406700690	70	6

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
406338152	load	14-10	14-10	6	provided
405356171	rtn	14-10	14-10	6	848201919
405356189	load	8	8	10	provided
405348178	rtn	8	8	10	848201919
405347436	load	6	6	16	provided
406338400	rtn	6	6	16	848201919
405347543	load	4	4	25	provided
405347576	rtn	4	4	25	848201919
405348186	load	2	--	35	provided
405348202	rtn	2	--	35	848201919
405347659	load	--	2	--	provided
405347683	rtn	--	2	--	848201919

Figure 8-11: ED83143-31 Group 53 (H469-434/4827/4830 G52, 52A)
600A DC Distribution Panel

Distribution Panels, continued

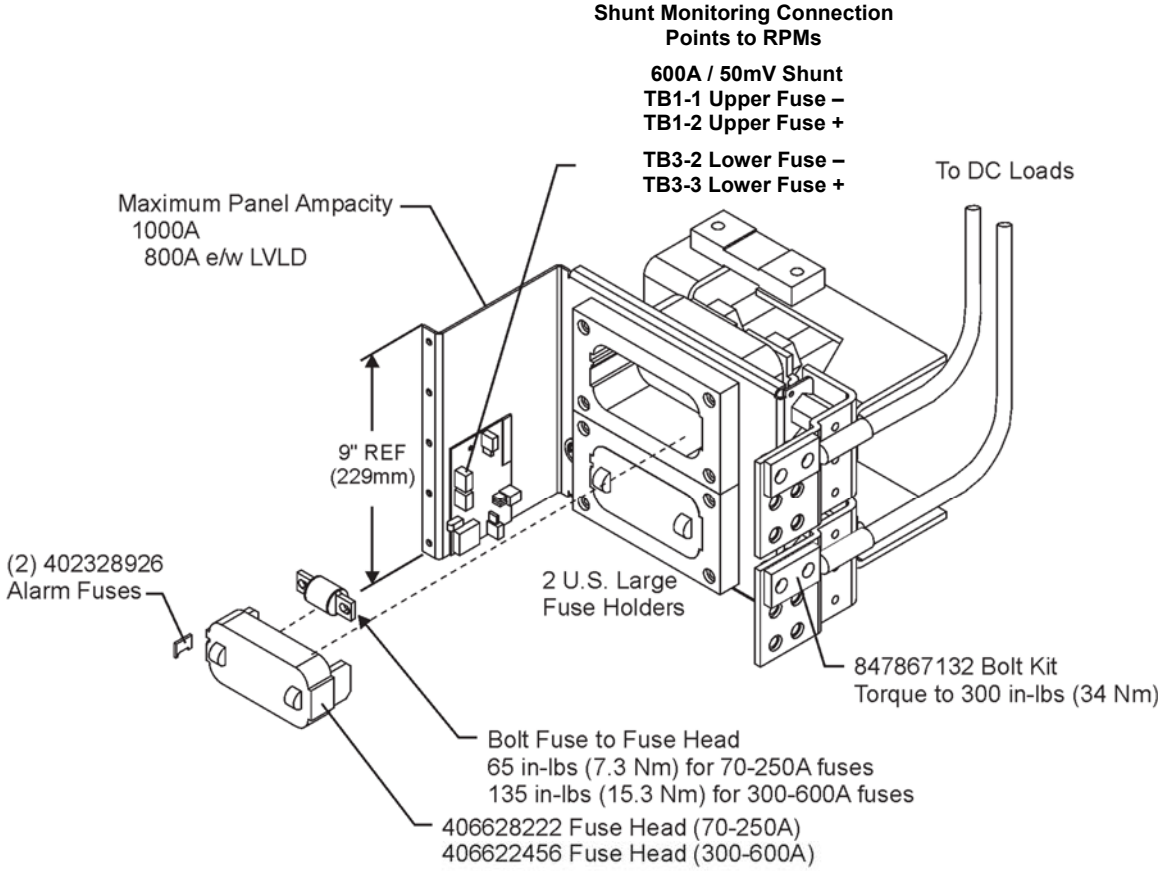


Large Fuses for Group 54		
Comcode	Size (A)	Wire Ga (min)
402328926	0.18A Alarm Fuse	
406794776	70	6
408239648	80	4
406794784	100	2
406925685	125	2
406794792	150	1/0
406794818	200	4/0
406794982	225	4/0
406794842	250	4/0

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
406332940	load	4	4	25	847867132
	rtn	4	4	25	
406338665	load	2	--	35	
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	

Figure 8-12: ED83143-31 Group 54 5-position (H469-434/4827/4830 G54, 54A) 1125A (800 e/w LVLD) DC Distribution Panel

Distribution Panels, continued



Order Fuse Head and Fuse separately

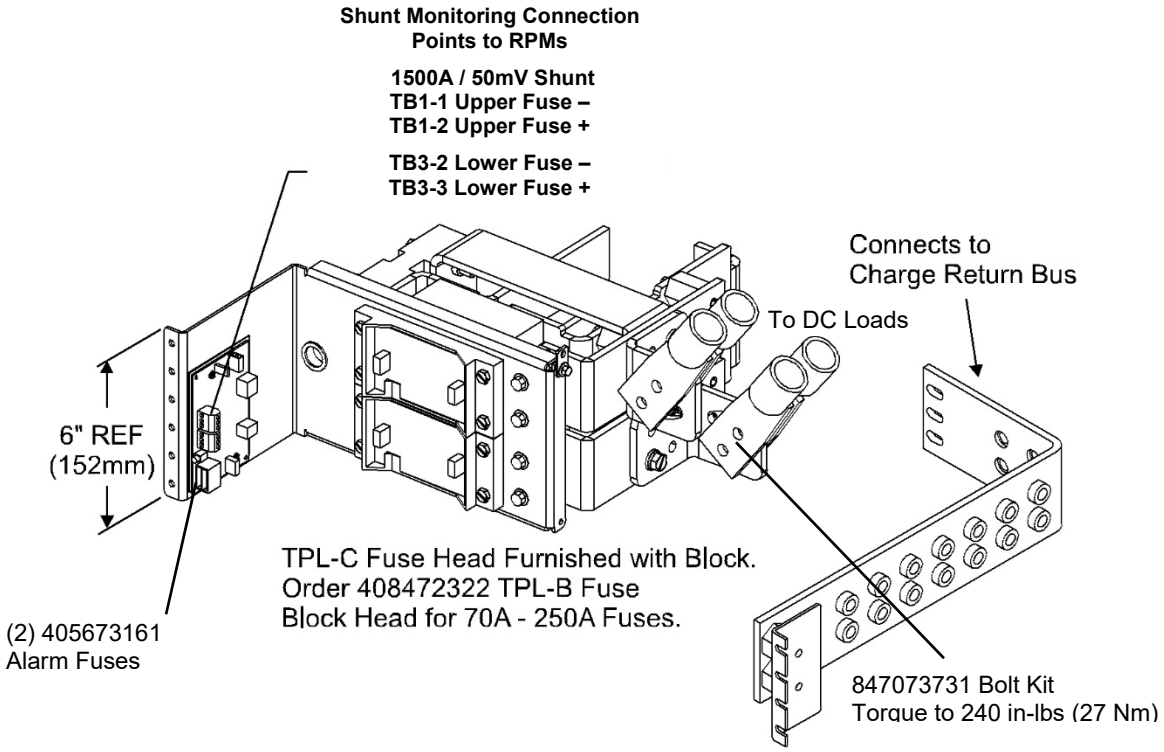
Large Fuses for Group 55		
Comcode	Size (A)	Wire Ga (min)
406628222	70-250A Head	
402328926	0.18A Alarm Fuse	
406794776	70	6
408239648	80	4
406794784	100	2
406925685	125	2
406794792	150	1/0
406794818	200	4/0
406794982	225	4/0
406794842	250	4/0
406622456	300-600A Head	
402328926	0.18A Alarm Fuse	
406794867	300	(2) 4/0*
406794875	400	(2) 4/0*
406794883	500	(2) 4/0*
406794891	600	(3) 4/0*

*Wires must be the same length and terminated at a common point at each end.

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
406332940	load	4	4	25	847867132
	rtn	4	4	25	
406338665	load	2	--	35	
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	

Figure 8-13: ED83143-31 Group 55 (H469-434/4827/4830 G53, 53A) 1000A (800A e/w LVLD) DC Distribution Panel

Distribution Panels, continued



Large Fuses for Groups 56 or 72		
Comcode	Size (A)	Wire Ga (min)
408472322	70-250A Head	--
405673161	0.18A Alarm Fuse	--
406794776	70	6
408239648	80	4
406794784	100	2
406925685	125	2
406794792	150	1/0
406794818	200	4/0
406794982	225	4/0
406794842	250	4/0
406794867	300	(2) 4/0*
406794875	400	(2) 4/0*
406794883	500	(2) 4/0*
406794891	600	350*
3150002P-19	800	(2) 350*
*Cables must be the same length and terminate at a common at each end.		

TPL-B

TPL-C

G72 only

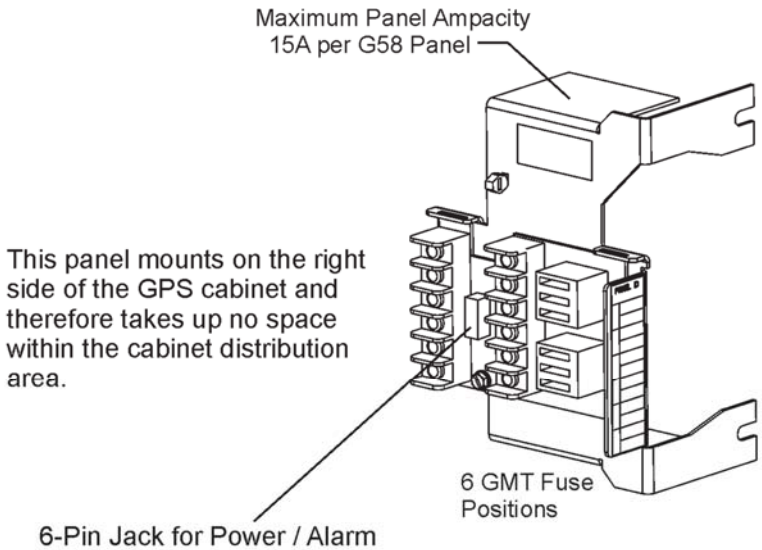
Figure 8-14: ED83143-31 Group 56 1200A or Group 72 1280A (H469-434/4827/4830 G59, 59A) DC Distribution Panel

Distribution Panels, continued

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
406332940	load	4	4	25	847073731
	rtn	4	4	25	
406338665	load	2	--	35	
	rtn	2	--	35	
405348228	load	1/0	--	50	
	rtn	1/0	--	50	
405348236	load	2/0	1/0	70	
	rtn	2/0	1/0	70	
406021725	load	--	2/0	--	
	rtn	--	2/0	--	
405348251	load	4/0	--	--	
	rtn	4/0	--	--	
405347923	load	--	4/0	120	
	rtn	--	4/0	120	
407890763	load	350	--	--	
	rtn	350	--	--	
407890748	load	--	350	--	
	rtn	--	350	--	
406335141	load	750	--	--	
	rtn	750	--	--	
407890730	load	--	750	--	
	rtn	--	750	--	

Figure 8-14A: ED83143-31 Group 56 and Group 72 DC Distribution Panels, Lugs and Hardware Table

Distribution Panels, continued



Two 16 Ga Red Leads: Terminate in a common 5/16-inch ring terminal for connection during installation to the cabinet return bus.

Two 16 Ga Black Leads: Terminate in a common 5/16-inch ring terminal for connection during installation to the cabinet hot bus.

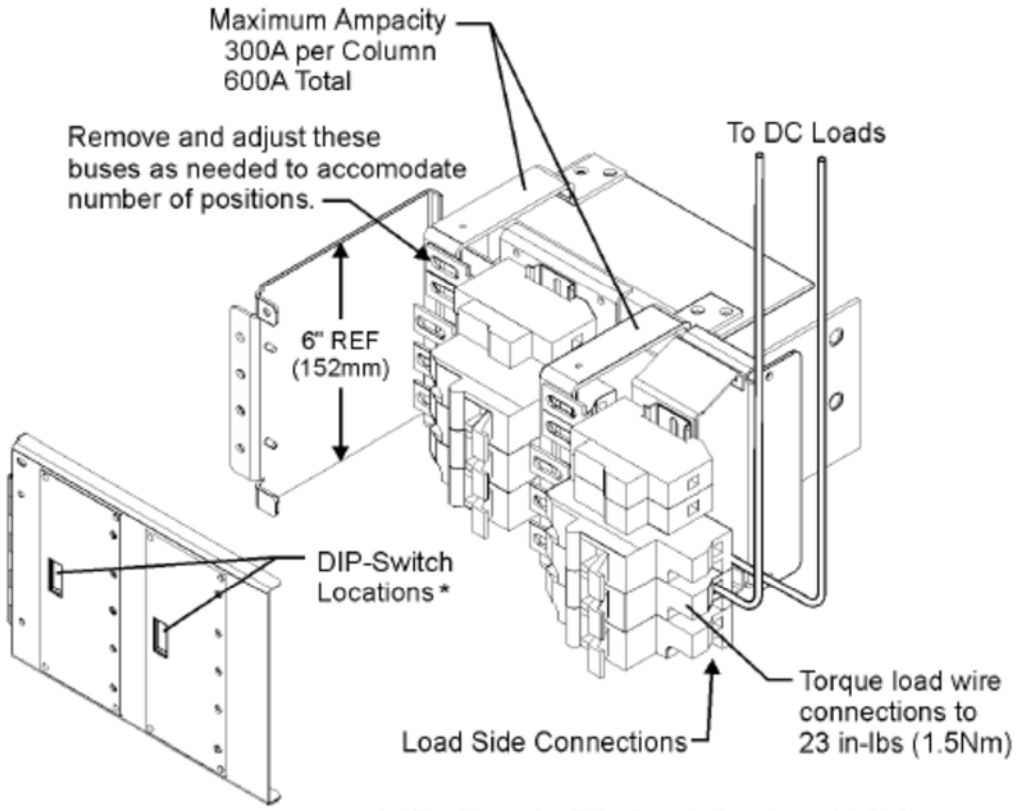
22 Ga Alarm Pair: Plugs into the lowest mounted alarm card on the left side of the cabinet during installation.

GMT Fuses for Group 58		
Comcode	Size (A)	Wire Ga (min)
407998137	0.25	22
407998145	0.5	22
407998152	1.33	20
407998160	2	20
407998178	3	18
407998186	5	18
407998194	7.5	16

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
405813072	load	18 - 22	18 - 22	0.75 - 0.5	Provided
	rtn	18 - 22	18 - 22	0.75 - 0.5	
405854837	load	14 - 16	14 - 16	1.5 - 2.5	
	rtn	14 - 16	14 - 16	1.5 - 2.5	

Figure 8-15: ED83143-31 Group 58, 6-position GMT, (H469-434/4827/4830 G58) 15A DC Distribution Panel

Distribution Panels, continued



14 Positions for DIN Circuit Breakers (1-63A)
or DIN Fuse Holders (10 x 38mm fuses, 1-32A)
or
10 Positions for DIN Circuit Breakers (80-125A, shown)
or DIN Fuse Holders (14 x 51mm fuses, 1-50A)

* Enable alarm circuit by moving the corresponding DIP-switch position to the ENABLED position and inserting the load wire into the load side of the breaker or fuse holder with the alarm wire.

DIN Fuse Holders, Fuses, and Circuit Breakers for Group 71 (must be provided by customer)	
Fuse Holder, Fuse, or Circuit Breaker	Agency Approved With
407765627 10x38mm Fuse Holder	Class gL – Class gG Fuses
407765635 14x51mm Fuse Holder	Class gL – Class gG Fuses
10x38mm Fuse	Class gL – Class gG
14x51mm Fuse	Class gL – Class gG
1–63A Circuit Breaker	ABB 270 Series
8–125A Circuit Breaker	ABB 290 Series

Lugs and Hardware					
Lug Comcode	Type	Std Wire Ga (Class B)	Flex Wire Ga (Class I)	Metric Wire Size (mm^2)	Hardware Kit (Grade 2)
none req'd	load	14-10	14-10	6	none req'd
405356171	rtn	14-10	14-10	6	848201919
none req'd	load	8	8	10	none req'd
406338210	rtn	8	8	10	847867124
none req'd	load	6	6	16	none req'd
406338376	rtn	6	6	16	847867124
none req'd	load	4	4	25	none req'd
406338483	rtn	4	4	25	847867124
none req'd	load	2	--	35	none req'd
406338616	rtn	2	--	35	847867124
none req'd	load	--	2	--	none req'd
407334697	rtn	--	2	--	847867124

Figure 8-16: ED83143-31 Groups 71 (H469-434/4827/4830 G60/A, G61/A, G65/A, or G66/A) 600A DC Distribution Panel

Low Voltage Load Disconnect Feature

EBV Circuit Pack

If the distribution panels are equipped with an Low Voltage Load Disconnect (LVLD) feature, an EBV circuit pack is also provided. The EBV circuit pack is factory set to operate as Contactor 2 as defined by the controller. If instructed in the Job Site Documentation to set some or all of the Low Voltage Load Disconnects to operate as Contactor 3, all the straps for that EBV need to be moved, as shown in Figure 8-16. This will allow the LVLDs defined as "2" (those not changed) to operate at different voltage levels than those defined as "3" (those that are changed). These voltage levels will be set during the controller setup.

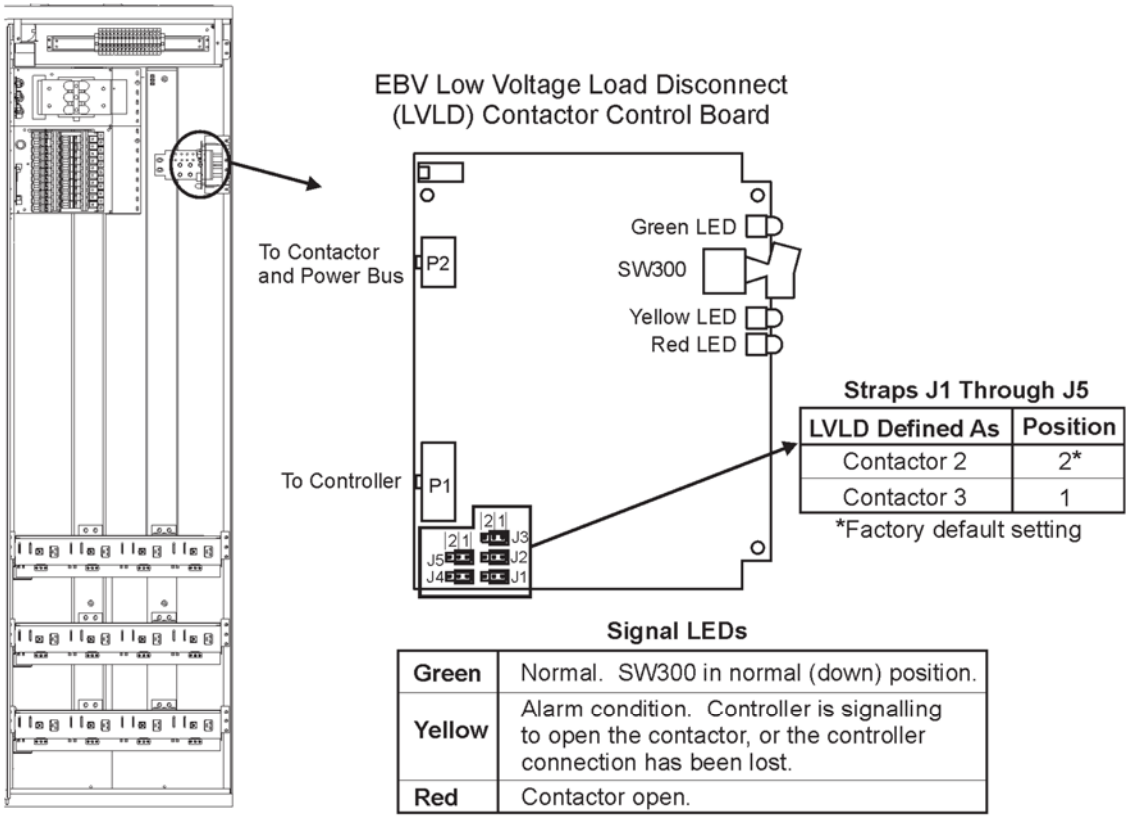


Figure 8-17: EBV Circuit Pack for Load Disconnect

9 Remote Peripheral Monitoring

Overview

RPM Modules

Remote Peripheral Monitoring (RPM) measurement and control modules provide data acquisition and control functions for a power environment. System capacity is added in a modular fashion with measurement and control modules. Each measurement module consists of six input channels and one temperature channel. A temperature module has seven channels to measure the temperature of seven different points in the system. A control module provides three separate control relays. The modules, which communicate back to the controller, are physically connected in a daisy-chain bus configuration. The user can program various alarm and control functions with the modules when used with a Millennium II controller.

Table 9-A lists the RPM modules.

Table 9-A: RPM Modules and Connection Units

Module Type(s)	Module Code(s)	Module and Connection Unit Kit Comcode
Control Relay	214A	108298456
Voltage (0-3Vdc)	221A	108298431
Voltage (0-16Vdc)	221B	108298498
Voltage (0-70Vdc)	221C	108469503
Voltage (0-200Vdc)	221D	108469479
Shunt	221F	108469461
Transducer	221J	108469495
Binary	222A	108298449
Temperature	223T	108274242

Overview, continued

Current Limiting Resistors

Current limiting resistors (100K-ohm) are required for the measurement inputs of the voltage, current, and binary modules. Comcode 847540424 current limiting resistor assemblies are available for connections that do not already have them. All shunts (load and battery) and some voltage points that are provided with the GPS cabinet already have current limiting resistors; check T-83314-30 for resistor presence.

For the 214A Control Relay module, the maximum relay contact voltage is 110Vdc and maximum current is 0.3Adc. Wiring depends on the voltage, current, local building codes, and various other characteristics of the controlled point.

Mounting Locations

Figure 9-1 shows possible mounting locations for the RPMs.

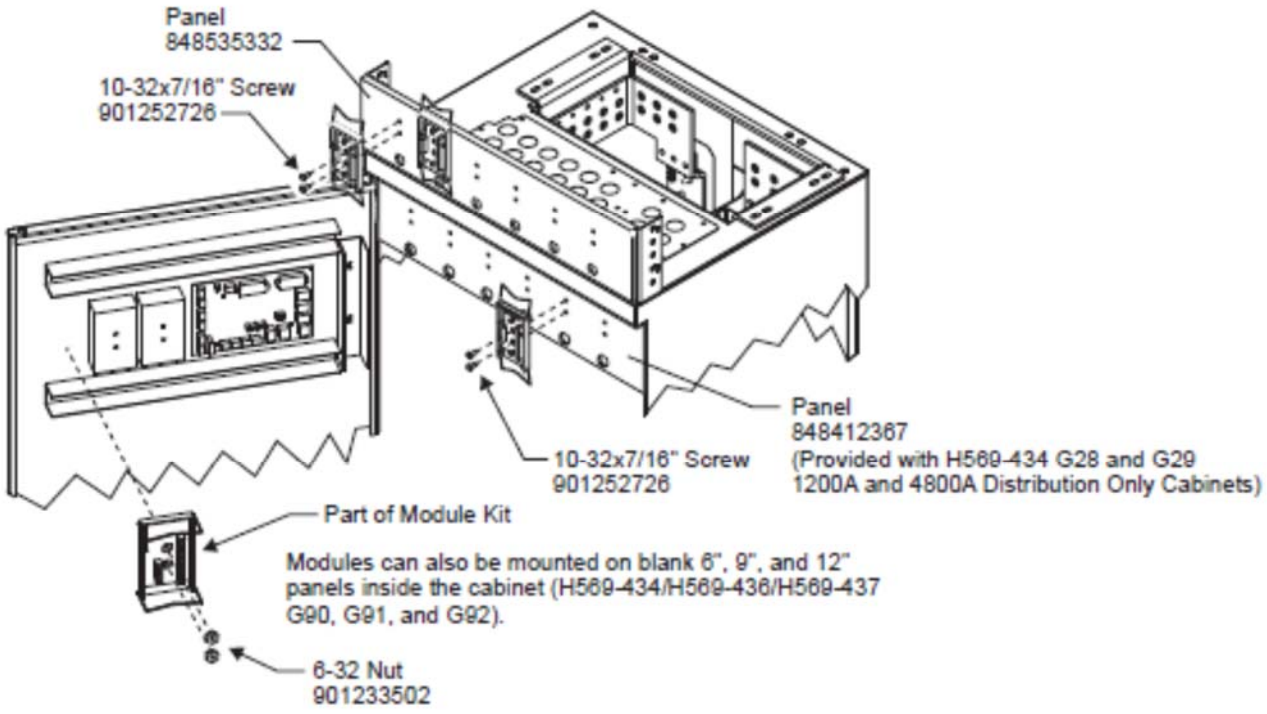


Figure 9-1: Possible RPM Mounting Locations

RPM Installation

RPM Installation	
Step	**Action**
1	Make required equipment connections to the connection units as shown in Figures 9-2, 9-3, and 9-4. Correct polarity must be maintained. Cable is provided by installer; length should not exceed 100 ohms per wire.
2	Route the wires connected to the module through the open-faced bottom of the connection unit. Place a cable tie through the opening at the bottom of the connection unit and around the connected wires for strain relief. (See Figures 9-2, 9-3, and 9-4.)
3	TB102 is used for communications input/output within the connection units. Use ONLY ABB shielded twisted pair cable per comcode 407377704 to wire the communications bus as shown in Figure 9-5. This cable is designed to the specific impedance necessary for optimum use in this bus wiring application. Polarity is not essential for this input/output communications bus wiring (expect for the shield).
4	To verify that no shorts exist between any of the three cable connections (blue, white, or shield) on the final bus module, place a terminating resistor (560 ohm, comcode 405298308) in the socket of the final bus module for each of the three buses. Measure the resistance across the blue and white wires of the module containing the terminating resistor. The resistance measurement should be in the range of 560-600 ohms.
	Continued on next page.

RPM Installation, continued

RPM Installation, continued	
Step	**Action**
5	Using a jeweler's screwdriver, set the address on each module before it is attached to the connection unit. (See Figure 9-6.) Secure each module to the connection unit with the two clips provided. Write the connected equipment description and module address on the label on the front of the module. **Caution** **Each module requires a unique address for proper communications between the module and controller. All addresses are valid except 00. No two modules should have the same address! The unique address is set via two switches (SW1 - Hi and SW2 - Low) located on the remote peripheral monitoring module. The switch display numbers/letters are in hexadecimal. For example:** SW1-Hi = D SW2-Low = 8 (The HEX address is D8)
6	Connect from the first module back to the controller circuit pack as shown in Figure 9-5. Wrap each bus wire twice through one of the supplied 406712968 inductor beads prior to its termination at the controller. Note: Use only one inductor bead for each bus.

RPM Installation, continued

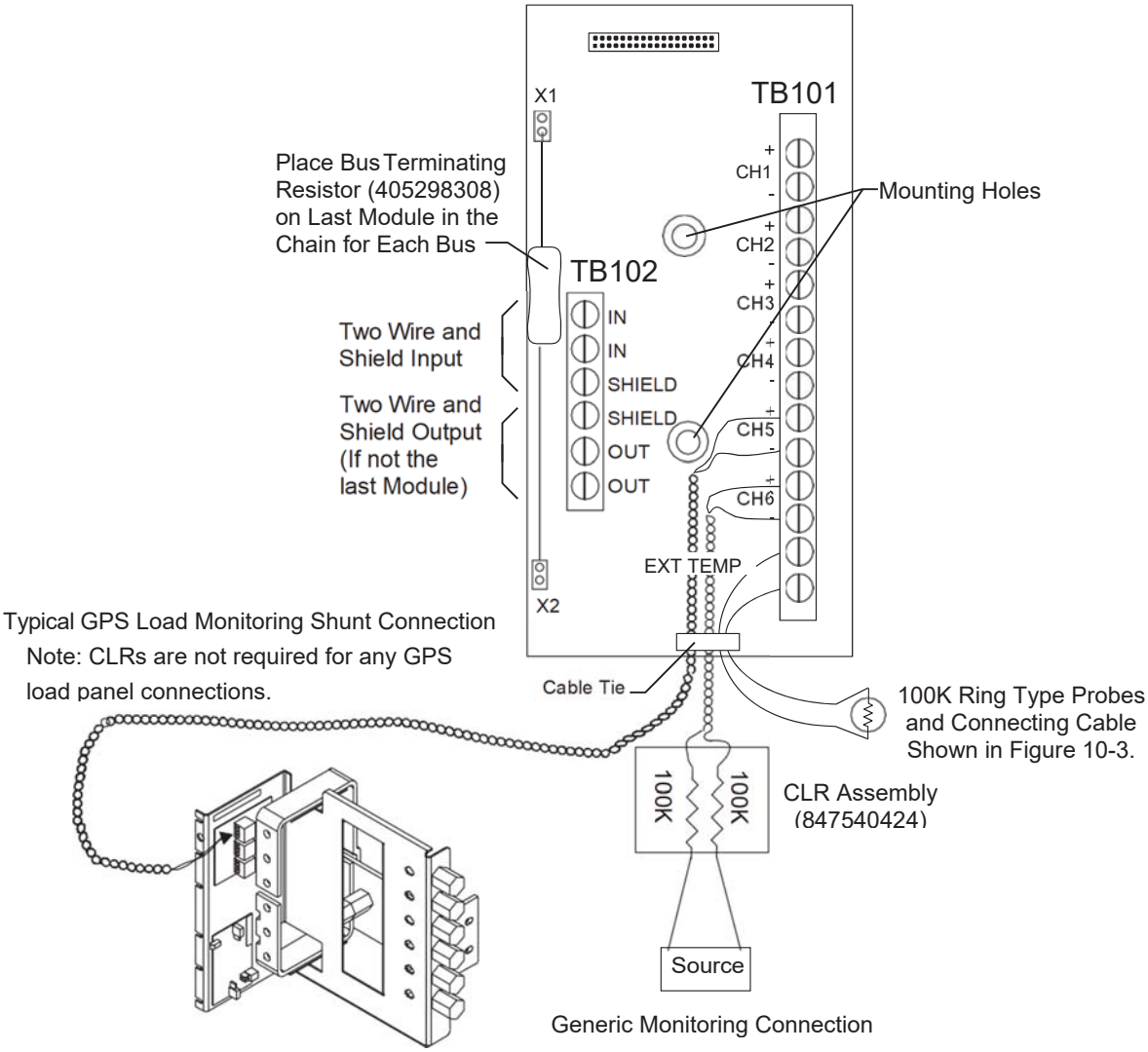


Figure 9-2: Connection of Voltage, Shunt, Transducer, and Binary Modules

RPM Installation, continued

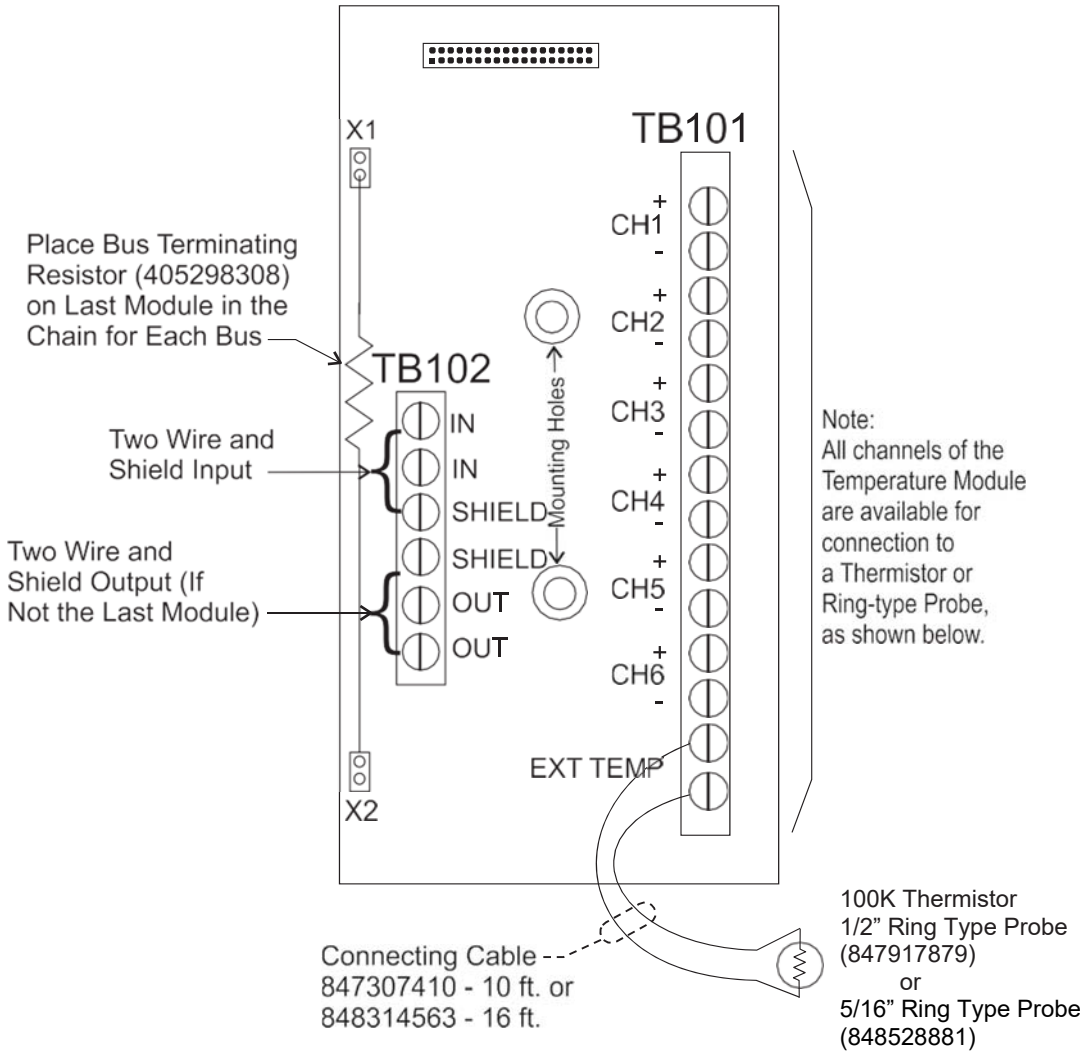


Figure 9-3: Connection of Temperature Module

RPM Installation, continued

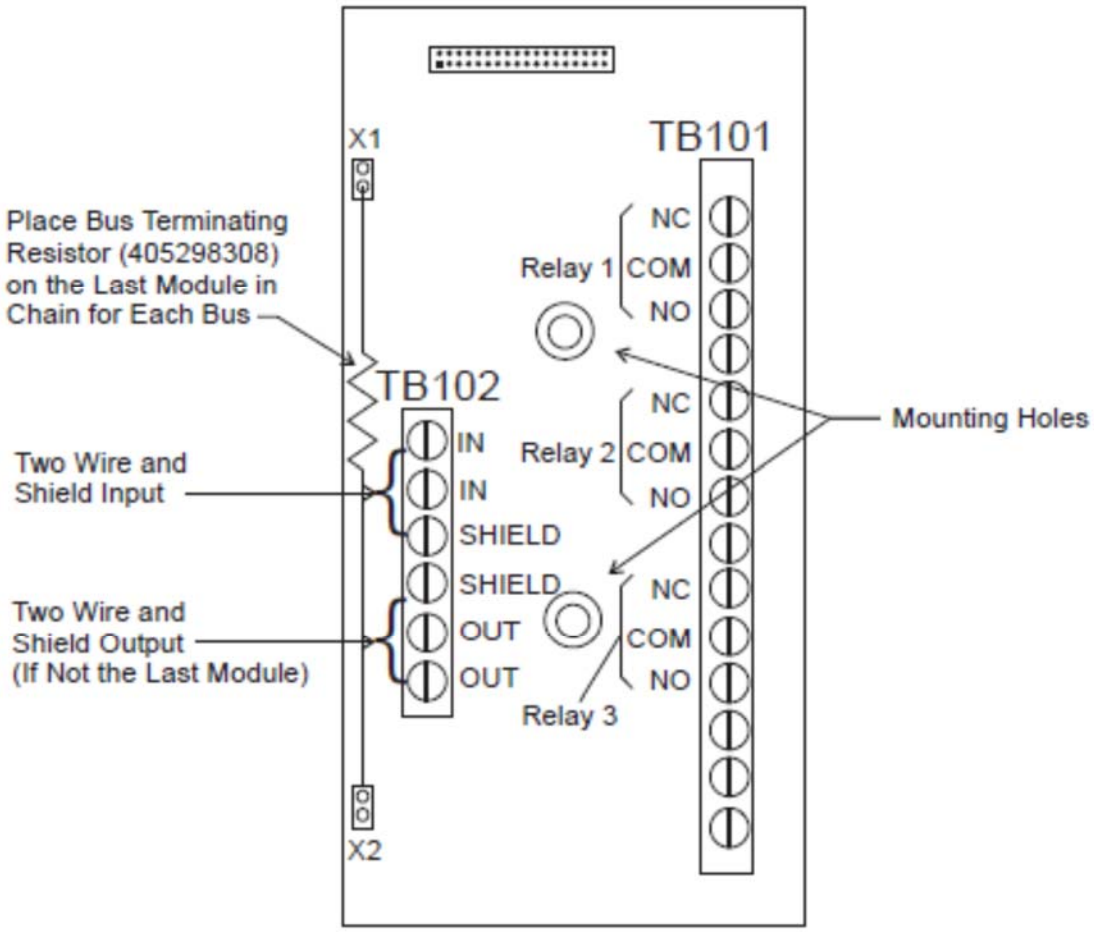
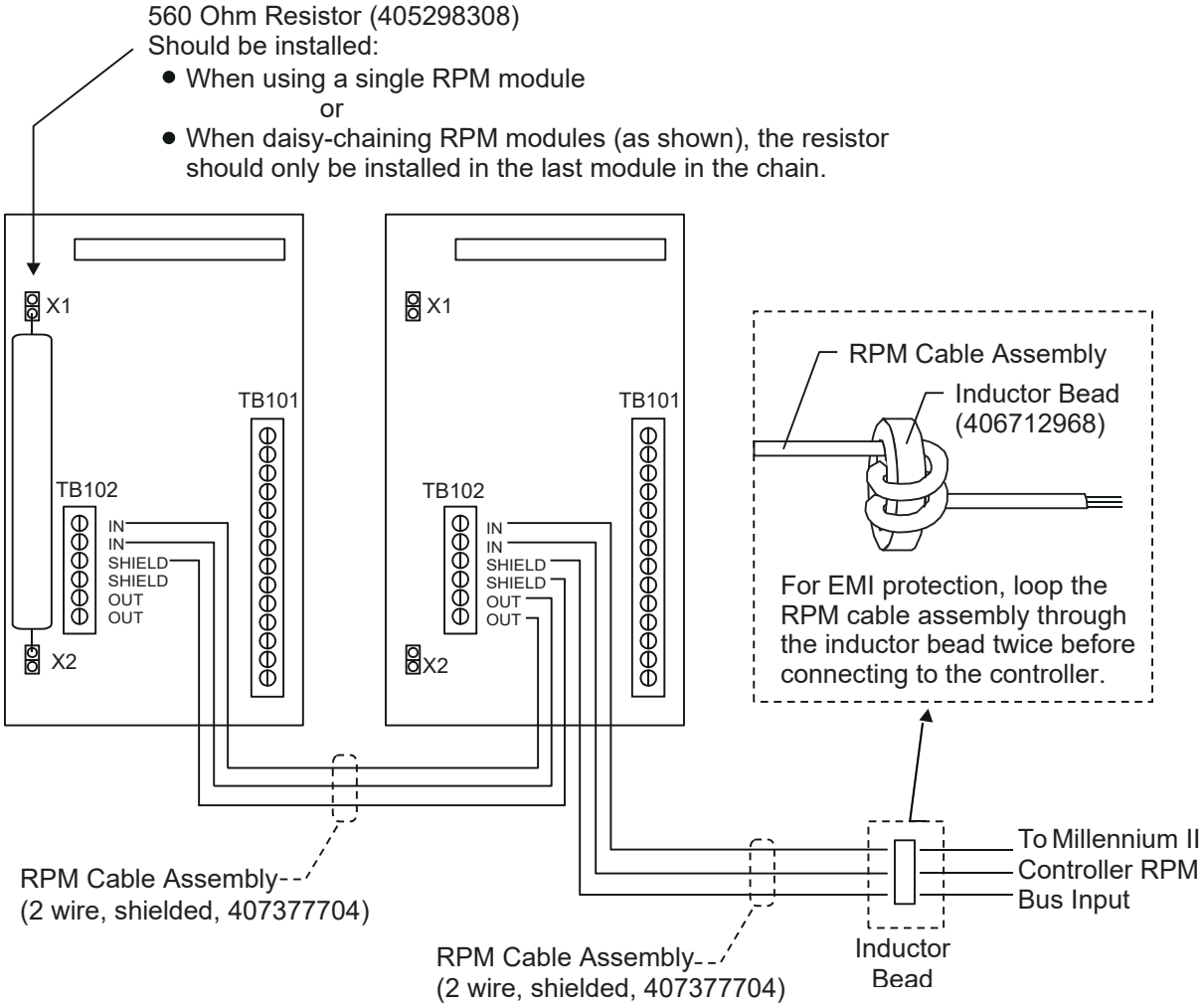


Figure 9-4: Connection of Control Relay Module

RPM Installation, continued



Up to 95 RPM modules can be daisy-chained on a single bus as shown, provided that the bus length, from the controller to the last RPM in the chain, is 100 meters or less. For bus lengths between 100 meters and 300 meters (maximum bus length), the number of RPMs on that bus must be reduced. See the RPM product manual (167-790-063).

Figure 9-5: Connection to the Controller (All Modules)

RPM Installation, continued

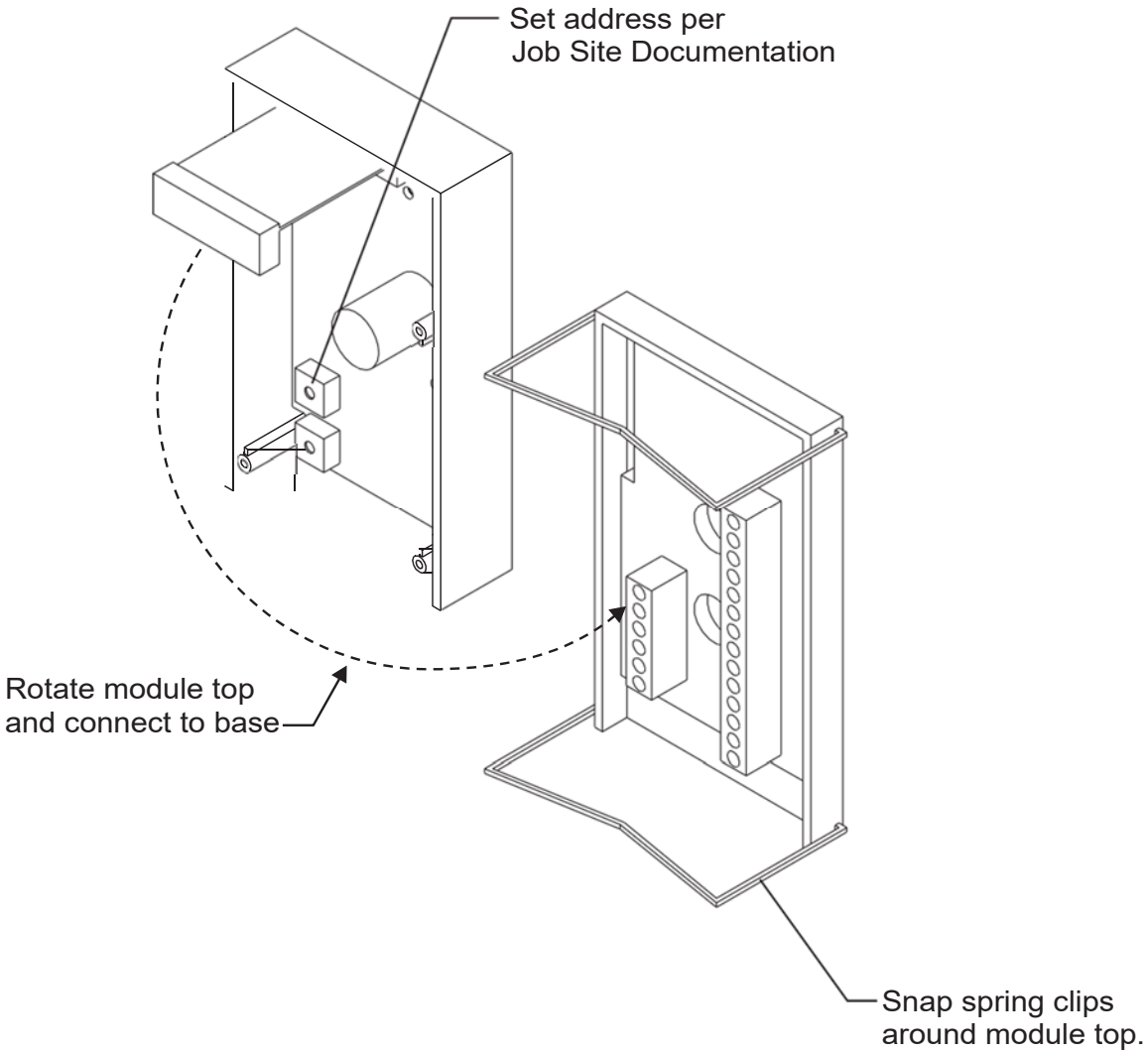


Figure 9-6: RPM Module Assembly

Notes

10 Battery Connection Panels

Connecting and Disconnecting Batteries

Note For Centralized Architectures, skip this section.

Overview

Battery strings or sections may be connected to the cabinet through contactors and a shunt, fuses and a shunt, circuit breakers and a shunt, or a shunt only. The shunts in each battery connection panel are required to obtain a system load reading. The contactor, fuse, and circuit breaker panels are equipped with alarm cards that report back to the controller if the battery section is taken off the system bus. Charge and discharge current can be read from the front panel of the Millennium II controller when battery section shunts are properly wired and programmed.

Disconnect voltage levels on contactor panels are controlled by the Millennium II controller. Fuses and circuit breakers provide only overload protection for current into or out of the batteries. They do not provide short circuit current protection of the batteries since they are located in the cabinet and not at the batteries. They do, however, provide a convenient way to disconnect the batteries from the system bus for maintenance.

Note: Panels for battery connection are blue; dc distribution panels are white.

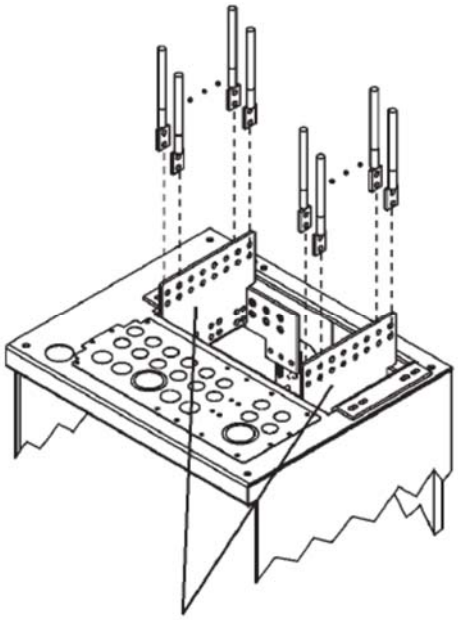
Battery Connection Panels Cross Reference

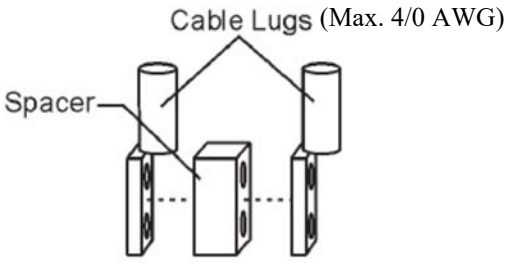
Table 10-A: Battery Connection Panels Cross Reference

Other	LVBD	Shunt	ED83143-31	H569-434 GPS4848/100	H569-4827 GPS 4827	H569-4830 GPS 4830
No Battery Panel						
			None	33	-	33
Panels without Fuses or Circuit Breakers						
		3,000A	30A	32A	-	32A
		1,500A	30	32	-	32
	2,000A	3,000A	36	39	39	39
	1,200A	1,500A	31	31	-	31
	2 x 600A	2 x 600A	32	30	-	30
Panels with Fuses or Circuit Breakers						
2 x NH3 fuse		2 x 600A	41	34	-	34
1 x NH3 fuse		600A	42	35	-	35
2 x NH3 fuse	1,200A	2 x 600A	43 with 31	80	80	80
4 x NH3 fuse	1,200A	4 x 600A	2 x 43 with 31	81	-	81
6 x NH3 fuse	1,200A	6 x 600A	3 x 43 with 31	82	-	82
6 x breaker poles			63	86	-	86
6 x breaker poles	800A		64	87	-	87
2 x NH4 fuse		2 x 1,500A	44	83	83	83
2 x NH4 fuse	2000A	2 x 1,500A 1 x 3,000A	45 with 36	84	84	84
Off Line Equalize Panels						
3 x 600A fuse	1,200A	3 x 1,000A	60	37	-	-
3 x 600A fuse		3 x 1,000A	61	38	-	-

Additional Battery Leads

Figure 10-1 shows options for connecting more than eight battery leads (16 maximum).





Bus Bar Spacer: 848385878
Permits two lugs to be stacked at one location. Spacer Kit Includes bus bar spacer, bolts and washers.
Torque connections to 300 in-lbs (34 Nm).

1600098086A Kit contains
(2) 8600097665P Bus Bars and hardware.
Provides 16 output terminations
(on 1.25” centers)
or
Provides 10 output terminations
(on 1.80” centers)

Figure 10-1: Additional Battery Leads

Battery Connection Panel Options

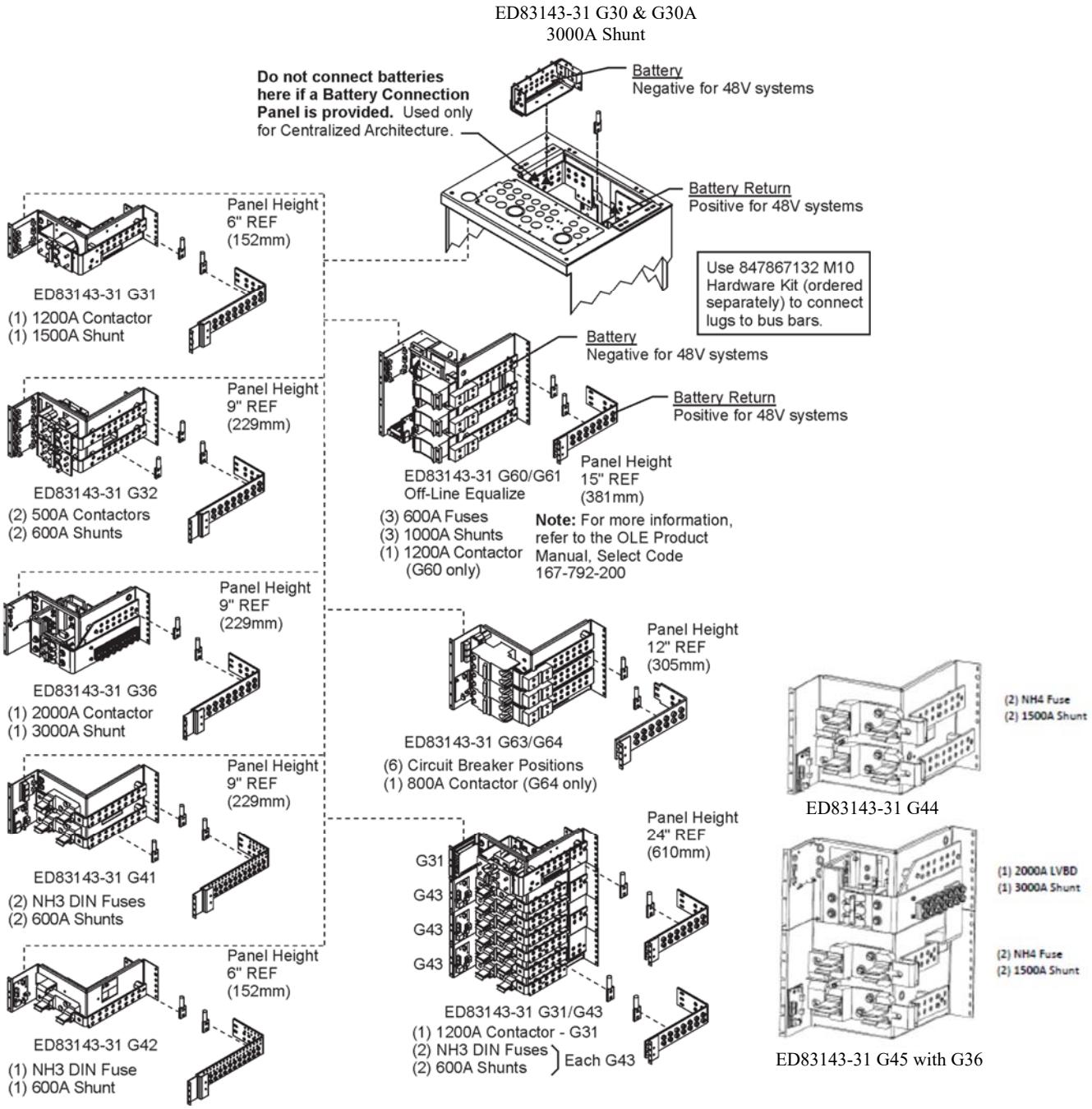


Figure 10-2: H569-434 and H569-4830 Battery Connection Panel Options

Battery Connection Panel Options, continued

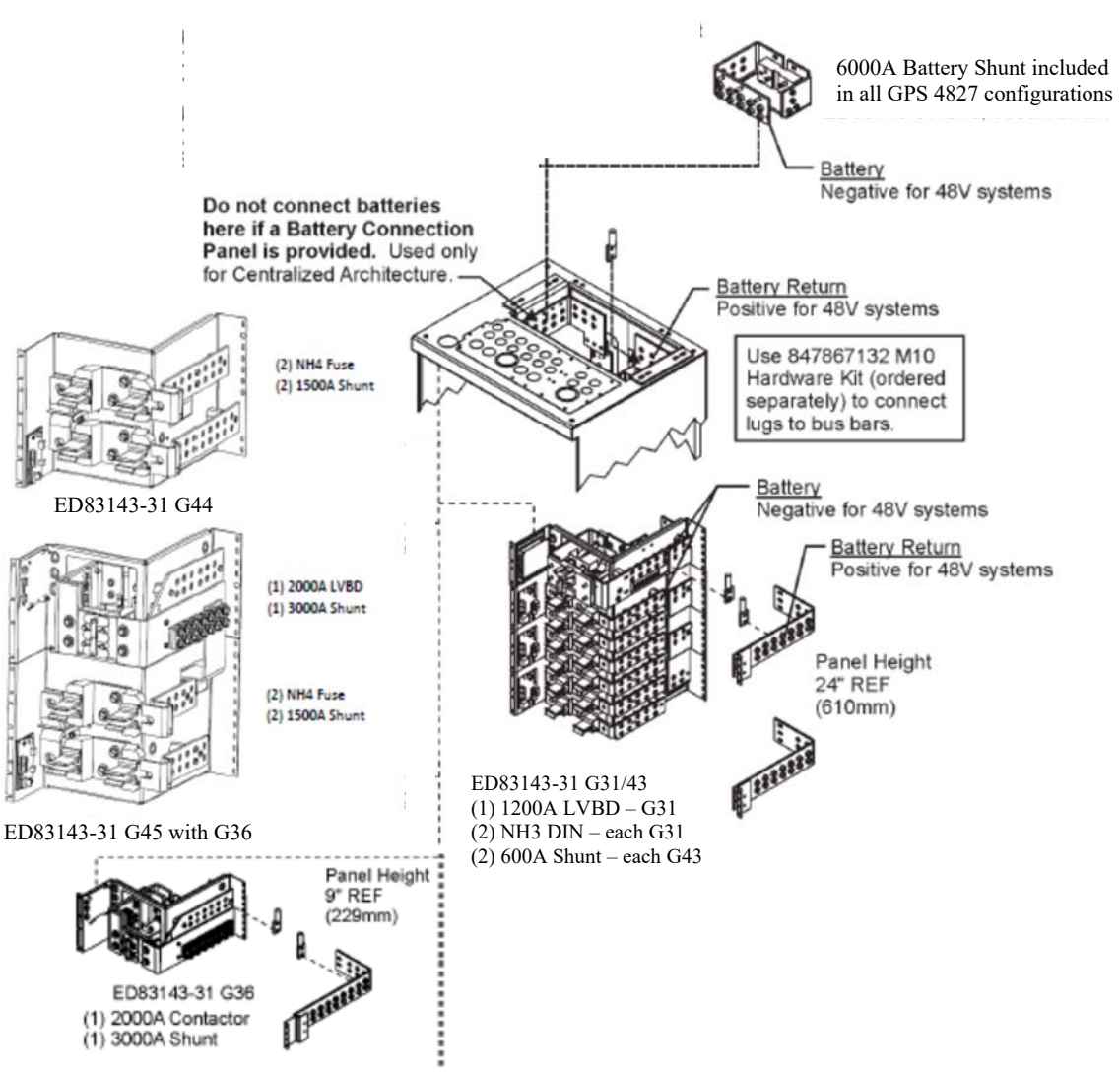


Figure 10-3: H569-4827 Battery Connection Panel Options

Connecting (+) and (-) Conductors

-48-volt Systems

Battery (-) conductors are connected to the exposed bus bar ends of the battery fuse holders, contactors, or shunt. Battery (+) conductors are connected to the battery return bus. See Figures 10-2 and 10-3 to locate the battery connection panels and battery return bus. Also see Figures 4 and H3 in the T83314-30 drawing for additional information.

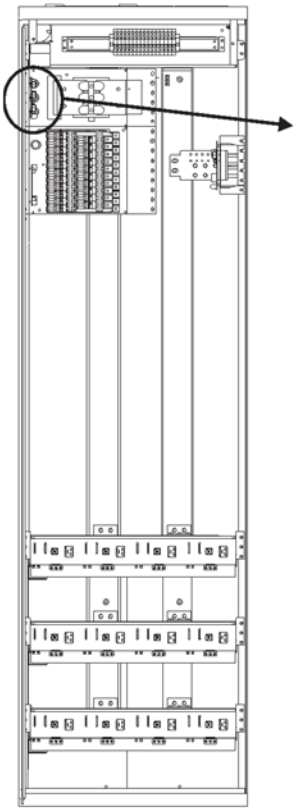
Installing Battery Connection Panels

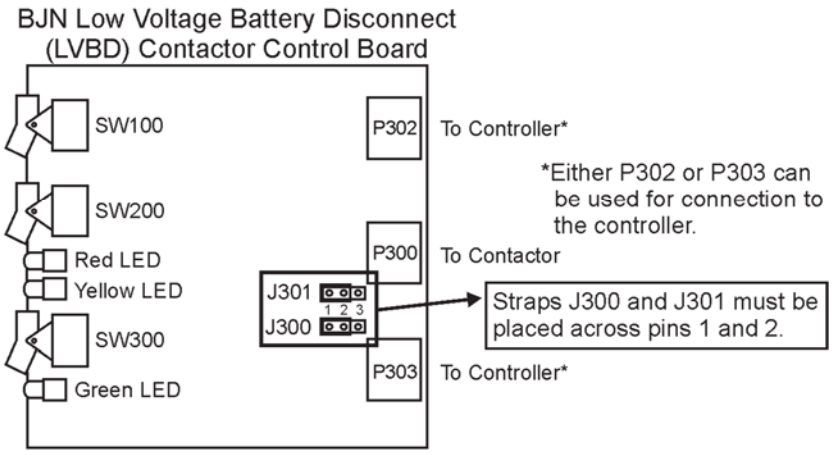
Follow these guidelines for making connections during this procedure:

- For all battery connection panels, connect the first wire lead toward the back of the cabinet.
- On the panel with two bus bars, use the back four mounting locations on the top bus. On the lower bus bar, use the front four locations.

Installing Battery Connection Panels	
Step	**Action**
1	Before making any battery connections: a. Verify that the battery fuses and alarm fuses **are not installed**. b. If the panel is equipped with contactors, place the forced-off switches (SW100 and SW200) on the BJN board in the forced **OPEN** position. See Figure 10-5.
2	Verify that all AC and DC protectors are **OFF**.
3	Terminate the appropriate conductors with terminal lugs as required. Use heat shrink insulating sleeves over any exposed lug shanks as necessary.
4	Connect the cabinet end of the battery cables to the contactor, circuit breakers, or fuse holders and return bus. Next connect the battery end of the cables. Tape the terminal lugs as required for safety during installation. If a battery contactor, circuit breaker, or fuse is not being used to keep the batteries off the bus, do not connect the leads at the batteries.
5	Use a DC voltmeter to check the voltages at the fuse holders, contactors, battery bus, and return bus. **Verify the polarity.**
6	If the battery connection panel is equipped with contactors, do not place the forced-off switches (SW100 and SW200) on the BJN board in the **NORMAL** position at this time. See Figure 10-5.

Contactor Control Board





Signal LEDs

Green	Normal. SW100 - SW300 in normal (up) position.
Yellow	Alarm condition. Controller is signalling to open the contactor, or the controller connection has been lost.
Red	Contactor open.

Manual Contactor Control Switch

SW100*	SW200*	SW300	Contactor State
Up	Up	Up	Under controller control (normal position, shown)
x	x	Down	Contactor forced closed
Down	Down	Up	Contactor forced open

x - Switch position doesn't matter

Note Board Orientation.

These switches are not meant to be used to permanently override the LVBD function. They are only to be used temporarily while servicing or testing the equipment.

When powering up the system from an ac failure, switches must be in the up position.

*SW100 and SW200 are redundant switches. If either switch is up, the controller will determine the contactor state. If both switches are not in the up position however, the green LED will not be lit.

Figure 10-5: BJN Low Voltage Battery Disconnect (LVBD) Contactor Control Board

Battery and Alarm Fuses and Circuit Breakers

If the battery connection panel is equipped with battery fuses and alarm fuses, **do not** install them at this time; the battery fuses should be installed after batteries have been connected.

If the battery connection panel is equipped with circuit breakers, they should be installed but left in the OFF position.

Note: The batteries will be connected in Section 13, *Power Up and Installation Completion*.

Notes

11 *Fascia Cover Installation*

Introduction

This section provides the installation procedure for the fascia covers. The covers are optional on centralized architecture.

Installing the Fascia Covers

One front Fascia Cover and associated hardware is provided with each GPS cabinet. Two End of Line-up Fascia Covers and associated hardware are provided with GPS cabinet equipped with a controller. Additional and different Fascia Panels (supplied with all necessary hardware) must be ordered.

Refer to Figure 11-1 for an illustration of this procedure.
Refer to Figure 5-12 for fascia mounting brackets installation.

Installing the Fascia Covers Optional on Centralized Architecture Cabinets	
Step	**Action**
1	Install each fascia cover using the four 8-32 nuts provided. Fascia panels are optional on the left and right ends of the cabinet lineup.

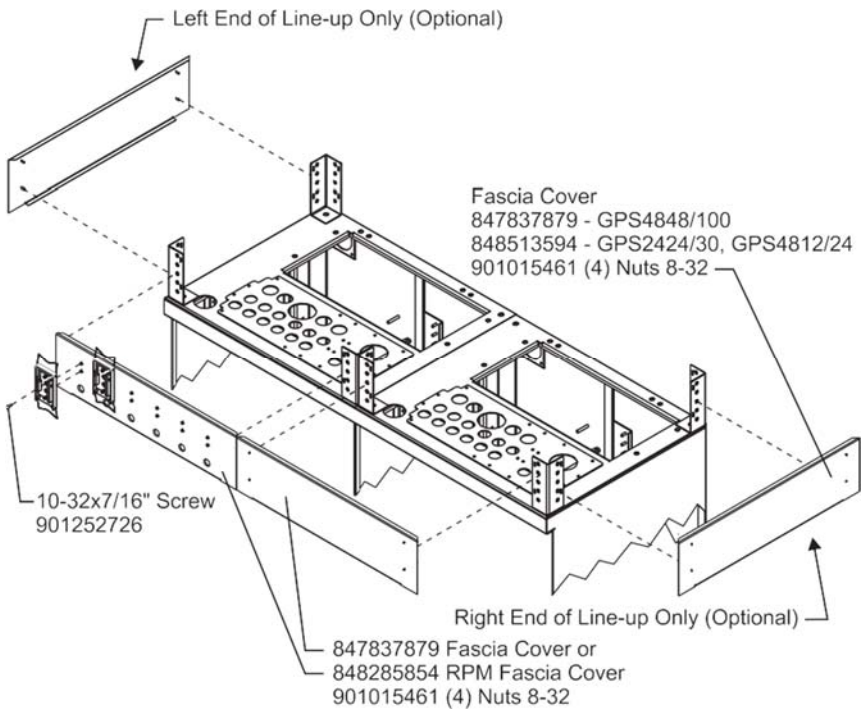


Figure 11-1: Fascia Cover Installation

12 Connection of Office Alarms

Introduction

This section explains the installation procedure to connect the office alarms.

Connecting Controller Alarms

Connecting Office Alarms	
Step	**Action**
1	Choose the appropriate illustration from the following list: • Figure 12-1: Millennium II Controller with Insulation Displacement Alarm Board • Figure 12-2: Millennium II Controller with Wire Wrap Alarm Board
2	Route wires (installer provided, 22-gauge maximum) from the office alarm block back to the controller by following the numbered sequence of steps on the illustration.

Connecting Controller Alarms, continued

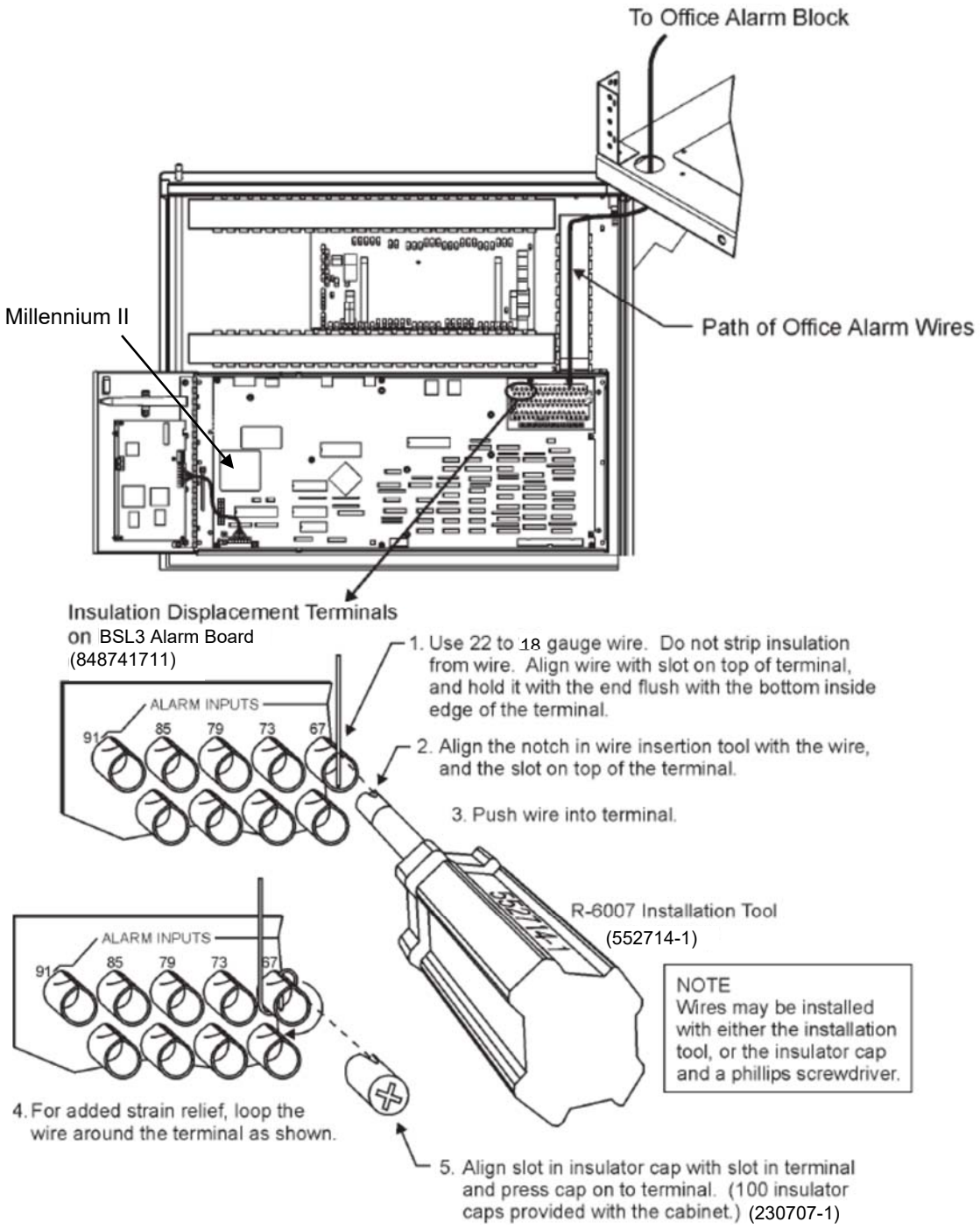


Figure 12-1: Millennium II Controller with Insulation Displacement Alarm Board

Connecting Controller Alarms, continued

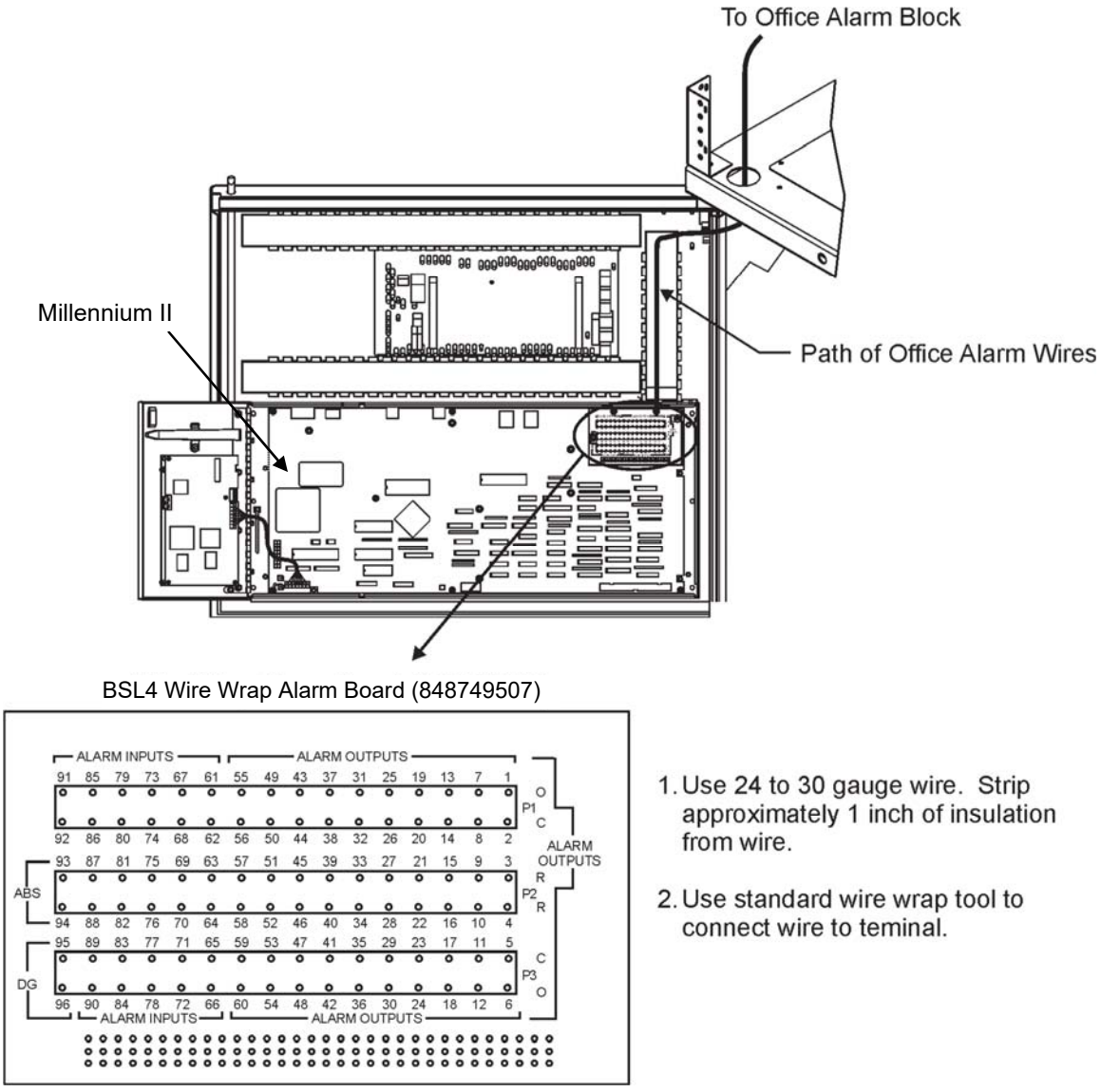


Figure 12-2: Millennium II Controller with Wire Wrap Alarm Board

13 Power Up and Installation Completion

Initial System Checkout and Preparation for Power Up

Before Installing Rectifiers

Prior to installing rectifiers, verify that the correct ac voltage is present at the AC connectors in the rectifier shelves. Note: Disregard if this was done as part of the "AC Connection and Wiring" procedure.

Safety Reminder

Some of the following procedures are performed while ac voltage is present at the cabinet; exercise extreme caution and observe all precautions described in the safety section of this product manual.

Controller Front Panels

Illustrations

Refer to the following figures for illustrations of the controller front panels:

Figures 13-1A and 13-1B Millennium II Controller

Controller Front Panels, continued

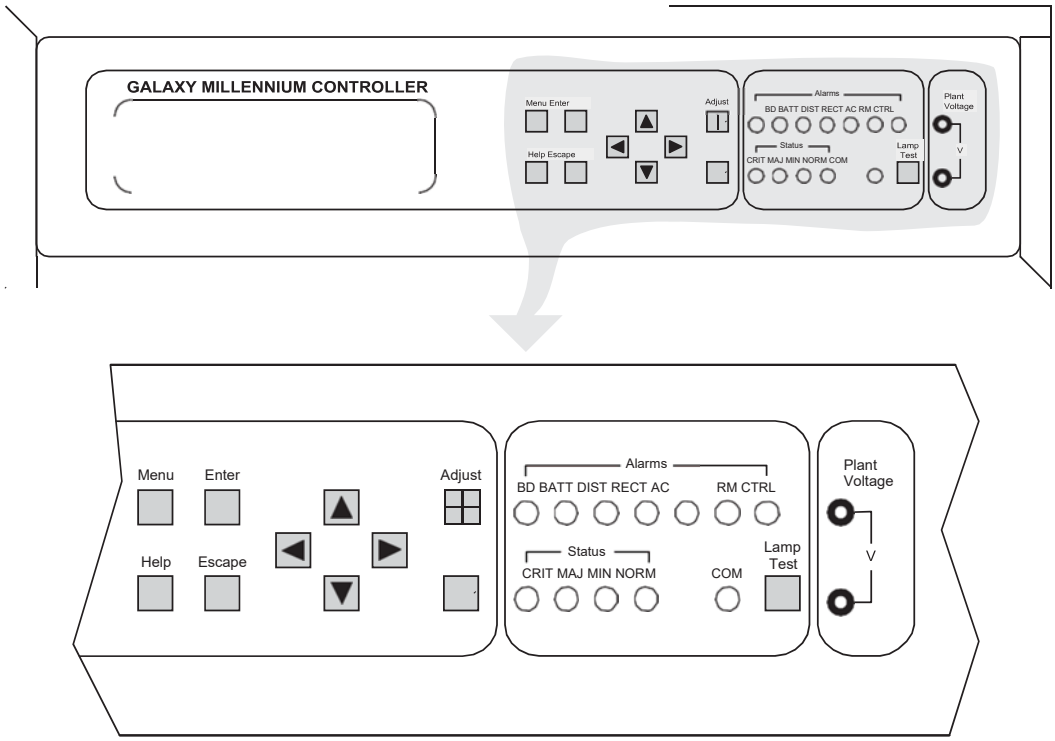


Figure 13-1A: Galaxy Millennium II Controller Front Panel, Square Keys (DA)

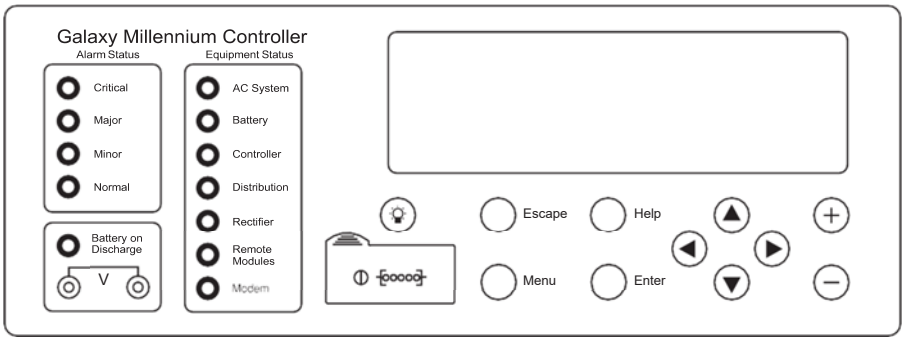


Figure 13-1B: Galaxy Millennium II Controller Front Panel, Round Keys

Initial Power Up of the System

Initial Power Up of the System	
Step	**Action**
1	To turn on the system while using the factory default firmware and software loaded in the controller, proceed as follows: **⚠ Warning** **Before proceeding with the initial power up of the system, verify:** • **Batteries are disconnected from the system bus.** • **The ac source circuit breakers are turned OFF.** • **The system ac and dc load circuit breakers/fuses are OFF or removed.**

Rectifier Installation Notes

Note: Install rectifiers from bottom to top of GPS 4848 cabinets. GPS 4830 rectifiers are installed, starting from the top-left and working right, then down. GPS 4827 rectifiers are installed, starting from the bottom-left and working right, then up. Vacant rectifier positions below or beside the top installed rectifiers in a GPS 4848 cabinet may cause over-heating of the installed rectifiers. Install a Rectifier Shelf Cover / Air Dam into vacant positions.

Install Rectifier Shelf Cover / Air Dam on rectifier shelves as required. See Figure 13-2A.

When installing a single 595LTA or 595LTB on a shelf, install an Air Dam to block vacant right or left rectifier position.

Rectifier Shelf Cover (848680211)	Covers both left and right rectifier positions
Air Dam (848754358)	Covers the left or right rectifier position

Continued on next page.

Initial Power Up of the System, continued

Initial Power Up of the System, continued

Step	Action
Installing the First Rectifier 2 (GPS 4848)	Install a rectifier in slot one. See Figures 13-2 and 13-2A. **⚠ Caution Rectifier is heavy (up to 75 lbs.)** a. Verify that rectifier matches the ac input voltage of the system. **⚠ Caution** **DO NOT INSTALL 595B OR 595LTB RECTIFIERS INTO 380/400/480Vac systems; they will be damaged.** b. Verify that the control switch on the front of the rectifier is in the standby (STBY) position; for 595 rectifiers, verify that the output circuit breaker is also OFF. When installing a 595LTA or 595LTB rectifier into a single rectifier shelf, remove the Rear Keying Plate and install the Keying Bracket onto the rectifier. See Figure 13-2A. 1. Remove Rectifier Rear Keying Plate by removing 2 securing screws. Save Rear Keying Plate for future re-use. See note below. 2. Replace the two Rectifier Rear Keying Plate screws onto rectifier and torque to 10 in-lb (1.1 Nm). 3. Remove Screw "A". 4. Install Keying Bracket using Screw "A" removed in Step 3, and 2 additional screws supplied with the keying bracket. Torque to 10 in-lb (1.1 Nm). 5. Move keying pin on keying bracket to 480Vac position if rectifier is 595LTA. **Note: Rectifier is not keyed in dual rectifier shelf with Rear Keying Plate removed.**

Continued on next page.

Initial Power Up of the System, continued

Initial Power Up of the System, continued	
Step	**Action**
	c. Place the rectifier on the appropriate shelf assembly. Note: Install rectifiers vertically, starting at the bottom left side of the shelf assembly and working *up* and *left to right* (if applicable). d. Carefully slide the rectifier toward the rear of the shelf assembly. Push until the unit is seated. e. Gently pushing against the right side of the rectifier, use a 5mm (3/16-inch) Allen-head wrench (T-handle) to turn the recessed locking screw clockwise to secure the rectifier to the shelf. Note: It is extremely important to fully seat the rectifier into its shelf position. A steady or blinking ALM LED on the rectifier, after it has been seated and turned on, must be investigated and resolved before it is allowed to support a load.
2 (GPS 4830 & GPS 4827)	Install a rectifier into the top left slot (GPS 4830) or bottom left slot (GPS 4827). Use the hinged front cover of the rectifier module as a lever to draw the rectifier module into its slot position and lock it into place.
3	Turn ON the AC source circuit breaker and the AC circuit breaker for the installed rectifier.
4 (GPS 4848)	Turn ON the rectifier's power switch; close its output breaker.
5	Verify that the rectifier turned ON.
6	Verify that the controller and the optional contactor control boards power up. Note: Red LEDs will light on BJN and LVBD cards.
7	If the controller has alpha-character capability, verify that the text on the display is in English. If Spanish text is required, follow instructions on the Help menu to make the change.
	Continued on next page.

Verify Controller

Initial Power Up of the System, continued

Set Rectifier ID

Initial Power Up of the System, continued	
Step	**Action**
8	Verify the following: • Green LEDs are illuminated on the rectifier and LVLD and LVBD contactor control boards. • The system voltage is 52.08 volts (48V system). • The system current is zero.
9 (GPS 4848)	Set rectifier ID number (choose appropriate procedure): **For 595A2 and higher, 595B2 and higher, or 596LT rectifiers:** a. Depress rectifier power switch in UP position; rectifier ID is displayed. b. Hold rectifier power switch in UP position for 5 seconds; the display number will begin to blink. c. Release the switch. d. Depress and hold the switch for 3 seconds to rapidly advance the ID. e. Depress and release repeatedly until the desired ID is reached. Note – For GPS 4848 rectifier ID's higher than 24, the 25th+ rectifiers must be communicating with the Millennium II controller first before their ID's can be set. Once the rectifier establishes communication, the ID display can be advanced to the present highest ID number +1, before returning to ID #1. f. Leave switch un-pressed for 10 seconds to save the ID number. **For 595A, or 595B rectifiers:** a. Depress and hold rectifier power switch in UP position for 5 seconds; the displayed number will begin to blink. b. Depress and release switch until desired number is reached. c. When the desired number is reached, continue to hold switch until display stops blinking. The new ID number is now set. Note: Abandoning this process before the display stops blinking will default the rectifier to the last number set.
10	Follow Step 2 to 5 to install the remaining rectifiers, and follow Step 9 (GPS 4848) to set their ID numbers.

Installing Rectifiers

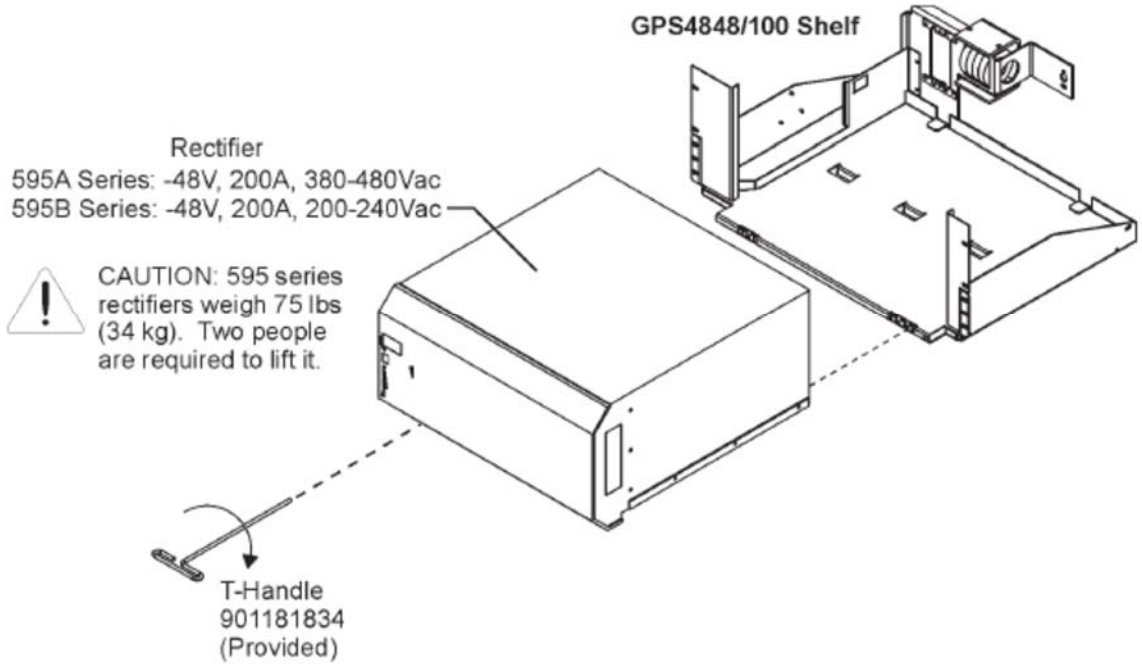


Figure 13-2: Installing 595A/B Rectifier Carriers

Installing Rectifiers, continued

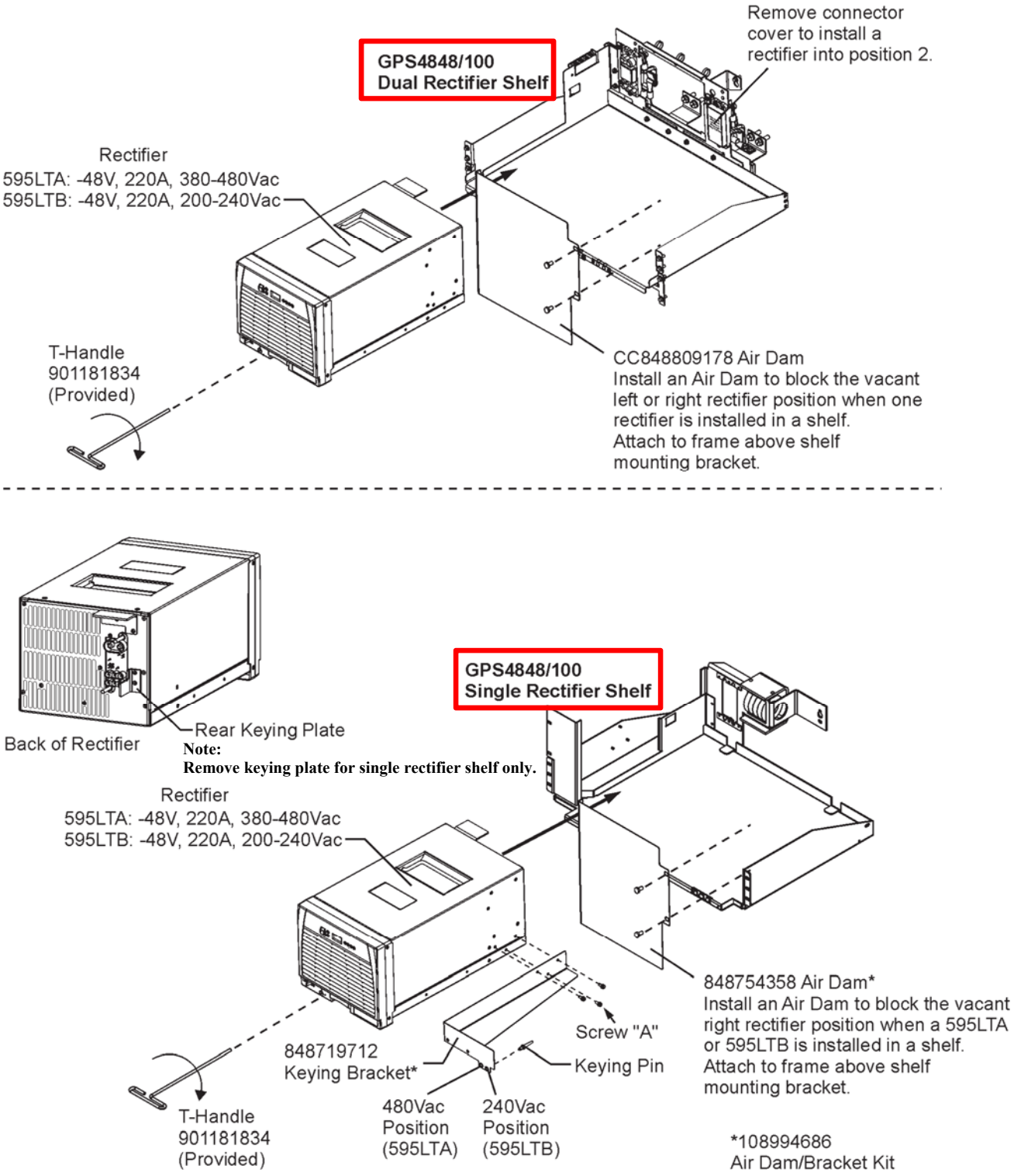
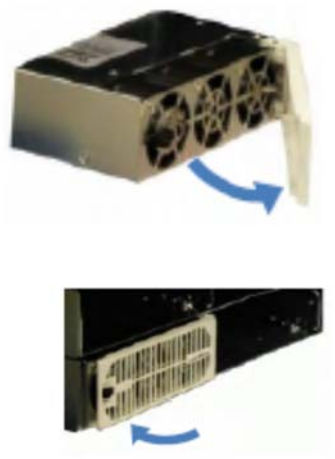


Figure 13-2A: Installing 595LTA and 595LTB Rectifiers

Installing Rectifiers, continued



Install Rectifiers

1. Open the faceplate by sliding the black latch to the left to release the faceplate.
2. Push the unit firmly into the shelf until seated.
3. Swing the faceplate closed until it is secured by the latch.
4. Turn on the AC breaker powering the shelf slot.
5. Following initialization of the rectifier module, verifying its green LED and only its green LED is on.
6. If this isn't the case, see **Troubleshooting** section.

Figure 13-2B: Installing Infinity (NE050AC48ATEZ or NE075AC48ATEZ) Rectifiers

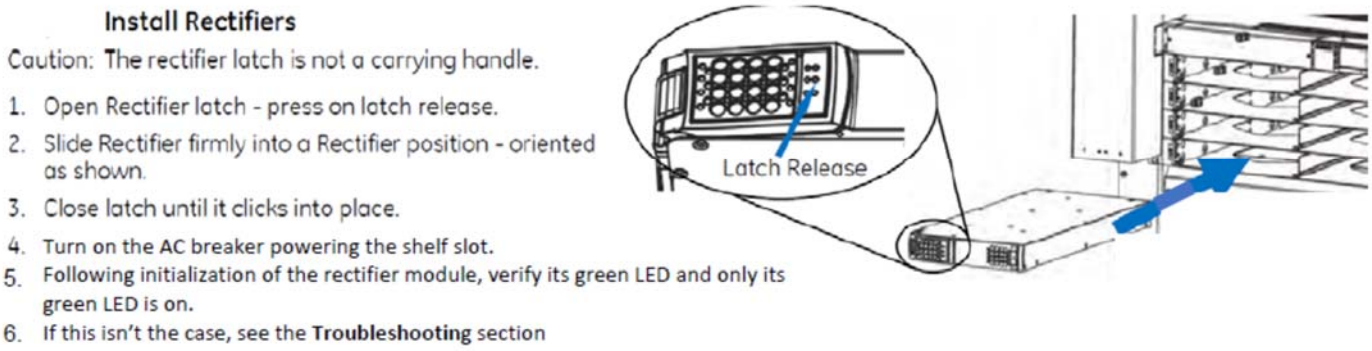


Figure 13-2C: Installing GP100 Series Rectifiers

Lamp Test

Lamp Test	
Step	**Action**
1	Depress LAMP TEST on the Millennium II controller display.
2	Verify that the LEDs on the rectifiers and controller illuminate. Note: The green NORMAL LEDs will remain illuminated on the rectifiers, controller, LVBD and LVLD contactor control boards (optional), and the remote peripheral monitoring modules (optional). The other controller LEDs will extinguish after several seconds, and the remaining system LEDs will extinguish within approximately 10 seconds.

Voltage Calibration

Note: Do NOT attempt to set the system voltage level using this procedure. The only purpose for this procedure is to calibrate the display to the test jacks. Refer to "Setting the System Voltage" (next procedure) for setting the system voltage level.

Voltage Calibration	
Step	**Action**
1	Using a calibrated digital voltmeter (DVM), measure the system voltage from the test jacks (located on the front panel of the Millennium II controller).
2	If the voltage on the controller display does not match the DVM reading, adjust the controller display. To move to the correct screen to make the adjustment, follow the procedure below: **Menu → Control/Operations → Calibration → Calibrate Plant Voltage**
3	Use the keys to calibrate the system voltage to match the reading of the DVM. Press ENTER (Millennium II) to use the new calibrated system voltage. Verify that the voltage reading at the test jacks now matches the controller reading.

Setting the System Float Voltage

Setting the System Float Voltage	
Step	**Action**
1	Enter the appropriate key sequence: **Menu → Configuration → Float Settings → Voltage Alarms**
2	Verify that the Very High and High alarm thresholds are set at least 0.5V above the float voltage to be specified in Step 3.
3	Use the adjust keys to set the system float voltage. Enter the following M2 key sequence: **Menu → Configuration → Float Settings → Set Point**

Setting the System Shunt

Setting the System Shunt	
Step	**Action**
1	Enter the following key sequence: **Menu → Configuration → Shunt → Plant Shunt**
2	Select Shunt Type: • Distributed Architecture no shunts external to the GPS cabinet), select: – "None" for both Shunt 1 Type and Shunt 2 Type • Centralized Architecture (shunts outside the GPS cabinet used), select: – "Load" for both Shunt 1 Type and Shunt 2 Type
3	Set the shunt size for centralized architecture systems (the size is not used for distributed architecture systems).

Setting the Low-Voltage Battery Disconnect Feature

Setting the LVBD Feature (if used)	
Step	**Action**
1	To enable LVBD, enter the following key sequence: **Menu → Configuration → Contactor Interfaces → Select BIC1 Type and set it to LVBD** Note: The LVBD configuration **must** be set, if used. No alarm lights will show if this is not set.
2	The default thresholds are: disconnect voltage: -44V reconnect voltage: -48V To set the thresholds to other values, enter the following key sequence: **Menu → Configuration → LVBD → Disconnect Control** **or** **Menu → Configuration → LVBD → Reconnect Control** Note: The factory default on all battery contactors in the system is hardwired as Contactor 1. This cannot be changed.

Setting the Low-Voltage Load Disconnect Feature

Setting the LVLD Feature	
Step	**Action**
1	To enable LVLD, enter the following key sequence: **Menu → Configuration → Contactor Interfaces → Select BIC2 Type (or BIC3 Type, whichever the EBV card is wired to) and set it to LVLD1 (or LVLD2) as appropriate.** Note: The LVLD configuration **must** be set. No alarm lights will show if this is not set.
2	The default thresholds are: disconnect voltage: -44V reconnect voltage: -48V To set the thresholds to other values, enter the following key sequence: **Menu → Configuration → LVLD1 (or LVLD2) → Disconnect Control** **or** **Menu → Configuration → LVLD1 (or LVLD2) → Reconnect Control** Note: The factory default for all load disconnect contactors in the system is hardwired as BIC2 and LVLD1. In the Millennium II system this can be changed to BIC3 and LVLD2 to allow some load contactors to open at different thresholds. To change, move the jumpers on the associated EBV contactor drive boards as shown in Figure 8-15. Next, set the controller's BIC3 and LVLD2 configuration to Load with the desired thresholds as described above.

Connecting Batteries

⚠ **Caution:** Review and observe precautions outlined in Section 2, *Safety*, before proceeding.

Connecting Batteries	
Step	**Action**
1	Measure the battery string voltage. Temporarily use the following M2 menu path to set the plant voltage to match the measured battery string voltage (+/- 0.05V). **Menu → Configuration → Float Settings → Set Point**
2	Connect the batteries to the system. Choose the appropriate method: • Install the battery fuses and alarm fuses, or • Close the battery circuit breakers, or • Set the battery contactor board switches from forced open to normal state, or • Connect the remaining battery conductors. (See Figures 13-5 and 4-1 through 4-4.)
3	When all battery strings have been placed on line, use the following M2 menu path to set the plant voltage back to the desired Float Voltage. **Menu → Configuration → Float Settings → Set Point**
Continued on next page	

Connecting Batteries, continued

Connecting Batteries, continued	
Step	**Action**
4	Observe that all rectifiers share the battery charging load current. Verify this using the following M2 menu path: **Menu → Status → Measurements → Rectifiers → Rectifier Currents** If any installed rectifiers are missing or are not sharing load, perform the following M2 reboot process to have all the rectifiers reinitialized into the system. **Menu → Control/Operations → Reboot Controller** When the current has stabilized or dropped to a level equal to several amperes per string, proceed to the next section.

Connecting Batteries, continued

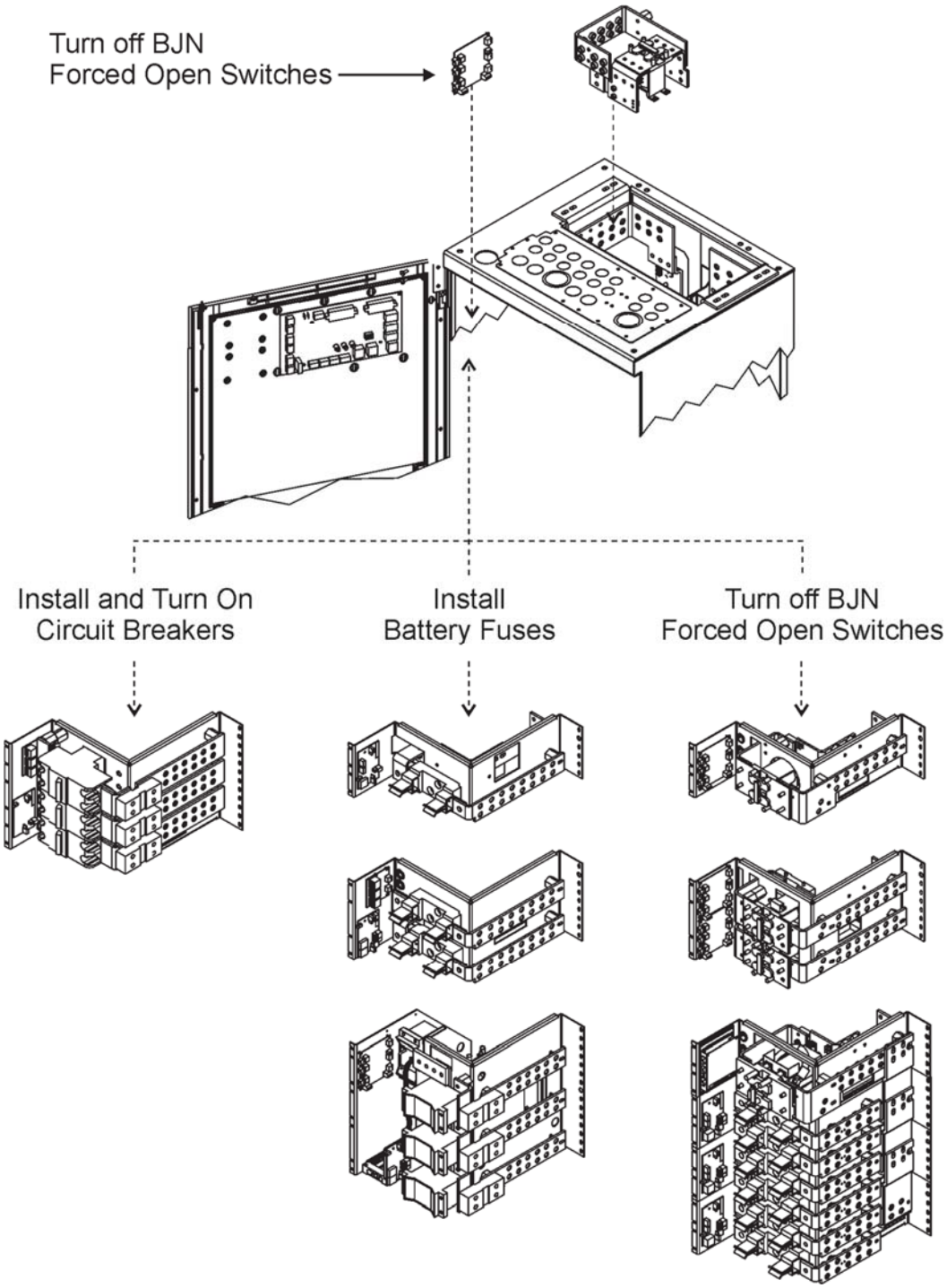


Figure 13-5: Battery Connection Panel

Testing Rectifiers and Load Share

Testing Rectifiers and Load Share	
Step	**Action**
1	Connect a resistive load box (proper voltage) to the system's positive and negative bus bars. A connection onto the load side of a distribution bay will permit the test load current to be seen at the M2 controller.
2	Increase the system load to 50 amperes.
3	After approximately 60 seconds, verify that the load is divided equally among all the rectifiers (within ~ 2 amperes). Use the following M2 menu path to perform this task: **Menu → Status → Measurements → Rectifiers → Rectifier Currents**
4	Reduce the system load. Verify that the rectifiers continue to share the load.
5	Remove system load.

Testing Additional Alarms

Alarm operation may be verified while the system operates at float voltage.

Testing Additional Alarms	
Step	**Action**
1	Turn OFF the AC circuit breaker of the first rectifier. Verify that the AC and MIN alarm LEDs illuminate, the rectifier displays ACF, and the controller alarms screen indicates AC FAIL against it.
2	Turn ON the AC circuit breaker of the first rectifier. Verify that the rectifier starts and the alarms retire.
3	Simulate a load circuit breaker alarm by shorting the alarm contacts on the circuit breakers or inserting an operated alarm fuse. For ED83143-31 G1-G6, add a jumper from the hot bus to the FAJ input signal on the associated BNL1 (P4-1) or BNL7 (P5-6) alarm card. Verify that the DIST and MAJ alarm LEDs illuminate and the controller alarms screen indicates EXTERNAL FUSE MAJOR.

Testing the BD Alarm

Testing the BD Alarm	
Step	**Action**
1	Set the system load to 25 amperes.
2	Turn off AC input breakers to all rectifiers.
3	As the system voltage drops, observe that the BD alarm activates at the programmed BD threshold. The programmed BD threshold can be found using the following menu path: **Menu → Configuration → Float Settings → Voltage Alarms → BD**
4	Turn on the AC breaker to a single rectifier after the BD activates. Observe that the BD retires as the system voltage rises above the BD threshold.

Millennium II Controller System Alarm Test

The Alarm Test provides a means of testing the operation of any or all of the system alarm relays and their wiring to the connected alarm system. The test cannot be performed if any alarms are active. In addition, Rectifier HVSD (High Voltage Shut Down) and RFA (Rectifier Fail Alarm) tests can be included. For additional information, consult the Millennium Controller product manual.

Millennium II Controller System Alarm Test	
Step	**Action**
1	Connect all office alarm wiring from the controller's office alarm terminal block to the office alarm monitoring system.
2	Enable the Alarm Test feature by using the following key sequence to get tothe menu with the software switch: **Menu → Configuration → Alarm Test → Test**
3	Once the Alarm Test feature has been enabled, use the following front panel key sequence to start the Alarm Test. **Menu → Control/Operations → Alarm Test → Start All Relay Alarm Test**

Connecting to Load

The system is ready to connect to equipment loads. Install or turn on load protectors when needed.