## SYSTEM OVERVIEW

**Description:** -48VDC @ up to 4000 Amperes Power System

This power system is designed to power a load while charging a positive grounded battery. This system is capable of operating in a batteryless installation or off battery for maintenance purposes. The system is designed for operation with the positive output grounded.

The NetSure 701NVBB DC Power System is a complete integrated power system containing rectifiers (PCUs), intelligent control, metering, monitoring, and distribution. This power system consists of the following components.

- **Distribution Cabinet**

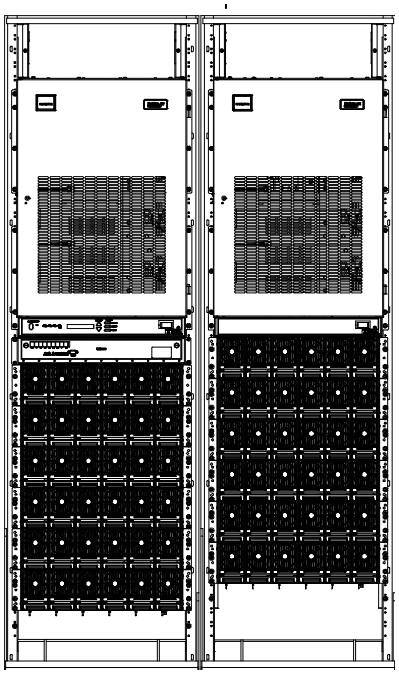
  The system always includes a minimum of one Distribution Cabinet, which provides DC distribution through fuses and/or circuit breakers.

  Four different sizes of Distribution Cabinets may be ordered to accept from one (1) to four (4) Distribution Bus Modules. A variety of Distribution Bus Modules are available that provide combinations of load distribution, battery distribution, low voltage load or battery disconnect, and manual battery disconnect. The Distribution Cabinet is factory mounted in the relay rack specified when ordered.

  Most of the Distribution Bus Modules accept either TPS/TLS-type fuseholders or Bullet Nose-type circuit breakers. TPH-type fuses and GJ/218-type circuit breakers are also available in ratings up to 600 amps.

- **Meter-Control-Alarm (MCA) Assembly**

  The system contains one MCA. The MCA controls the operation of the Rectifier Modules (PCUs). The MCA also provides power system control, metering, monitoring, and alarm functions.



- **Rectifier Module (PCU) Mounting Shelves**

  The system contains one or more Rectifier Module (PCU) Mounting Shelves, each of which houses up to six (6) Rectifier Modules (PCUs). Refer to PD588705000 for more information.

- **Rectifier Modules (PCUs)**

  The system contains Rectifier Modules (PCUs), which provide load power, battery float current, and battery recharge current during normal operating conditions. Refer to UM1R483500e (Rectifier User Instructions) for more information.

- **DC-DC Converter System**

  Where +24VDC load power is required, DC-DC Converters are available in this power system.

- **Monitoring System**

  An LMS1000 Monitoring System may also be furnished. Refer to SAG586505500 for more information.

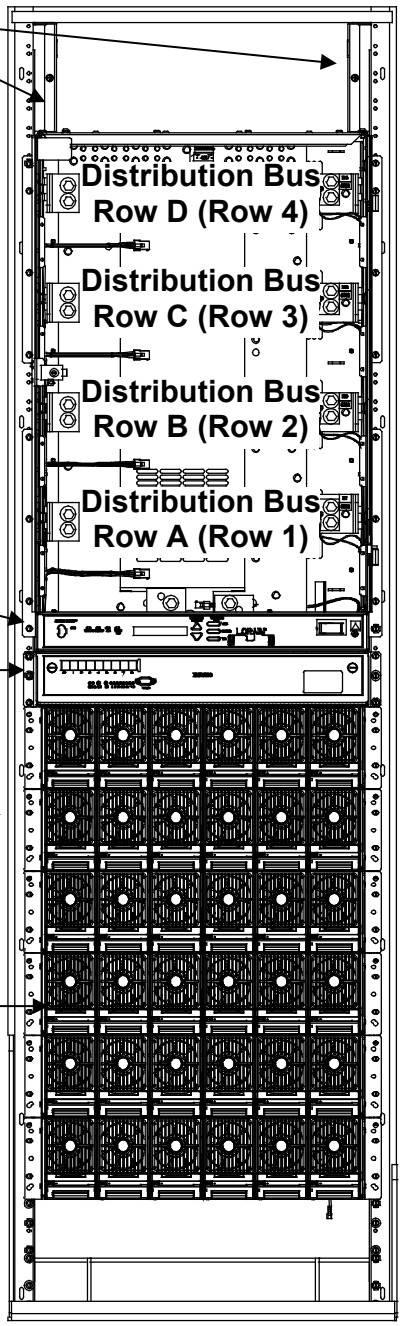
| | |
|---|---|
| Family: | NetSure |
| Spec. No.: | 582126000 |
| Model: | 701NVBB |
| Output Voltage: | -48 Volts DC |
| Rectifier System Input Voltage | Nominal 208/240 volts AC, single phase, 50/60 Hz, with an operating range of 176 to 264 volts. Acceptable input frequency range is 45 to 65 Hz. |
| Output Capacity: | |
| System: | 4000 Amperes, maximum |
| Bay: | 2000 Amperes, maximum (1500A maximum when equipped with List AH; 1200A maximum when equipped with List RA or RB) |
| Distribution Bus Module: | 500 Amperes, maximum (List ND rated for 960A) |
| Rectifier Module (PCU) | |
| 1R483200 and 1R483200e: | 55.2A @ -58VDC to 66.6A @ -48VDC |
| Agency Approval: | UL 1801 Listed ("c UL"), NEBS |
| Framework Type: | Relay Rack |
| Mounting Width: | 23 Inches, nominal |
| Mounting Depth: | |
| Distribution Cabinet: | 18 Inches (single-bay), 21 Inches (multi-bay)<br>(List RC, RD, and RE adds 5.25 inches to back of system, see Overall Dimensions Illustrations) |
| Rectifier Module Mounting Shelf: | 18 Inches |
| Battery Tray: | 24.4 Inches |
| Access: | Front, Sides, and Rear for Installation and Maintenance,<br>Front for Operation |
| Supplemental Bay(s) Available: | One |
| Control: | Microprocessor |
| Color: | Bay and Rectifier Module Faceplates: Textured Gray (Spec. M500-147)<br>Rectifier Shelf and Rectifier Modules Bodies: Bright Zinc Plating (Spec. M500-53) |
| Environment: | -40°C to +40°C (-40°F to +104°F) |

## TABLE OF CONTENTS

## MAIN COMPONENTS ILLUSTRATIONS

### 582126000

Main Bay:.....List 1
Supplemental Bay (located next to Main Bay):.....List 2
Supplemental Bay 'Distribution Only' Option:.....List 4
Supplemental Bay (located away from Main Bay):.....List 5




Distribution Assembly List AA, AB, AC, AD, AE, AG, AH, AJ, AK, AL, AM, AN, AP, BA, CA, CB, CD, CE, CF, CG, CJ, EA, GB, JA, JB, JC, JD, KA, LB, LC, NA, NB, NC, ND, TA, TB
List RA: LV Battery Disconnect
List RB, RC: Manual Battery Disconnect
List RD: LV/Manual Battery Disconnect
List RE: LV Battery Disconnect

Other Options

List 29: Distribution Cabinet Top Shield
List 62: 20A Converter Module
List 63, 64: 160A DC-DC Converter Shelves
List 71: Optional Audible Alarm and Alarm Termination Circuit Card
List 72: MCA Interface Modem Option
List 73:MCA Interface WinLink Software
List 74: MCA Interface Combination Modem/RS-232 Option
List 75: MCA Interface Ethernet Option: Modbus TCP + Web Interface
List 76: MCA Interface Ethernet Option: Modbus TCP + Web Interface + SNMP
List 77: MCA Interface Ethernet Option: Modbus TCP + Web Interface + Battery Monitoring
List 78: MCA Interface Ethernet Option: Modbus TCP + Web Interface + SNMP + Battery Monitoring
List 79: Capacitor Precharge Assembly
List 92: Battery System
List 93: Battery Tray

## LIST DESCRIPTIONS

### List Numbers

**List 1: Main Bay Common Equipment (Power and Distribution)**

**Features**

- Provides common equipment for one “power and distribution” bay rated for up to 2000 amperes of distribution.
- Accepts one (1) Distribution Cabinet (options are 1-Row, 2-Row, 3-Row, or 4-Row cabinet).
- Accepts up to six (6) Rectifier Module Mounting Shelf(s).
- Accepts one (1) Meter-Control-Alarm (MCA) Assembly.

**Restrictions**

Cannot use a List 21 in a List 1 when List 1 is used with a List 2.
(List 21 is not provided with connection points for inter-bay busbars.)

**Ordering Notes**

1) Order a relay rack per 'Relay Racks' under ACCESSORY DESCRIPTIONS. If required, order Relay Rack Transition Plates per 'Transition Plates to Mount Relay Rack on Top of GNB Absolyte IIP Batteries' under ACCESSORY DESCRIPTIONS. A ship loose option is available, as described in 'Relay Racks' under ACCESSORY DESCRIPTIONS.
2) Order one (1) List 21, 22, 23, or 24 Distribution Cabinet.
3) Order up to four (4) Distribution Bus Modules as required per 'Distribution Bus Modules' and the capacity of the Distribution Cabinet ordered.
4) Order one (1) List 10, 11, 12, or 13 MCA.
5) Order as required;
   the LMS1000 Monitoring System per List 80,
   or
   an MCA Interface option per Lists 72, 74, 75, 76, 77, and 78.
   Also order, as required, WinLink Software per List 73.
6) Order interface components for Rectifier Module Mounting Shelf(s) as required per List 31. Order Rectifier Module Mounting Shelf(s) per PD588705000.
7) Order Rectifier Modules as required per P/N 1R483200e or 1R483200.
8) Order a Rectifier Module Mounting Position Blank Cover Panel, P/N 21140440, for each empty rectifier module mounting position in the system.
9) Order converter shelves and modules, as required, per Lists 62, 63, and 64.
10) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
11) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.
12) Order additional List Options, as required, per Lists 29, 45, 46, 71, 79, 92, and 93.
13) Order any additional Accessory Options described under ACCESSORY DESCRIPTIONS.

**List 2: Supplemental Bay Common Equipment (Power and Distribution) (located next to Main Bay)**

**Features**

- Provides common equipment for one bussed “power and distribution” bay rated for up to 2000 amperes of distribution. Includes interbay power busbars and communications cabling.
- Mounts to either left or right side of List 1 Main Bay.
- Accepts one (1) Distribution Cabinet (options are 2-Row, 3-Row, or 4-Row cabinet).
- Accepts up to six (6) Rectifier Module Mounting Shelf(s).
  or
  Can be configured for “distribution only” (no Rectifier Module Mounting Shelf).

**Restrictions**

Will not accept List 21 Distribution Cabinet.
(List 21 is not provided with connection points for interbay bus bars.)

Order maximum of one (1) List 2 or List 5 per Power System. Cannot be used when List 5 is ordered. Order List 2 or List 5, not both.

Rear access required for installation of inter-bay busbars.

**Ordering Notes**

1) Order a relay rack per 'Relay Racks' under ACCESSORY DESCRIPTIONS. If required, order Relay Rack Transition Plates per 'Transition Plates to Mount Relay Rack on Top of GNB Absolyte IIP Batteries' under ACCESSORY DESCRIPTIONS. Relay rack must be same height as relay rack ordered for List 1. A ship loose option is available, as described in 'Relay Racks' under ACCESSORY DESCRIPTIONS.
2) Order one (1) List 22, 23, or 24 Distribution Cabinet.
3) Order up to four (4) Distribution Bus Modules as required per 'Distribution Bus Modules' and the capacity of the Distribution Cabinet ordered.
4) Order interface components for Rectifier Module Mounting Shelf(s) as required per List 31. Order Rectifier Module Mounting Shelf(s) per PD588705000.
   or
   Order Supplemental Bay 'Distribution Only' option per List 4.
5) Order Rectifier Modules as required per P/N 1R483200e or 1R483200.
6) Order a Rectifier Module Mounting Position Blank Cover Panel, P/N 21140440, for each empty rectifier module mounting position in the system.
7) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
8) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.
9) Order additional List Options, as required, per Lists 29, 45, 46, 79, 92, and 93.
10) Order any additional Accessory Options described under ACCESSORY DESCRIPTIONS.

**List 4: "Distribution Only" Option for Lists 2 or 5**

**Features**

- Provides components needed to convert one List 2 or 5 bay from "power and distribution" to "distribution only".

**Restrictions**

Rectifier Module Mounting Shelf(s) cannot be mounted in a bay when List 4 is installed.

**Ordering Notes**

1) Order one List 4 for each List 2 or 5 being ordered for distribution only.

**List 5: Supplemental Bay Common Equipment (Power and Distribution) (located away from Main Bay)**

**Features**

- Provides common equipment for one remote "power and distribution" bay rated for up to 2000 amperes of distribution. Includes interbay communications cabling.
- Accepts one (1) Distribution Cabinet (options are 1-Row, 2-Row, 3-Row, or 4-Row cabinet).
- Accepts up to six (6) Rectifier Module Mounting Shelf(s).
  or
  Can be configured for "distribution only" (no Rectifier Module Mounting Shelf).

**Restrictions**

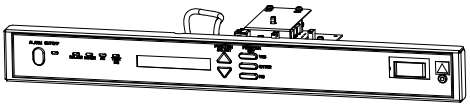
Order maximum of one (1) List 2 or List 5 per Power System. Cannot be used when List 2 is ordered. Order List 2 or List 5, not both.

Interbay power cabling is not included, and must be separately provided per site requirements.

**Ordering Notes**

1) Order a relay rack per 'Relay Racks' under ACCESSORY DESCRIPTIONS. If required, order Relay Rack Transition Plates per 'Transition Plates to Mount Relay Rack on Top of GNB Absolyte IIP Batteries' under ACCESSORY DESCRIPTIONS. A ship loose option is available, as described in 'Relay Racks' under ACCESSORY DESCRIPTIONS.
2) Order one (1) List 21, 22, 23, or 24 Distribution Cabinet.
3) Order up to four (4) Distribution Bus Modules as required per 'Distribution Bus Modules' and the capacity of the Distribution Cabinet ordered.
4) Order interface components for Rectifier Module Mounting Shelf(s) as required per List 31. Order Rectifier Module Mounting Shelf(s) per PD588705000.
   or
   Order Supplemental Bay 'Distribution Only' option per List 4.
5) Order Rectifier Modules as required per P/N 1R483200e or 1R483200.
6) Order a Rectifier Module Mounting Position Blank Cover Panel, P/N 21140440, for each empty rectifier module mounting position in the system.
7) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
8) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.
9) Order additional List Options, as required, per Lists 29, 45, 46, 79, 92, and 93.
10) Order any additional Accessory Options described under ACCESSORY DESCRIPTIONS.

**List 10: MCA (Standard Application)**



**Features**

- Provides one standard application Meter-Control-Alarm (MCA) assembly (Configuration No. 534876). Refer to SPECIFICATIONS for a description of MCA functions.
- Alarms: Major, Minor, High Voltage #1, High Voltage #2, Battery on Discharge, 50% Battery On Discharge, AC Fail, MCA Audible, Test/Equalize Mode.

**Restrictions**

Only one (1) MCA per power system is required.

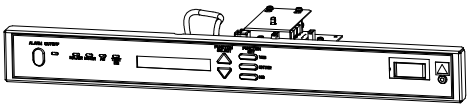
Mounts in the Main Bay Distribution Cabinet.

Cannot be ordered with List 2 or List 5.

**Ordering Notes**

1) Order one (1) List 10, 11, 12, or 13 as required per power system.

**List 11: MCA (Special Application)**



**Features**

- Provides one special application Meter-Control-Alarm (MCA) assembly (Configuration No. 534877). Refer to SPECIFICATIONS for a description of MCA functions.
- Alarms: Major, Minor, High Voltage #1, Rectifier Module Fail Major, Battery On Discharge, Rectifier Module Fail Minor, AC Fail, MCA Audible, Fuse/Circuit Breaker.

**Restrictions**

Only one (1) MCA per power system is required.

Mounts in the Main Bay Distribution Cabinet.

Cannot be ordered with List 2 or List 5.

**Ordering Notes**

1) Order one (1) List 10, 11, 12, or 13 as required per power system.

**List 12: MCA (Special Application)**

**Features**

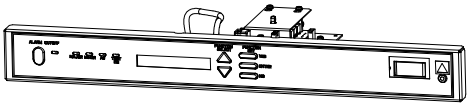
- Provides one special application Meter-Control-Alarm (MCA) assembly (Configuration No. 534878). Refer to SPECIFICATIONS for a description of MCA functions.
- Alarms: Major, Minor, High Voltage #1, MCA Fail, Battery on Discharge, Very Low Voltage, AC Fail, Fuse/Circuit Breaker, Rectifier Module Fail.

**Restrictions**

Only one (1) MCA per power system is required.

Mounts in the Main Bay Distribution Cabinet.

Cannot be ordered with List 2 or List 5.

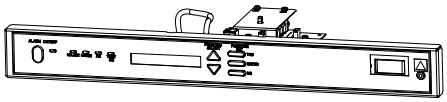


**Ordering Notes**

1) Order one (1) List 10, 11, 12, or 13 as required per power system.

## List 13: MCA (Special Application)

### Features



- Provides one special application Meter-Control-Alarm (MCA) assembly (Configuration No. 534879). Refer to SPECIFICATIONS for a description of MCA functions.
- Alarms: Major, Minor, Test/Equalize 2, Fuse/Circuit Breaker, Battery on Discharge, 50% Battery On Discharge, AC Fail, Low Voltage Disconnect, Test/Equalize 1.

### Restrictions

Only one (1) MCA per power system is required.

Mounts in the Main Bay Distribution Cabinet.

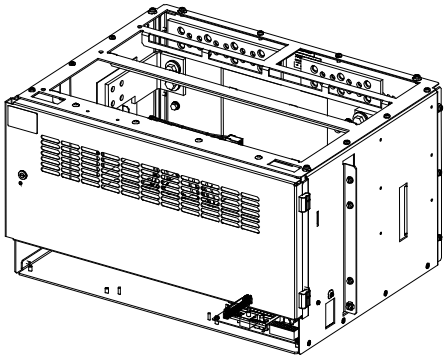
Cannot be ordered with List 2 or List 5.

### Ordering Notes

1) Order one (1) List 10, 11, 12, or 13 as required per power system.

## List 21: One-Row Distribution Cabinet

### Features



- Accepts one (1) Distribution Bus Module.
- Rated for up to 500 amperes of distribution (960 amperes when equipped with List ND).
- Available for use in List 1 and List 5 bays.
- One (1) Quad Shunt circuit card (P/N 507431) is provided with each distribution cabinet. This circuit card can monitor up to four (4) system distribution load shunts. All shunt cards interface with the MCA for system distribution load current monitoring.
- A Low Voltage Disconnect (LVD) circuit card (P/N 509477) is provided in each Distribution Cabinet that…
  - Contains one or more distribution rows that are equipped with a low voltage disconnect contactor, or
  - Controls a Low Voltage Battery Disconnect (LVBD) contactor located in an associated Battery Stand.

  The LVD circuit card provides three separate control circuits. Each control circuit can be programmed, through the MCA, with its own disconnect voltage setpoint and one global reconnect setpoint. One LVD circuit card can control up to four (4) contactors. Any contactor can be controlled by any of the three control circuits on the card by setting of user-selectable switches.

  Where more than one Distribution Cabinet contains an LVD control circuit card, the control circuits on all LVD circuit cards can be set to any of the three MCA-controlled disconnect setpoints independently with user-selectable switches.

  Each of the three control circuits on any LVD card consists of two individual battery voltage monitors, both of which must sense low system voltage before disconnection can occur. This redundancy prevents a control circuit failure from unnecessarily disconnecting loads or batteries.

  The user can set the low voltage disconnect circuits for either automatic or manual reconnect.
  - **Automatic Reconnect:** When system bus voltage recovers to a preset adjustable value, the low voltage disconnect circuits automatically reconnect the loads (or battery) to the system bus.
  - **Manual Reconnect:** When system bus voltage has recovered to a preset adjustable value, the user must issue a command via the MCA to reconnect loads (or battery) to the system bus.

A local switch provided in each Distribution Cabinet can be set to inhibit LVD operation for adjustment, maintenance, and repair purposes. A local indicator illuminates when the low voltage disconnect circuit has been inhibited. LVD operation is not inhibited in any other Distribution Cabinets in the power system.

### Restrictions

Not available for List 2 bays (no interbay busbar landings available).

Cannot be ordered with List 1 if it is to be used with a List 2.

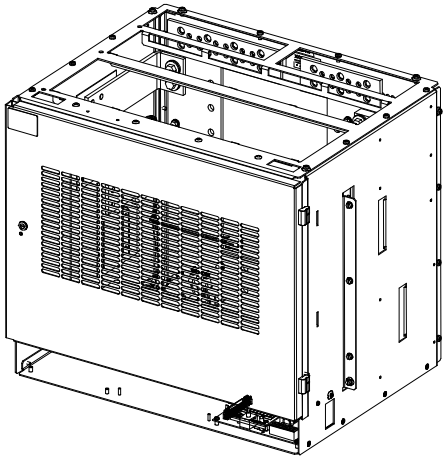
**Ordering Notes**

1) Order one (1) Distribution Bus Module for each List 21 per 'Distribution Bus Modules'.
2) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
3) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.

## List 22: Two-Row Distribution Cabinet

**Features**

- Accepts up to two (2) Distribution Bus Module.
- Rated for up to 1,000 amperes of distribution.
- Available for use in List 1, List 2, and List 5 bays.
- See also the description of the Quad Shunt circuit card under List 21 features.
- See also the description of the Low Voltage Disconnect circuit card under List 21 features.



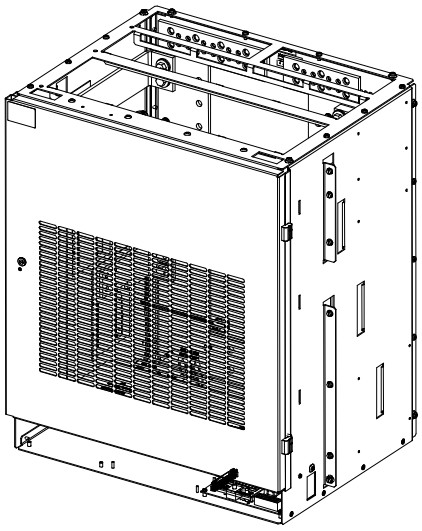
**Ordering Notes**

1) Order up to two (2) Distribution Bus Modules for each List 22 per 'Distribution Bus Modules'.
2) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
3) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.

## List 23: Three-Row Distribution Cabinet

**Features**

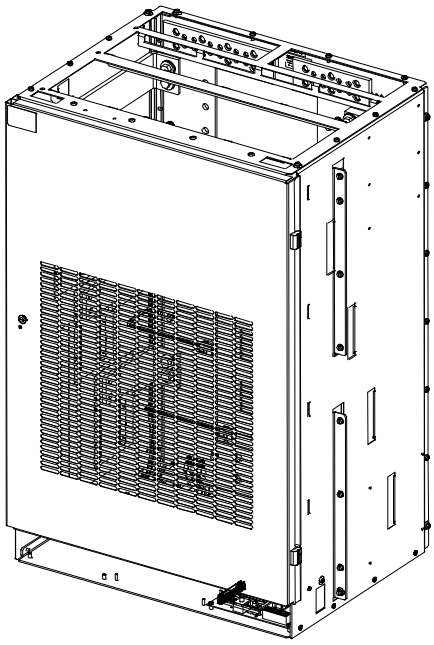
- Accepts up to three (3) Distribution Bus Modules.
- Rated for up to 1500 amperes of distribution.
- Available for use in List 1, List 2, and List 5 bays.
- See also the description of the Quad Shunt circuit card under List 21 features.
- See also the description of the Low Voltage Disconnect circuit card under List 21 features.



**Ordering Notes**

1) Order up to three (3) Distribution Bus Modules for each List 23 per 'Distribution Bus Modules'.
2) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
3) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.

## List 24: Four-Row Distribution Cabinet



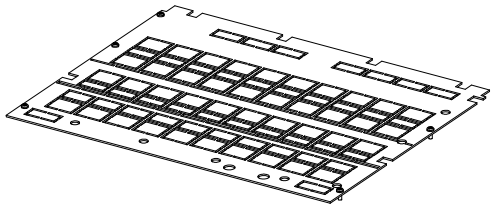
### Features

- Accepts up to four (4) Distribution Bus Modules.
- Rated for up to 2000 amperes of distribution.
- Available for use in List 1, List 2, and List 5 bays.
- See also the description of the Quad Shunt circuit card under List 21 features.
- See also the description of the Low Voltage Disconnect circuit card under List 21 features.

### Ordering Notes

1) Order up to four (4) Distribution Bus Modules for each List 24 per 'Distribution Bus Modules'.
2) Order fuses and/or circuit breakers, as required, per 'Distribution Devices' under ACCESSORY DESCRIPTIONS.
3) Order input and load distribution lugs, as required, per 'Wiring Components' under ACCESSORY DESCRIPTIONS.

## List 29: Top Shield for Distribution Cabinet



### Features

- Plastic shield covers all wiring access openings in top of Distribution Cabinet. Individual cutouts can be removed for wiring as required for specific installation.

### Ordering Notes

1) Where closed top cover is required, order one (1) List 29 for each List 21, 22, 23, and 24 ordered.

## List 31: Rectifier Module Mounting Shelf Interface Components

### Features

- Provides components to add one (1) to six (6) Rectifier Module Mounting Shelf(s) (Spec. No. 588705000) to a Main or Supplemental Bay.

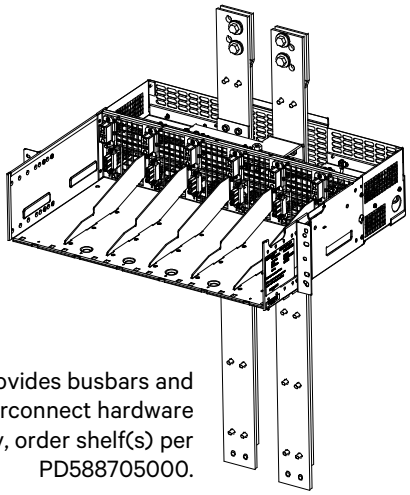
### Restrictions

Includes 'Rectifier Module Mounting Shelf-to-Power System/Distribution Cabinet' interconnect components only.

Rear access required for AC input connections when List 45 or 46 are not ordered.

Maximum of six (6) List 31.

Only two List 31 rectifier shelves can be added to a system in the field for expansion.

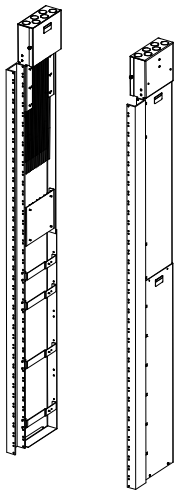


Provides busbars and interconnect hardware only, order shelf(s) per PD588705000.

### Ordering Notes

1) Specify how many Rectifier Module Mounting Shelf(s) are to be installed in the bay so correct busbars can be provided, and if space between Distribution Cabinet and 1st Rectifier Module Mounting Shelf is either 0U or 2U.
2) Order Rectifier Module Mounting Shelf(s) as required per PD588705000. (Single-phase and three-phase input options are available.)
3) Order Rectifier Modules as required per P/N 1R483200e or 1R483200.
4) Order a Rectifier Module Mounting Position Blank Cover Panel, P/N 21140440, for each empty rectifier module mounting position in the system.

**List 45: Top Mount AC Input Termination Panel for Single Phase Input**



**Features**

- Consists of a pre-wired, top-mount AC input termination panel. Provides input terminations for up to six (6) List 31 Rectifier Module Mounting Shelves (36 individual feeds). Panel accepts (12) 3/4" conduit fittings (six per side).
- 4U high termination panel mounts on top of Distribution Cabinet, and can extend above relay rack. Distribution Cabinet can be mounted so that List 45 uses 0U, 1U, 3U, or 4U of rack space.

**Restrictions**

For use with List 1 of 588705000 only (single-phase input). NOT FOR USE WITH LIST 11 OF 588705000 (SHELF W/ AC INPUT LINE CORDS).

Factory installed only.

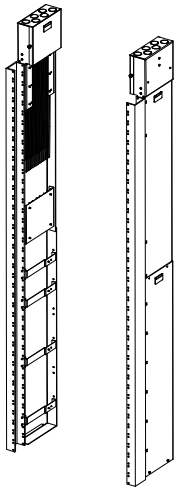
For initial installation only. Initial rectifier shelves are factory wired to List 45. If rectifier shelves are added to the system, AC inputs MUST be wired directly to the shelves.

CANNOT be installed where List 45 uses exactly 2U of rack space.

**Ordering Notes**

1) For top-mount AC input termination, order one (1) List 45 per Bay.
2) Specify 0U, 1U, 3U, or 4U of rack space List 45 is to occupy. (List 45 can extend above top of relay rack.)

**List 46: Top Mount AC Input Termination Panel for Three Phase Input**



**Features**

- Consists of a pre-wired, top-mount AC input termination panel. Provides two (2) three-phase input circuits for each of up to six (6) List 31 Rectifier Module Mounting Shelves (12 three-phase feeds total). Panel accepts (12) 3/4" conduit fittings (six per side).
- 4U high termination panel mounts on top of Distribution Cabinet, and can extend above relay rack. Distribution Cabinet can be mounted so that List 46 uses 0U, 1U, 3U, or 4U of rack space.

**Restrictions**

For use with List 3 of 588705000 only (three-phase input).

Factory installed only.

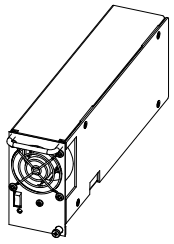
For initial installation only. Initial rectifier shelves are factory wired to List 46. If rectifier shelves are added to the system, AC inputs MUST be wired directly to the shelves.

CANNOT be installed where List 46 uses exactly 2U of rack space.

**Ordering Notes**

1) For top-mount AC input termination, order one (1) List 46 per Bay.
2) Specify 0U, 1U, 3U, or 4U of rack space List 46 is to occupy. (List 46 can extend above top of relay rack.)

**List 62: Optional 20A Converter Module**



**Features**

- Provides Model MHSB20A, Spec. No. 486800128, -48V to +24V (20 ampere) Converter Module.
- For more information, refer to System Application Guide SAG588249700 in the Power System User Manual.

**Restrictions**

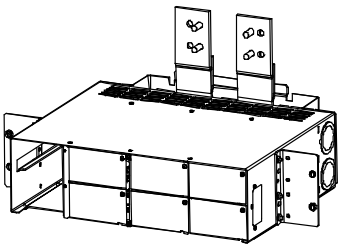
For use with List 63 and 64 only.

**Ordering Notes**

1) Order as required.

## List 63: Optional 160A Converter Shelf (Initial Shelf)

### Features



- Provides (1) Model MHSB160CAB, Spec. No. 588249700, -48V to +24V DC-DC 160A Converter Mounting Shelf. Includes input busbars and output cabling. Includes alarm cabling for List 63 and List 64.
- Holds up to eight (8) List 62 Converter Modules.
- For more information, refer to SAG588249700 in the Power System User Manual.

### Restrictions

Maximum of one (1) List 63 per Power System. For more capacity, order (1) List 64.

Must be installed in Main Bay **only**.

Must be used in conjunction with a dual voltage bus distribution panel assembly (List JA, JB, JC, JD, KA, LB, or LC).

Must be located directly beneath bottom (last) PCU Mounting Shelf.

List 92 is **not** available when List 63 is ordered.

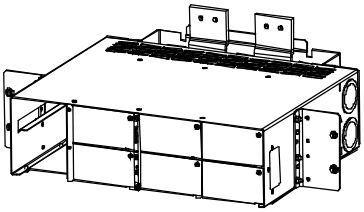
Bay will accommodate a maximum total of (4) List 63, List 64 and List 93.

### Ordering Notes

1) For initial Converter Mounting Shelf, order (1) List 63.
2) For an additional Converter Mounting Shelf, order (1) List 64.
3) Order up to eight (8) converter modules (List 62) for List 63.

## List 64: Optional 160A Converter Shelf (Expansion Shelf)

### Features



- Provides (1) Model MHSB160CAB, Spec. No. 588249700, -48V to +24V DC-DC 160A Converter Mounting Shelf. Includes input busbars and output cabling to a dual voltage bus distribution assembly.
- Holds up to eight (8) List 62 Converter Modules.
- For more information, refer to SAG588249700 in the Power System User Manual.

### Restrictions

Maximum of one (1) List 64 per Power System.

Must be installed in Main Bay **only**.

Must be used in conjunction with a List 63 and a dual voltage bus distribution panel assembly (List JA, JB, JC, JD, KA, LB, or LC).

Must be located directly beneath List 63.

List 92 is **not** available when List 64 is ordered.

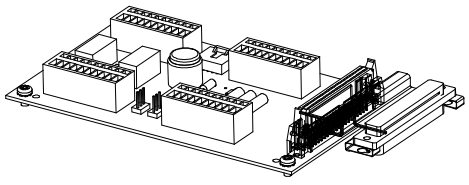
Bay will accommodate a maximum total of (4) List 63, List 64 and List 93.

### Ordering Notes

1) For initial Converter Mounting Shelf, order (1) List 63.
2) For an additional Converter Mounting Shelf, order (1) List 64.
3) Order up to eight (8) converter modules (List 62) for List 64.

## List 71: Optional Audible Alarm and Alarm Termination Circuit Card

### Features



- Provides an Audible Alarm and Alarm Termination circuit card (524734). This circuit card is interconnected to the MCA. The circuit card provides spring-clamp type terminals for connection of customer wiring to the MCA's external alarm circuits in lieu of the standard alarm cable.
- Includes a local audible alarm-sounding device connected to the external audible alarm contacts. The audible alarm can be silenced locally.

**Restrictions**

Must be located in Main Bay (List 1) only.

Audible alarm is inoperative when used with List 12 or 13 MCA (no audible alarm relay contacts available).

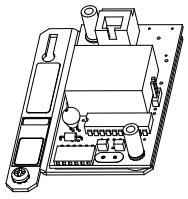
**Ordering Notes**

1) Order per site requirements.

## List 72: MCA Interface Modem Option

**Features**

- Provides a 2400 bits/s Modem circuit card, Spec. No. 486781300, plus associated hardware.
- This option plugs into the MCA.
- Allows MCA interface via a modem port.
- See also WinLink Software (List 73).



**Restrictions**

Must be located in Main Bay (List 1) only.

Only one interface option (List 72, 74, 75, 76, 77, 78 or RS-485) can be installed.

Do not order this option when the power system is equipped with List 80 (LMS1000 Monitoring System).

**Ordering Notes**

1) Order this option for each Power System (MCA) to be accessed via WinLink Software (List 73) via modem.

## List 73: MCA Interface WinLink Software

**Features**

- Provides Spec. No. 041182000 (WinLink Software).
- WinLink Software provides the user the ability to remotely communicate with multiple Power Systems equipped with an MCA. Only one Power System (MCA) can be remotely connected at a time. This allows a user to remotely monitor, control, and adjust the Power System via WinLink. Remote communications can be done over dial-up phone lines when the Power System is equipped with the List 72 Modem or List 74 RS-232/Modem MCA Interface Option. Remote communications can be done via an RS-232 connection when the Power System is equipped with the List 74 RS-232/Modem MCA Interface Option. Remote communications can be done via a TCP/IP connection when the Power System is equipped with the Ethernet MCA Interface Option (List 75, 76, 77, or 78).
- With WinLink Software, most tasks accomplished via the Power System's MCA local interface pad can be done remotely. This includes alarm monitoring, voltage/current monitoring, and adjustment of alarm and control circuits.
- Runs under Windows 98, ME, NT 4.0, 2000, or XP.
- See also Modem (List 72), RS-232/Modem (List 74), or Ethernet (List 75, 76, 77, or 78) MCA Interface Options.

**Restrictions**

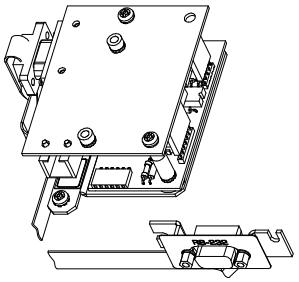
Not required for Lists 75, 76, 77, or 78.

**Ordering Notes**

1) Only one List 73 required for each computer installation.

**List 74: MCA Interface Combination Modem/RS-232 Option**

**Features**



- Provides a Modem circuit card, an RS-232 circuit card, and associated mounting hardware.
- This option plugs into the MCA.
- Allows MCA interface via an RS-232 and Modem port.
- See also WinLink Software (List 73).

**Restrictions**

Must be located in Main Bay (List 1) only.

Only one interface option (List 72, 74, 75, 76, 77, 78 or RS-485) can be installed.

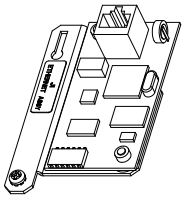
Do not order this option when the power system is equipped with List 80 (LMS1000 Monitoring System).

**Ordering Notes**

1) Order this option for each Power System (MCA) to be accessed via WinLink Software via modem or RS-232.

**List 75: MCA Interface Ethernet Option: Modbus® TCP + Web Interface**

**Features**



- Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- Ethernet circuit card provides a Modbus® TCP Interface and a Web Interface.
- This option plugs into the MCA.
- Allows MCA interface via an Ethernet port.

**Restrictions**

Must be located in Main Bay (List 1) only.

Only one interface option (List 72, 74, 75, 76, 77, 78 or RS-485) can be installed.

Do not order this option when the power system is equipped with List 80 (LMS1000 Monitoring System).

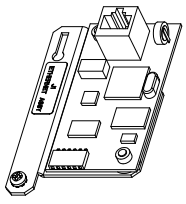
The Ethernet card requires an MCA with firmware version 5.2.0 or later.

**Ordering Notes**

1) Order this option for each Power System (MCA) to be accessed via WEB Interface.
2) Order optional Front Access Ethernet Connector Kit P/N 525110, as required. This includes an RJ45 connector, mounting bracket, and jumper that mounts in the cutout provided on the front of the MCA Panel. CANNOT be used when *System Load Shunt Test Point Kit* is required.

**List 76: MCA Interface Ethernet Option: Modbus® TCP + Web Interface + SNMP**

**Features**



- Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- Ethernet circuit card provides a Modbus® TCP Interface, a Web Interface, and SNMP.
- This option plugs into the MCA.
- Allows MCA interface via an Ethernet port.

**Restrictions**

Must be located in Main Bay (List 1) only.

Only one interface option (List 72, 74, 75, 76, 77, 78 or RS-485) can be installed.

Do not order this option when the power system is equipped with List 80 (LMS1000 Monitoring System).

The Ethernet card requires an MCA with firmware version 5.2.0 or later.

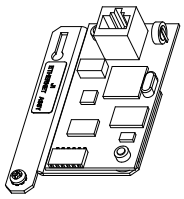
**Ordering Notes**

1) Order this option for each Power System (MCA) to be accessed via WEB Interface.

2) Order optional Front Access Ethernet Connector Kit P/N 525110, as required. This includes an RJ45 connector, mounting bracket, and jumper that mounts in the cutout provided on the front of the MCA Panel. CANNOT be used when *System Load Shunt Test Point Kit* is required.

**List 77: MCA Interface Ethernet Option:**
**Modbus® TCP + Web Interface + Battery Monitoring**

**Features**



- Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- Ethernet circuit card provides a Modbus® TCP Interface, a Web Interface, and Battery Monitoring.
- This option plugs into the MCA.
- Allows MCA interface via an Ethernet port.

**Restrictions**

Must be located in Main Bay (List 1) only.

Only one interface option (List 72, 74, 75, 76, 77, 78 or RS-485) can be installed.

Do not order this option when the power system is equipped with List 80 (LMS1000 Monitoring System).

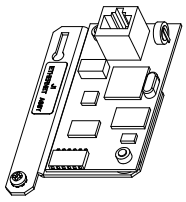
The Ethernet card requires an MCA with firmware version 5.2.0 or later.

**Ordering Notes**

1) Order this option for each Power System (MCA) to be accessed via WEB Interface.
2) Order optional Front Access Ethernet Connector Kit P/N 525110, as required. This includes an RJ45 connector, mounting bracket, and jumper that mounts in the cutout provided on the front of the MCA Panel. CANNOT be used when *System Load Shunt Test Point Kit* is required.

**List 78: MCA Interface Ethernet Option:**
**Modbus® TCP + Web Interface + SNMP + Battery Monitoring**

**Features**



- Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- Ethernet circuit card provides a Modbus® TCP Interface, a Web Interface, Battery Monitoring, and SNMP.
- This option plugs into the MCA.
- Allows MCA interface via an Ethernet port.

**Restrictions**

Must be located in Main Bay (List 1) only.

Only one interface option (List 72, 74, 75, 76, 77, 78 or RS-485) can be installed.

Do not order this option when the power system is equipped with List 80 (LMS1000 Monitoring System).

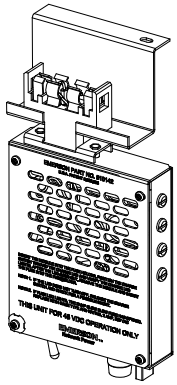
The Ethernet card requires an MCA with firmware version 5.2.0 or later.

**Ordering Notes**

1) Order this option for each Power System (MCA) to be accessed via WEB Interface.
2) Order optional Front Access Ethernet Connector Kit P/N 525110, as required. This includes an RJ45 connector, mounting bracket, and jumper that mounts in the cutout provided on the front of the MCA Panel. CANNOT be used when *System Load Shunt Test Point Kit* is required.

**List 79: Capacitor Precharge Assembly**

**Features**



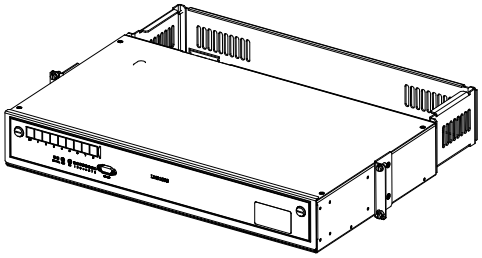
- Precharges load capacitors through the terminals of a GJ/218-type circuit breaker or TPH type fuseholder.
- Includes 3 ft. long clip leads.
- Includes mounting bracket.

**Ordering Notes**

1) Order per site requirements.

**List 80: LMS1000 Monitoring System**

**Features**



- Provides a Model LMS1000, Spec. No. 586505500, Master Node cabinet and CPU circuit card. The LMS1000 is a programmable monitoring, controlling, and data acquisition system designed for use in telecommunications power sites. Refer to SAG586505500 for further information.
- Also supplied is an RS-485 Communications Interface Circuit Card Assembly, Spec. No. 486781400. This assembly plugs onto the MCA circuit card, and allows the MCA to interface with the LMS1000, via an RS-485 port.
- Also provided is an interface cable that interconnects the MCA and the LMS1000.

**Restrictions**

Must be located in Main Bay **only**.

A maximum of one (1) List 80 can be used per power system, and must be mounted in a 2U space between the distribution enclosure and the top Rectifier Module Mounting Shelf in the Main Bay.

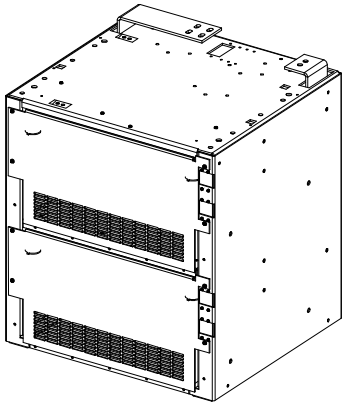
Do not order List 72, 74, 75, 76, 77 or 78 when List 80 is ordered.

**Ordering Notes**

1) Order per site requirements.
2) Order LMS1000 options as required per SAG586505500 (example; input/output cards to monitor points external to the power system).

**List 92: Battery Stand Interface Components**

**Features**



- Complete battery stand platform, including monitoring options. For more information, refer to SAG588820000.
- When List 92 is ordered as part of the system, the power system can be mounted in a relay rack on top of the battery stand.

**Restrictions**

Cannot be ordered with Lists RA, RB, RC, RD, RE, 63, 64, or 93.

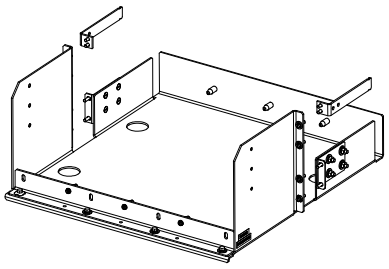
Power system must be mounted in one of these relay racks: 543151, 543152, 543153, 543154, 543155, 543156, and 543157.

**Ordering Notes**

1) Order per site requirements.

## List 93: Battery Tray, Pre-Cabled

### Features



- Provides one battery tray that mounts four (4) 12V front terminal VLRA batteries. Batteries are configured as one (1) 48V string. Battery cabling is factory-connected to Power System main bus.
- Accepts various Valve Regulated Lead Acid (VLRA) batteries. See **Ordering Notes** below.
- Tray dimensions are 21.3" wide X 22.4" deep. See 'List 93 (Battery Tray)' under *PHYSICAL SIZE INFORMATION* for a typical battery tray arrangement.
- Trays can be ordered with or without Battery Disconnect circuit breakers. When circuit breakers are ordered, one is provided in the –48V lead of each battery string (1 circuit breaker per tray).

### Restrictions

Cannot be used with Lists RA, RB, RC, RD, RE, or 92.

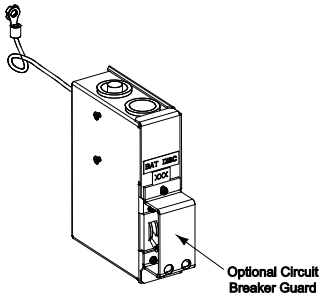
Maximum number of List 93's per bay is four (4).

A single List 93 must mount at bottom of bay. Multiple List 93's must mount starting at bottom of bay and working upward.

Not a stand-alone battery system. Must be used as part of a power system that includes List 1, List 2 or List 5 with List 21, 22, 23, or 24 and List 31.

### Ordering Notes

1) Order multiples of List 93 for more than one (1) battery tray. See Restrictions above.
2) Order batteries separately. Table A lists batteries recommended for use with List 93.
3) Specify rack spacing of 7U (12.25") or 8U (14") between trays and above top tray as required for battery clearance. See Table A.
4) Specify the batteries you intend to use with each List 93 ordered. Lugs for battery connections vary according to the batteries to be installed. Battery cables will be lugged as shown in Table B. Table B is provided for reference only.
5) Specify with or without Battery Disconnect circuit breakers. Note: All List 93 trays in a bay will be furnished with or without Battery Disconnect circuit breakers as specified for the first tray ordered.
6) An assembly for connection of all List 93's is automatically added to the order. Part number depends on system configuration.
7) If ordering List 93 with circuit breakers, order one (1) circuit breaker per List 93 from Table C. For double-pole circuit breakers, also order an optional circuit breaker guard (P/N 548014) per circuit breaker if desired.
8) If ordering List 93 with circuit breakers, specify breaker mounting on left side or right side of tray.
9) If optional front battery covers are desired, order per *Optional Front Battery Covers* in the ACCESSORY DESCRIPTIONS section.



| Manufacturer* | Model | Vertiv Network Power P/N | Rated 8-Hr. Capacity (Ah) | Dimension W x L x H (Inches) | Required Tray Spacing | Weight (per battery) (lbs) |
|---|---|---|---|---|---|---|
| C&D | TEL12-105F | 514368 | 100 | 4.94 x 22.51 x 9.00 | 6U | 84.9 |
| C&D | TEL12-160F | 140456 | 157 | 4.95 x 22.01 x 11.14 | 7U | 115 |
| C&D | TEL12-180F | -- | 181 | 4.95 x 22.01 x 12.60 | 8U | 131 |
| Deka | 12AVR-150ET | 122018 | 150 | 4.90 X 22.00 X 11.75 | 8u | 115 |
| Deka | 12AVR-170ET | 541381 | 170 | 4.91 x 22.16 x 12.60 | 8U | 120 |
| Deka | HR5500ET | -- | 152 | 4.90 x 22.00 x 11.75 | 8U | 120 |
| Douglas | DSN12-110F | -- | 110 | 4.92 x 22.05 x 8.94 | 6U | 86.4 |
| Douglas | DSN12-170F | 127691 | 171 | 4.92 x 22.05 x 12.60 | 8U | 129.6 |
| Douglas | DST12-170F | -- | 170 | 4.96 x 21.97 x12.64 | 8U | 132 |
| Enersys | 12TX105F | -- | 100 | 4.90 x 22.10 x 9.30 | 6U | 105.8 |
| Enersys | 12V100F | -- | 100 | 4.9 x 22.00 x 9.00 | 6U | 104.7 |
| Enersys | 12V155FS | 122010 | 155 | 4.9 x 22.10 x 11.10 | 7U | 125.6 |
| Enersys | 12V170F | -- | 170 | 4.90 x 22.10 x 12.40 | 8U | 147.7 |
| Enersys | 12VF105F | -- | 107 | 4.90 x 22.10 x 9.30 | 6U | 101.4 |
| Enersys | 12VX100F | -- | 100 | 4.9 x 22.00 x 9.00 | 6U | 104.7 |
| Enersys | SBS 170F | -- | 170 | 4.90 x 22.10 x 11.10 | 7U | 115.7 |
| Enersys | SBS 190F | -- | 190 | 4.90 x 22.10 x 12.40 | 8U | 132.3 |
| Fiamm | 12FAT100 | -- | 100 | 4.96 x 21.97 x 9.06 | 6U | 90.39 |
| Fiamm | 12FAT125 | -- | 125 | 4.96 x 21.97 x 10.67 | 7U | 110.23 |
| Fiamm | 12FAT155 | -- | 155 | 4.96 x 21.97 x12.64 | 8U | 132.28 |
| Fiamm | 12UMTx100FT | -- | 100 | 4.96 x 21.97 x 9.06 | 6U | 83.6 |
| Fiamm | 12UMTX110FT | -- | 110 | 4.96 x 21.97 x 9.06 | 6U | 90.36 |
| Fiamm | 12UMTX140FT | -- | 140 | 4.96 x 21.97 x 10.67 | 7U | 110 |
| Fiamm | 12UMTX155FT | -- | 155 | 4.96 x 21.97 x12.64 | 8U | 129.8 |
| Fiamm | 12UMTX170FT | -- | 170 | 4.96 x 21.97 x 12.64 | 8U | 132 |
| Fiamm | 12UMTX180FT | -- | 180 | 4.96 x 21.97 x12.64 | 8U | 134 |
| GNB | M12V125FT | 123617 | 125 | 4.88 x 22.01 x 11.14 | 7U | 104.7 |
| GNB | M12V155FT | 112795 | 155 | 4.88 x 22.01 x 11.14 | 7U | 118.4 |
| GNB | M12V180FT | -- | 180 | 4.88 x 22.01 x 12.5 | 8U | 133 |
| Northstar | NSB110FT | -- | 110 | 4.92 X 22.05 X 8.94 | 6U | 91.3 |
| Northstar | NSB12-600FT | -- | -- | 4.90 X 22.10 X 12.60 | 8U | 131.2 |
| Northstar | NSB155FT | -- | 148 | 4.92 X 22.05 X 11.14 | 7U | 131.2 |
| Northstar | NSB170FT | 127002, 126111 | 168 | 4.92 x 22.05 x 12.60 | 8U | 131 |

* *See Battery Manufacturer Information located at the end of this document.*

Table A

| Battery Lug Kit Part Numbers (Kit provides two lugs for one tray.) | | | |
|---|---|---|---|
| **Battery Specified** | **Ordered Without Circuit Breaker** | **Ordered With Circuit Breaker 125A or Higher** | **Ordered With Circuit Breaker 100A or Lower** |
| C&D TEL12-105F | 528235 | 528235 | 528234 |
| C&D TEL12-160F | 528235 | 528235 | 528234 |
| C&D TEL12-180F | 528235 | 528235 | 528234 |
| Deka 12AVR-150ET | 528235 | 528235 | 528234 |
| Deka 12AVR-170ET | 528235 | 528235 | 528234 |
| Deka HR5500ET | 528235 | 528235 | 528234 |
| Douglas DSN12-110F | 528235 | 528235 | 528234 |
| Douglas DSN12-170F | 528235 | 528235 | 528234 |
| Douglas DST12-170F | 528235 | 528235 | 528234 |
| Enersys 12TX105F | 528235 | 528235 | 528234 |
| Enersys 12V100F | 528235 | 528235 | 528234 |
| Enersys 12V155FS | 528235 | 528235 | 528234 |
| Enersys 12V170F | 528235 | 528235 | 528234 |
| Enersys 12VF105F | 528235 | 528235 | 528234 |
| Enersys 12VX100F | 528235 | 528235 | 528234 |
| Enersys SBS 170F | 528235 | 528235 | 528234 |
| Enersys SBS 190F | 528235 | 528235 | 528234 |
| Fiamm 12FAT 100 | 528235 | 528235 | 528234 |
| Fiamm 12FAT125 | 528235 | 528235 | 528234 |
| Fiamm 12FAT155 | 528235 | 528235 | 528234 |
| Fiamm 12UMTX 100FT | 528235 | 528235 | 528234 |
| Fiamm 12UMTX 110FT | 528235 | 528235 | 528234 |
| Fiamm 12UMTX 140FT | 528235 | 528235 | 528234 |
| Fiamm 12UMTX 155FT | 528235 | 528235 | 528234 |
| Fiamm 12UMTX170FT | 528235 | 528235 | 528234 |
| Fiamm 12UMTX180FT | 528235 | 528235 | 528234 |
| GNB M12V125FT | 528235 | 528235 | 528234 |
| GNB M12V155FT | 528235 | 528235 | 528234 |
| GNB M12V180FT | 528235 | 528235 | 528234 |
| Northstar NSB110FT | 528235 | 528235 | 528234 |
| Northstar NSB12-600FT | 528235 | 528235 | 528234 |
| Northstar NSB155FT | 528235 | 528235 | 528234 |
| Northstar NSB170FT | 528235 | 528235 | 528234 |

Table B

| Ampere Rating | Part Number | |
|---|---|---|
| | Electrical/Mechanical Trip[1] (Black Handle) | Electrical Trip[2] (White Handle) |
| 50 | 256694300 | 256694400 |
| 60 | 256694700 | 256694800 |
| 70 | 256695100 | 256695200 |
| 75 | 256695500 | 256695600 |
| 100 | 256695900 | 256696000 |
| 125 | 100765 | 100762 |
| 150 | 100763 | 100764 |
| 200 | 121810 | 121809 |

Circuit Breaker Alarm Operation:

[1] Provides an alarm during an electrical or manual trip condition.

[2] Provides an alarm during an electrical trip condition only.

Table C

## Distribution Panels

**List AA: Distribution Bus Module (P/N 509840)**
**(24) Fuse/Circuit Breaker System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (24) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

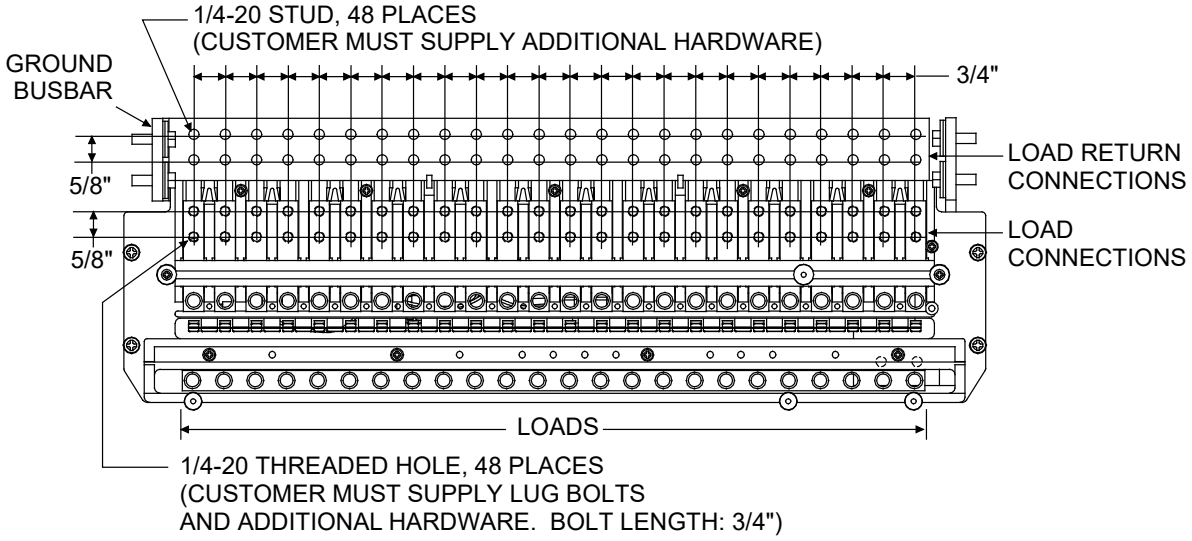
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List AB: Distribution Bus Module (P/N 428316100)**
**(3) GJ/218 Circuit Breaker System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**

**Restrictions**

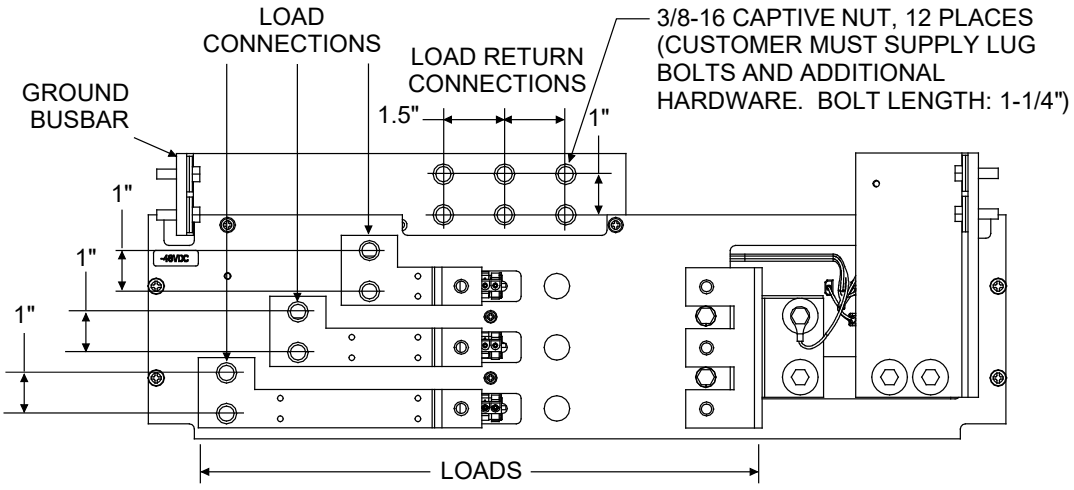
Can be installed in bus positions A-C (row 1-3) of a 1-, 2-, 3-, or 4-bus row cabinet. Cannot be installed in bus position D (row 4) of a 4-bus row cabinet. See also List AC for similar application in bus position D (row 4).

Panel is designed to mount circuit breakers in the following possible combinations:

(3) 100A to 250A
(1) 100A to 250A and (1) 300A or 400A
(1) 600A

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List AC: Distribution Bus Module (P/N 507198)**
**(3) GJ/218 Circuit Breaker System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**

**Restrictions**

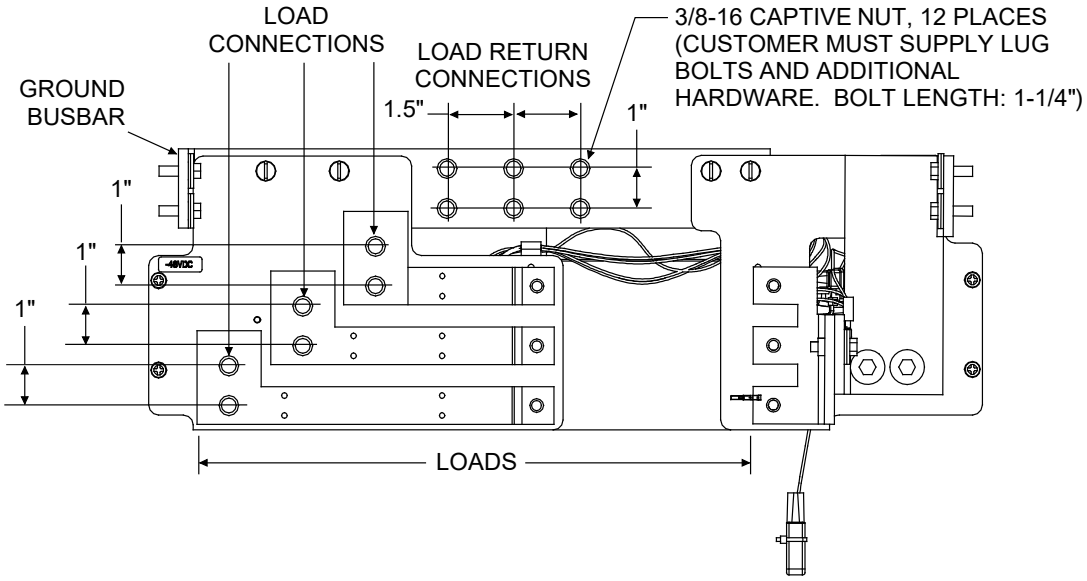
For use in a 4-bus row cabinet only. Must be installed in bus position D (row 4). See also List AB for similar application in bus positions A-C (rows 1-3).

Panel is designed to mount circuit breakers in the following possible combinations:

(3) 100A to 250A
(1) 100A to 250A and (1) 300A or 400A
(1) 600A

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List AD: Distribution Bus Module (P/N 509565)**
**(8) GJ/218 Circuit Breaker System Positions (Upper Two Rows)**

**Features**

- Single Voltage Distribution (-48V).
- 1,000A Maximum Capacity (500A per side).
- (8) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**

**Restrictions**

Occupies two distribution rows.

For use in a 4-bus row cabinet only. Must be installed in bus positions C and D (rows 3 and 4). See also List AE for similar application in bus positions A and B (rows 1 and 3) or B and C (rows 2 and 3).

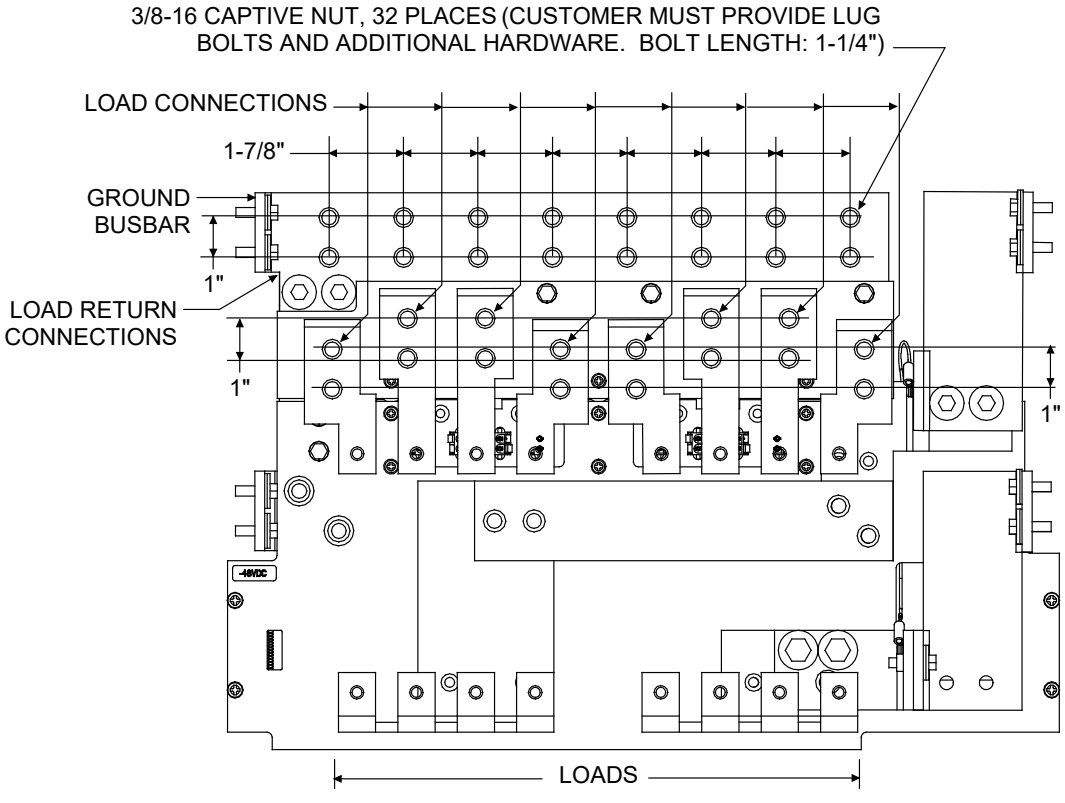
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

(4) 100A to 250A
(2) 100A to 250A and (1) 300A or 400A
(2) 300A or 400A
(1) 600A and (1) 100A to 250A

Unless otherwise specified circuit breakers are divided between the two sides, and are mounted from left to right, starting with the highest capacity and working to the lowest capacity on each side.

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.
3) Order adapter Busbar 559643 as required, per Accessory Descriptions.



**List AE: Distribution Bus Module (P/N 509648)**
**(8) GJ/218 Circuit Breaker System Positions (Lower Two Rows)**

**Features**

- Single Voltage Distribution (-48V).
- 1,000A Maximum Capacity (500A per side).
- (8) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**

**Restrictions**

Occupies two distribution rows.

For use in a 2-, 3-, or 4-bus row cabinet. Must be installed in bus positions A and B (rows 1 and 2), or B and C (rows 2 and 3). See also List AD for similar application in bus positions C and D (rows 3 and 4).

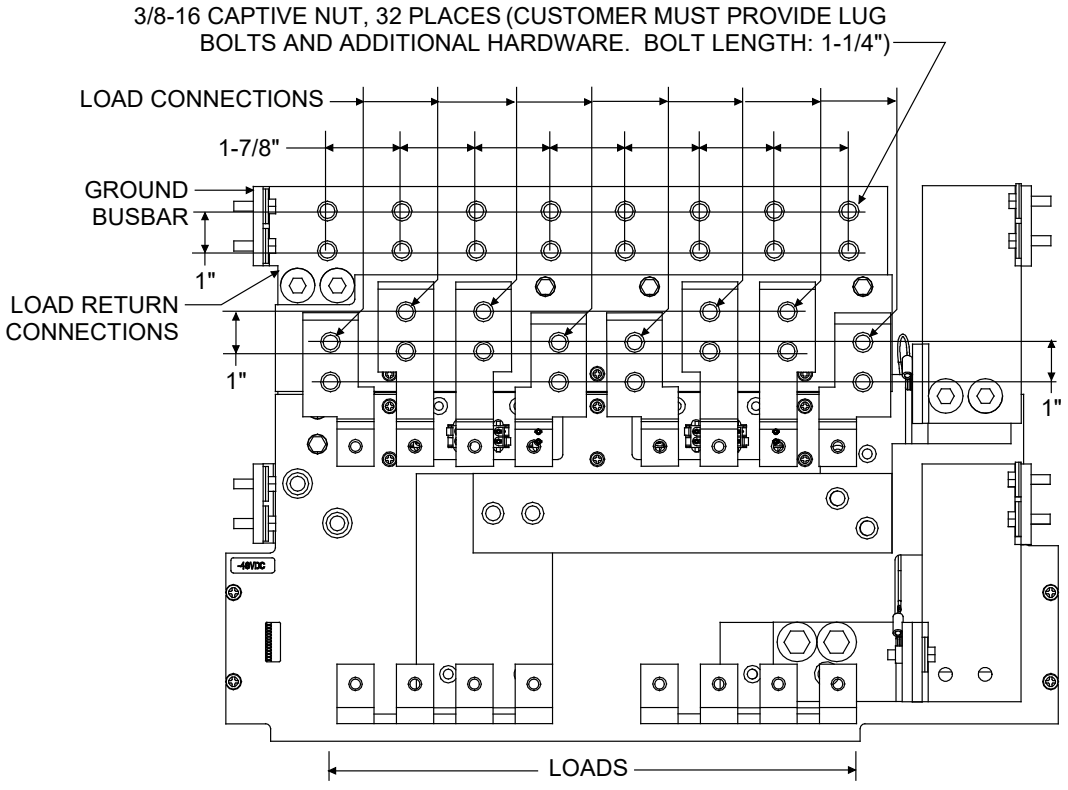
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

(4) 100A to 250A
(2) 100A to 250A and (1) 300A or 400A
(2) 300A or 400A
(1) 600A and (1) 100A to 250A

Unless otherwise specified circuit breakers are divided between the two sides, and are mounted from left to right, starting with the highest capacity and working to the lowest capacity on each side.

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.
3) Order adapter Busbar 559643 as required, per Accessory Descriptions.



**List AG: Distribution Bus Module (P/N 514010)**
**(2) TPH Fuse System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (2) Distribution Fuse Mounting Positions (70 to 600A TPH-Type).

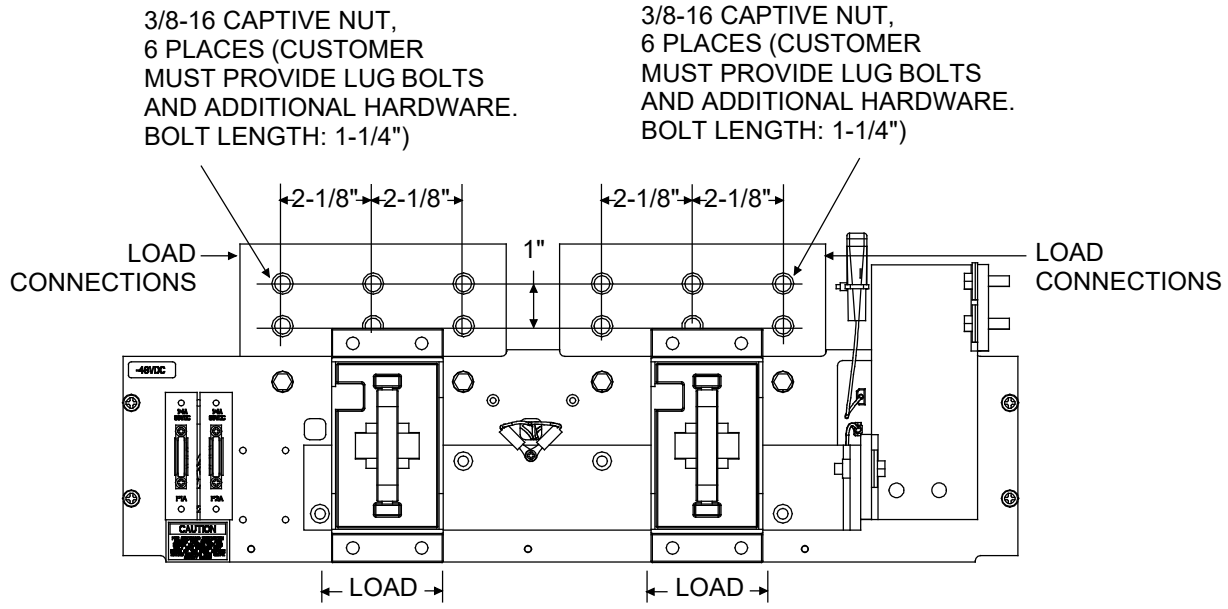
**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Does not provide connection for load returns (see **Ordering Notes**).

**Ordering Notes**

1) To terminate load returns within the distribution cabinet, order one (1) List AH for up to two (2) List AG.
2) Order fuses as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.
3) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List AH: Distribution Bus Module Ground Bar Assembly (P/N 500676) for Use with Up to (2) List AG, AJ, CG, or CJ; or (1) List AP**

**Features**

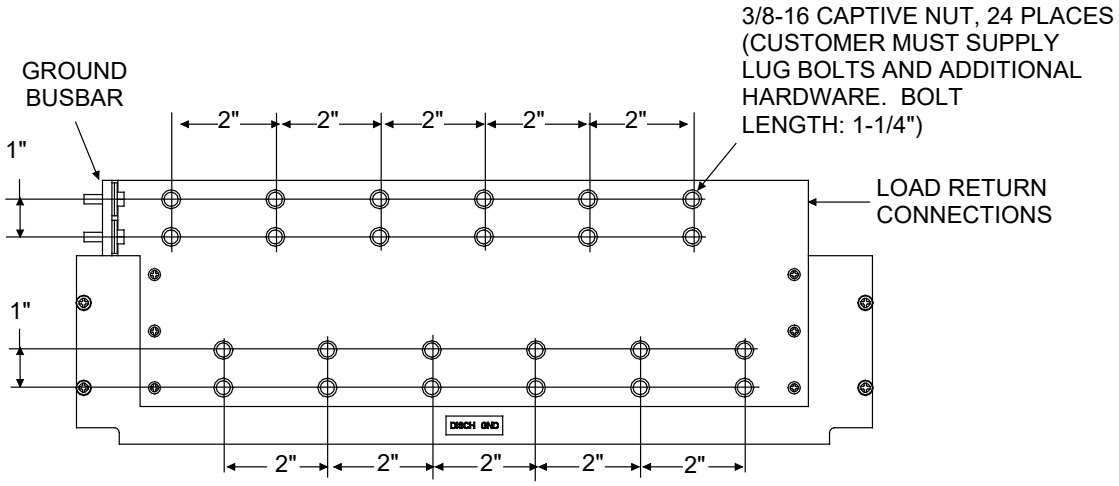
- Single Voltage Distribution (-48V).
- 1000A Maximum Capacity.
- Groundbar Assembly for Use with Up to Two (2) List AG, AJ, CG, or CJ; or one (1) List AP if internal load returns are required.

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Ordering Notes**

1) To terminate load returns within the distribution cabinet, order one (1) List AH for up to two (2) List AG, AJ, CG, or CJ; or one (1) List AH for each (1) List AP.



**List AJ: Distribution Bus Module (P/N 520819)**
**(2) TPH Fuse System Positions with Load Metering Shunts**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (2) Distribution Fuse Mounting Positions (70 to 600A TPH-Type).
- (1) Load Shunt (800A, 50mV) per load fuse is provided. Extended shunt leads are 22 AWG stranded wire, approximately 7-10 ft. long from exit point at bottom of Distribution Cabinet. Each shunt lead is equipped with a 49.9 ohm current limiting resistor. If a List 80 is ordered, shunt leads in the Main Bay are factory-connected to the LMS1000 unless otherwise specified.

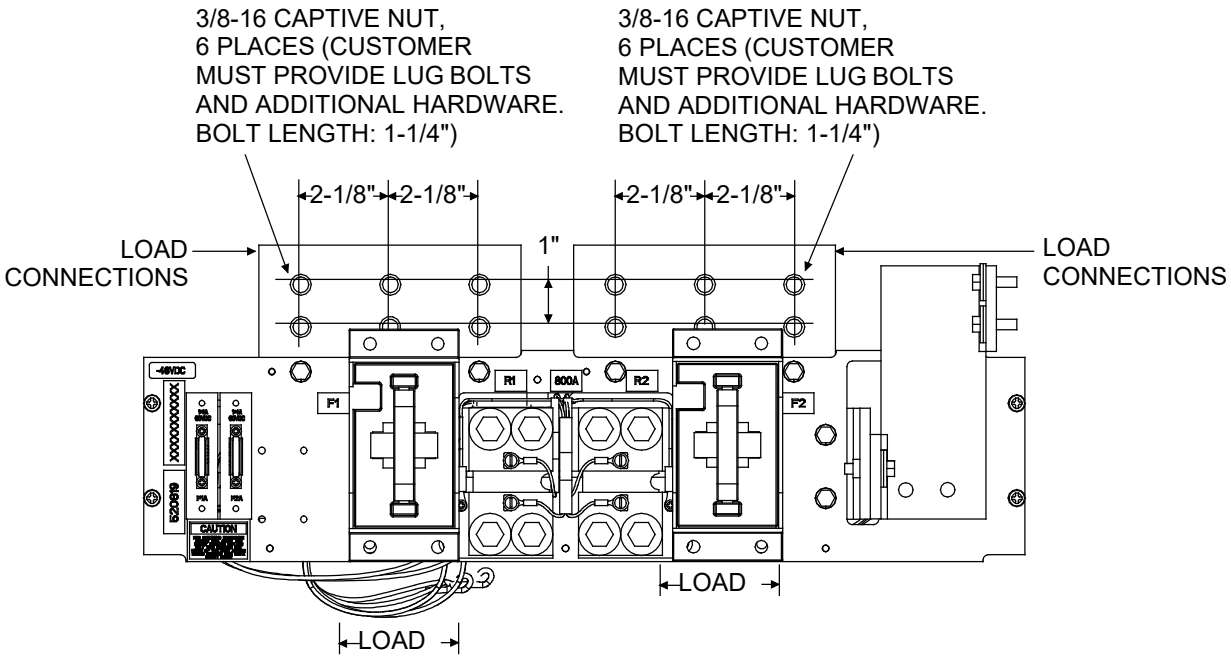
**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Does not provide connection for load returns (see **Ordering Notes**).

**Ordering Notes**

1) To terminate load returns within the distribution cabinet, order one (1) List AH for up to two (2) List AJ.
2) Order fuses as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.
3) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List AK: Distribution Bus Module (P/N 520805)**
**(24) Fuse/Circuit Breaker System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (24) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

**Restrictions**

Provides no ground return busbar. Ground return connections must be made outside of Power Distribution Cabinet, or to List AL.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet. ***NOTE:*** *Additional restrictions apply if used in conjunction with a List AL. See List AL for restrictions.*

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

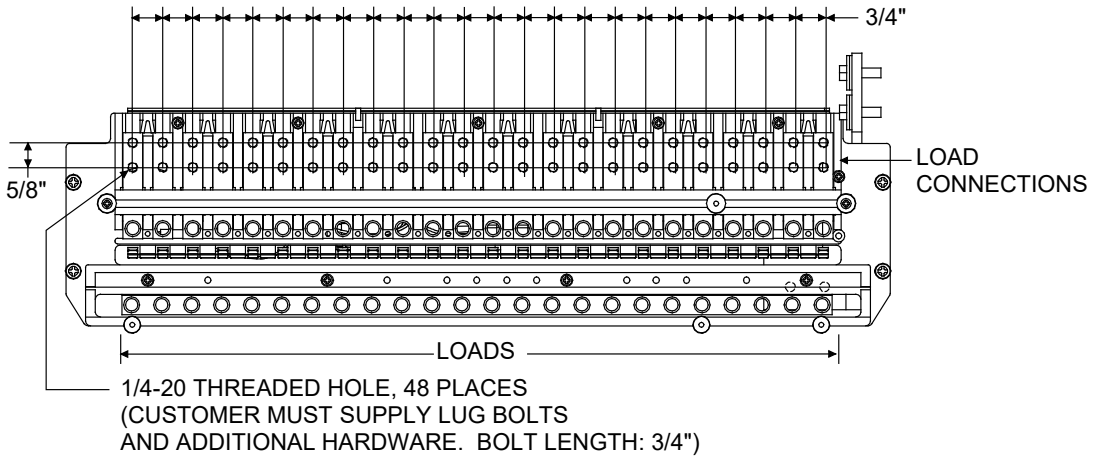
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



## List AL: Distribution Bus Module Ground Bar Assembly for Use with Up to (2) List AK

### Features

- Groundbar Assembly for Use with Up to Two (2) List AK when Internal Load Returns are Required.
- 1000A Maximum Capacity.

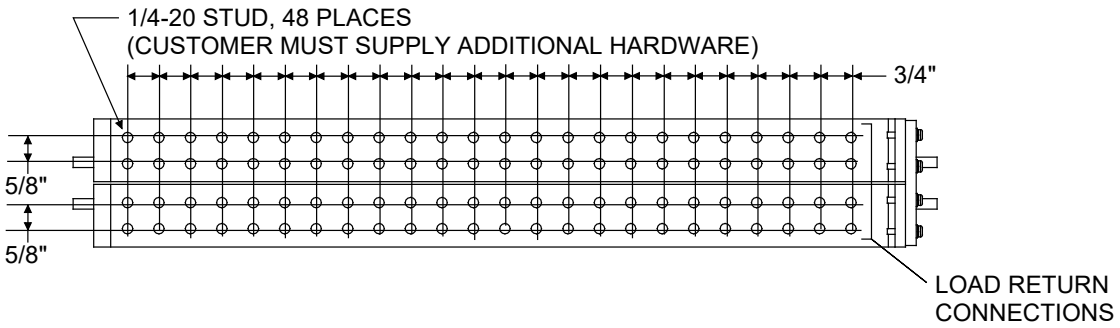
### Restrictions

Can be installed in a 2- or 3-bus row cabinet (List 22 or 23). Must be installed in top row.

Must be installed in the same bus row as a List AK.

### Ordering Notes

1) To terminate load returns within the distribution cabinet, order one (1) List AL for up to two (2) List AK.



**List AM: Distribution Bus Module (P/N 524632)**
**(20) Fuse/Circuit Breaker System Positions**
**(1) 3-Pole Input Disconnect Fuse/Circuit Breaker Position**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (20) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (1) Input Disconnect Fuse / Circuit Breaker 3-Pole Mounting Position (3 to 100A TPS/TLS-Type Fuse / 1 to 250A Bullet Nose Type Circuit Breaker). Disconnects all loads in row from system main bus.

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

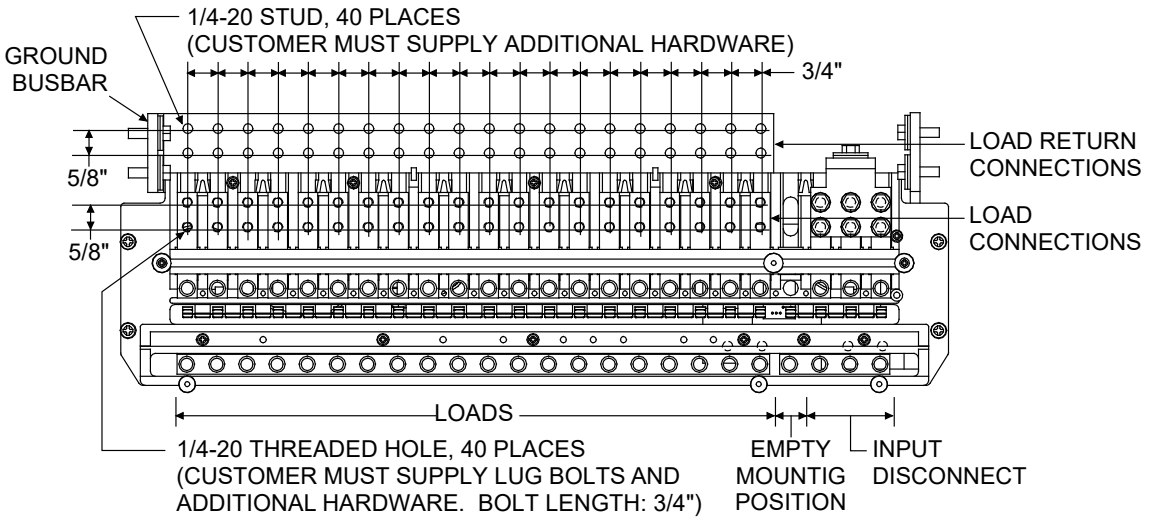
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List AN: Distribution Bus Module (P/N 541386)**
**(24) Fuse/Circuit Breaker System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (24) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

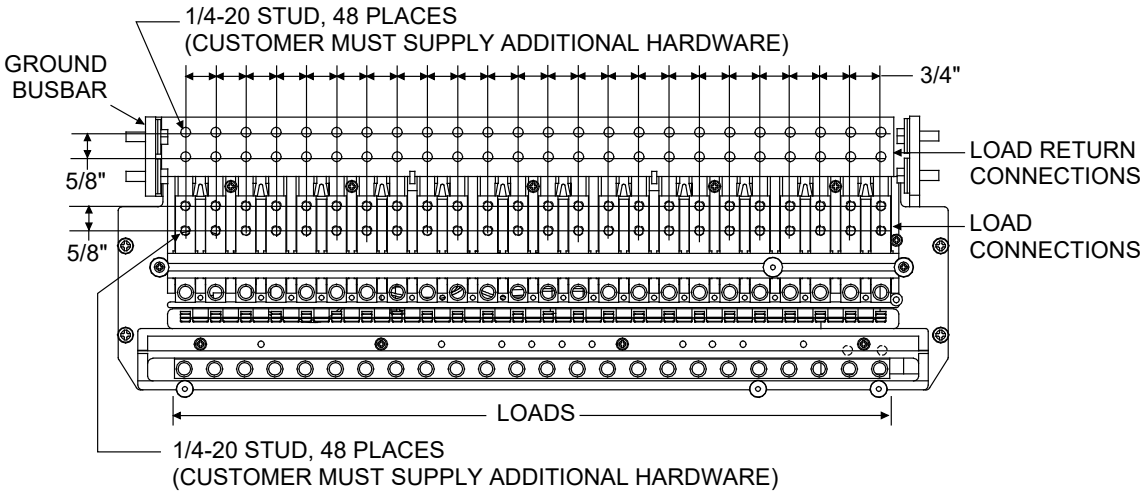
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 101212, as required. Kit provides all hardware required to connect load and ground lugs for two (2) positions of a bullet nose-type distribution assembly.



**List AP: Distribution Bus Module (P/N 541537)**
**(4) TPH Fuse System Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (4) Distribution Fuse Mounting Positions (70 to 400A TPH-Type).

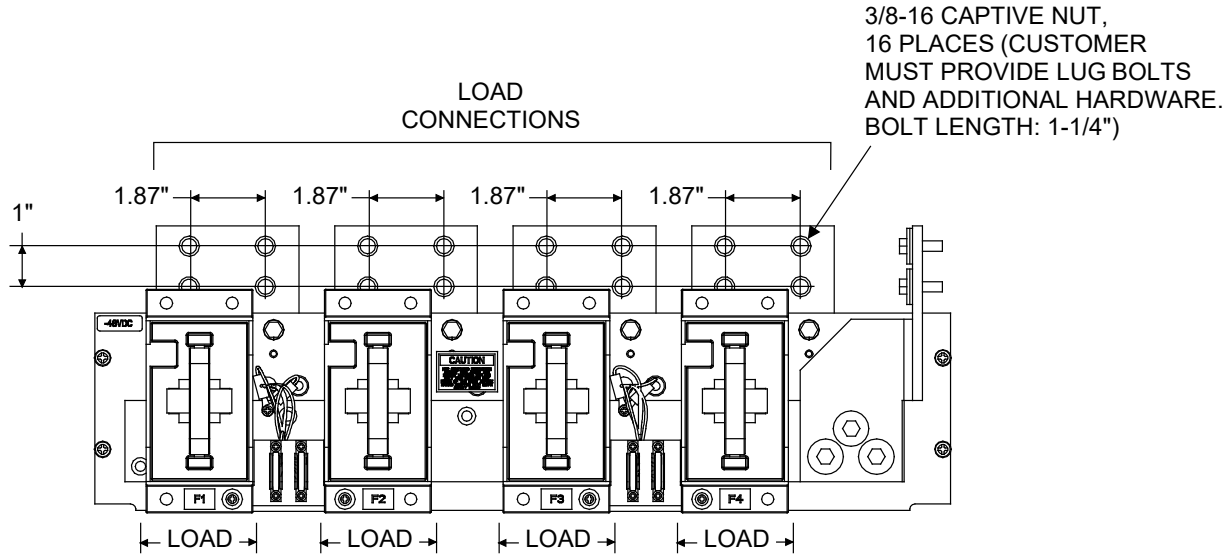
**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Does not provide connection for load returns (see **Ordering Notes**).

**Ordering Notes**

1) To terminate load returns within the distribution cabinet, order one (1) List AH for (1) List AP.
2) Order fuses (up to 400A) as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.
3) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List BA: Distribution Bus Module (P/N 520600)**
**(12) Fuse/Circuit Breaker System Positions with LVD**
**(8) Fuse/Circuit Breaker System Positions without LVD**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (12) LVD-Controlled Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (8) Non-LVD-Controlled Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- Low Voltage Load Disconnect Contactor

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

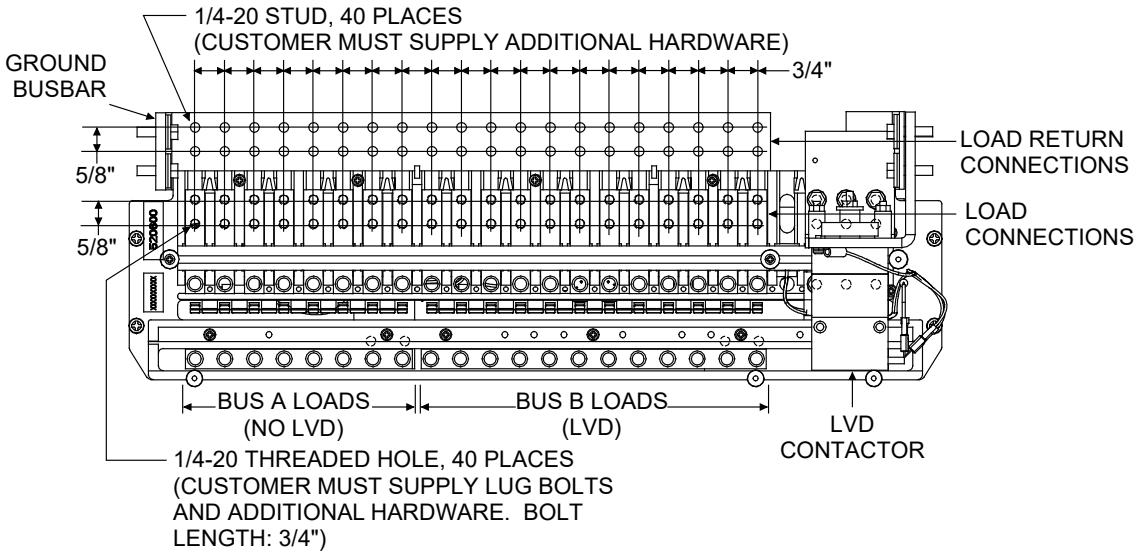
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List CA: Distribution Bus Module (P/N 509846)**
**(20) Fuse/Circuit Breaker System Positions w/LVLD**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (20) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- Low Voltage Load Disconnect Contactor.

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

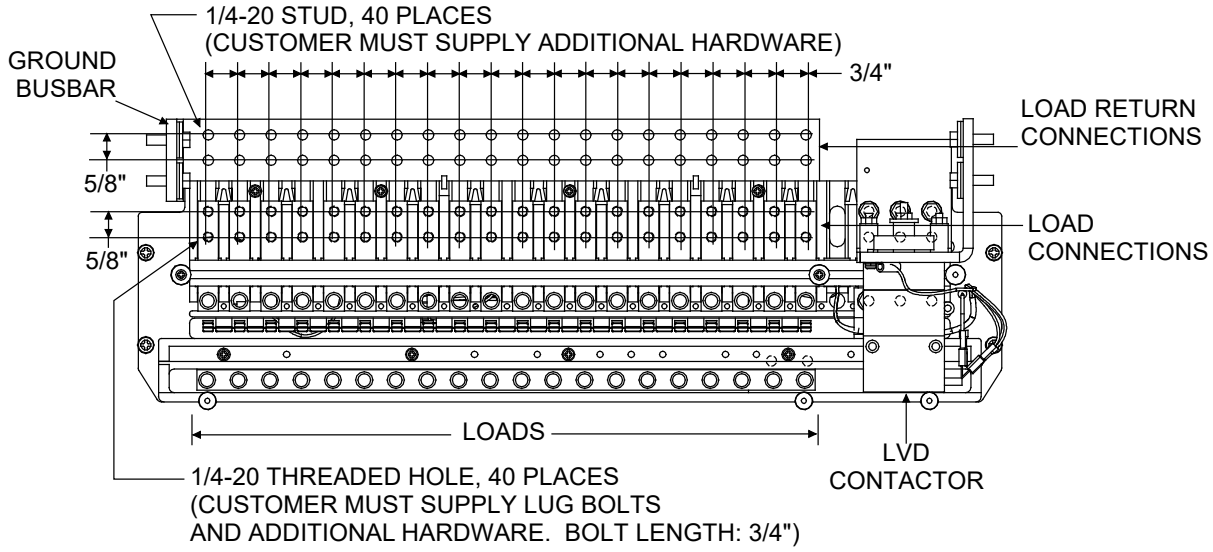
Circuit breakers with greater than 100 ampere rating occupy two mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List CB: Distribution Bus Module (P/N 509904)**
**(3) GJ/218 Circuit Breaker System Positions w/LVLD**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**
- Low Voltage Load Disconnect Contactor.

**Restrictions**

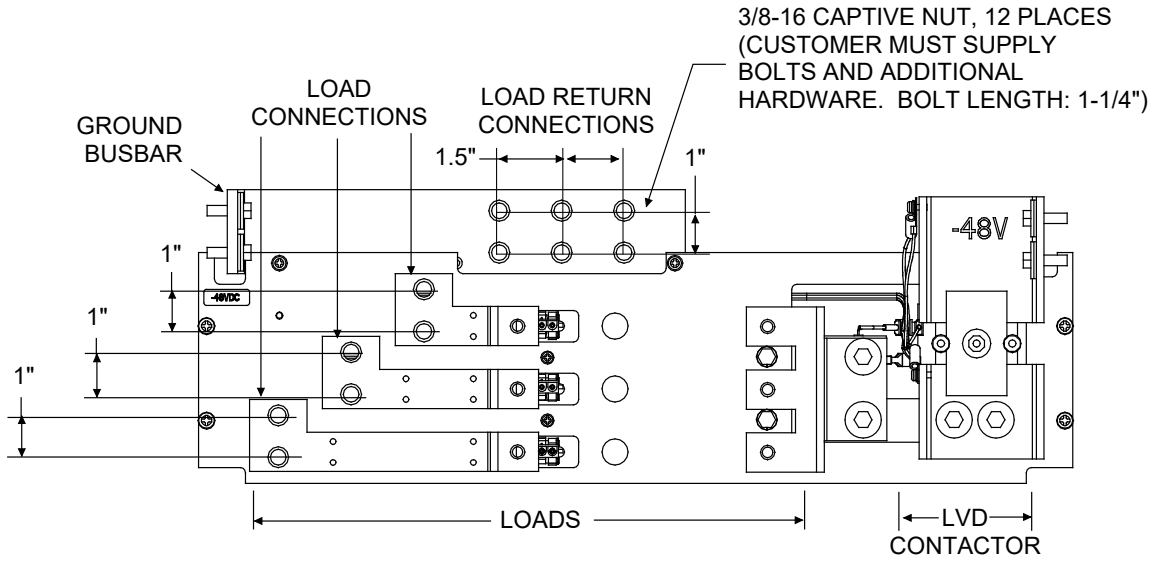
Can be installed in any bus position A-C (row 1-3) of a 1-, 2-, 3-, or 4-bus row cabinet. Cannot be installed in bus position D (row 4) of a four-bus row cabinet. See also List CD for similar application in bus position D (row 4).

Panel is designed to mount circuit breakers in the following possible combinations:

(3) 100A to 250A
(1) 100A to 250A and (1) 300A or 400A
(1) 600A

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List CD: Distribution Bus Module (P/N 507197)**
**(3) GJ/218 Circuit Breaker System Positions w/LVLD**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**
- Low Voltage Load Disconnect Contactor.

**Restrictions**

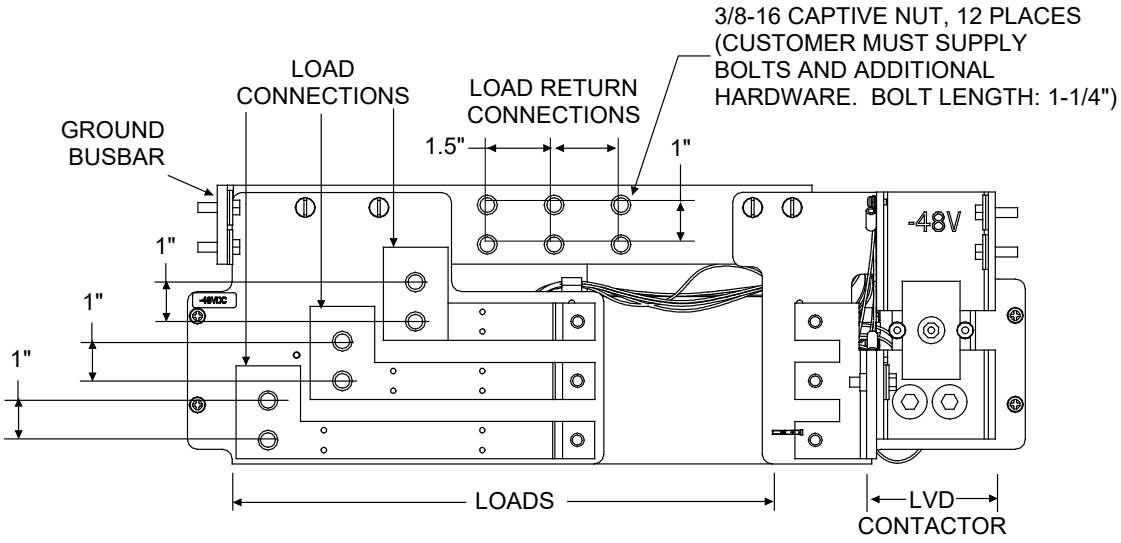
For use in a 4-bus row cabinet only. Must be installed in bus position D (row 4).. See also List CB for similar application in bus positions A-C (rows 1-3).

Panel is designed to mount circuit breakers in the following possible combinations:

(3) 100A to 250A
(1) 100A to 250A and (1) 300A or 400A
(1) 600A

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List CE: Distribution Bus Module (P/N 509563)**
**(8) GJ/218 Circuit Breaker System Positions w/LVLD (Upper Two Rows)**

**Features**

- Single Voltage Distribution (-48V).
- 1,000A Maximum Capacity (500A per side).
- (8) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**
- Low Voltage Load Disconnect Contactor.

**Restrictions**

Occupies two distribution rows.

For use in a 4-bus row cabinet only. Must be installed in bus positions C and D (rows 3 and 4). See also List CF for similar application in bus positions A and B (rows 1 and 2).

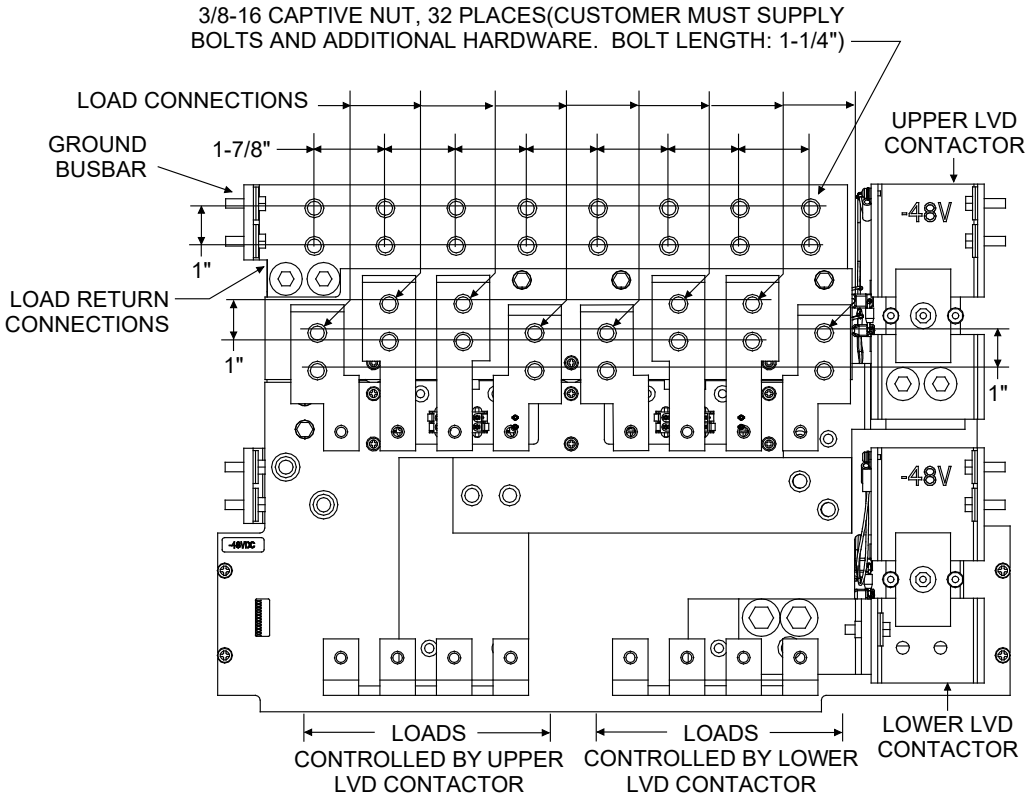
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

(4) 100A to 250A
(2) 100A to 250A and (1) 300A or 400A
(2) 300A or 400A
(1) 600A and (1) 100A to 250A

Unless otherwise specified circuit breakers are divided between the two sides, and are mounted from left to right, starting with the highest capacity and working to the lowest capacity on each side.

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List CF: Distribution Bus Module (P/N 509646)**
**(8) GJ/218 Circuit Breaker System Positions w/LVLD (Lower Two Rows)**

**Features**

- Single Voltage Distribution (-48V).
- 1,000A Maximum Capacity (500A per side).
- (8) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**
- Low Voltage Load Disconnect Contactor.

**Restrictions**

Occupies two distribution rows.

For use in a 2-, 3-, or 4-bus row cabinet. Must be installed in bus positions A and B (rows 1 and 2), or B and C (rows 2 and 3). See also List CE for similar application in bus positions C and D (rows 3 and 4).

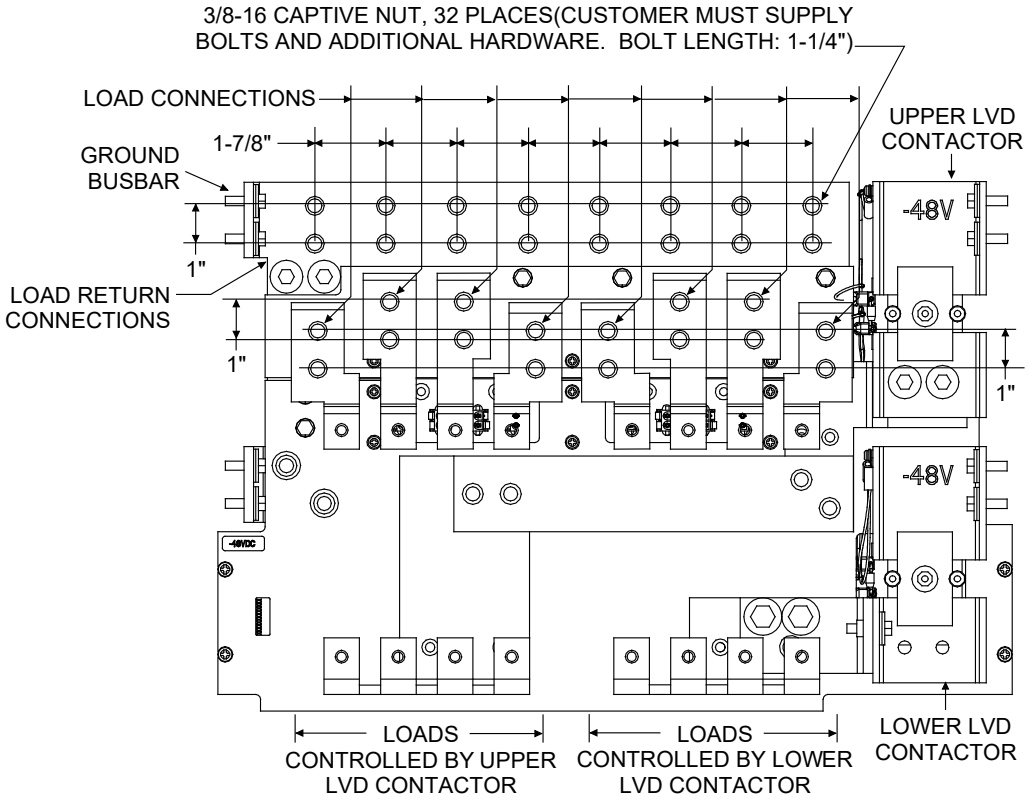
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

(4) 100A to 250A
(2) 100A to 250A and (1) 300A or 400A
(2) 300A or 400A
(1) 600A and (1) 100A to 250A

Unless otherwise specified circuit breakers are divided between the two sides, and are mounted from left to right, starting with the highest capacity and working to the lowest capacity on each side.

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order load lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List CG: Distribution Bus Module (P/N 514037)**
**(2) TPH Distribution Fuse Positions w/LVLD**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (2) Distribution Fuse Mounting Positions (70 to 600A TPH-Type).
- Low Voltage Load Disconnect Contactor.

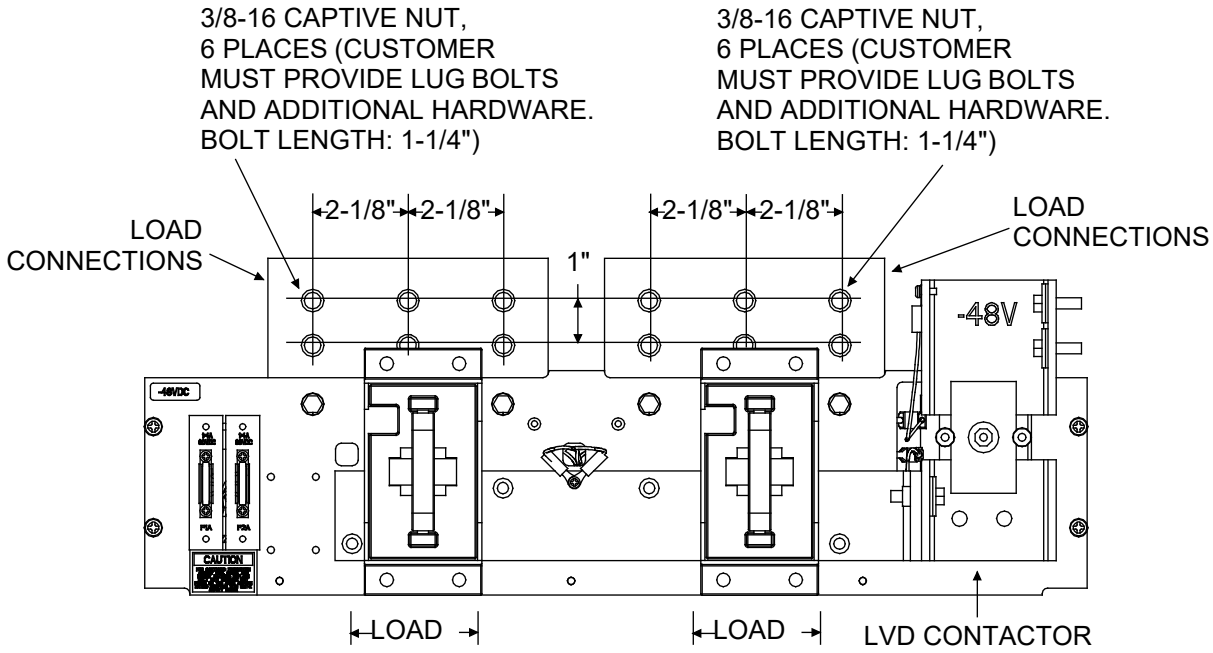
**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Does not provide connection for load returns (see **Ordering Notes**).

**Ordering Notes**

1) To terminate load returns within the distribution cabinet, order one (1) List AH for up to two (2) List CG.
2) Order fuses as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.
3) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List CJ: Distribution Bus Module (P/N 520937)**
**(2) TPH Distribution Fuse Positions with Load Metering Shunts and LVLD**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (2) Distribution Fuse Mounting Positions (70 to 600A TPH-Type).
- (1) Load Shunt (800A, 50mV) per load fuse is provided. Extended shunt leads are 22 AWG stranded wire, approximately 7-10 ft. long from exit point at bottom of Distribution Cabinet. Each shunt lead is equipped with a 49.9 ohm current limiting resistor. If a List 80 is ordered, shunt leads in the Main Bay are factory-connected to the LMS1000 unless otherwise specified.
- Low Voltage Load Disconnect Contactor.

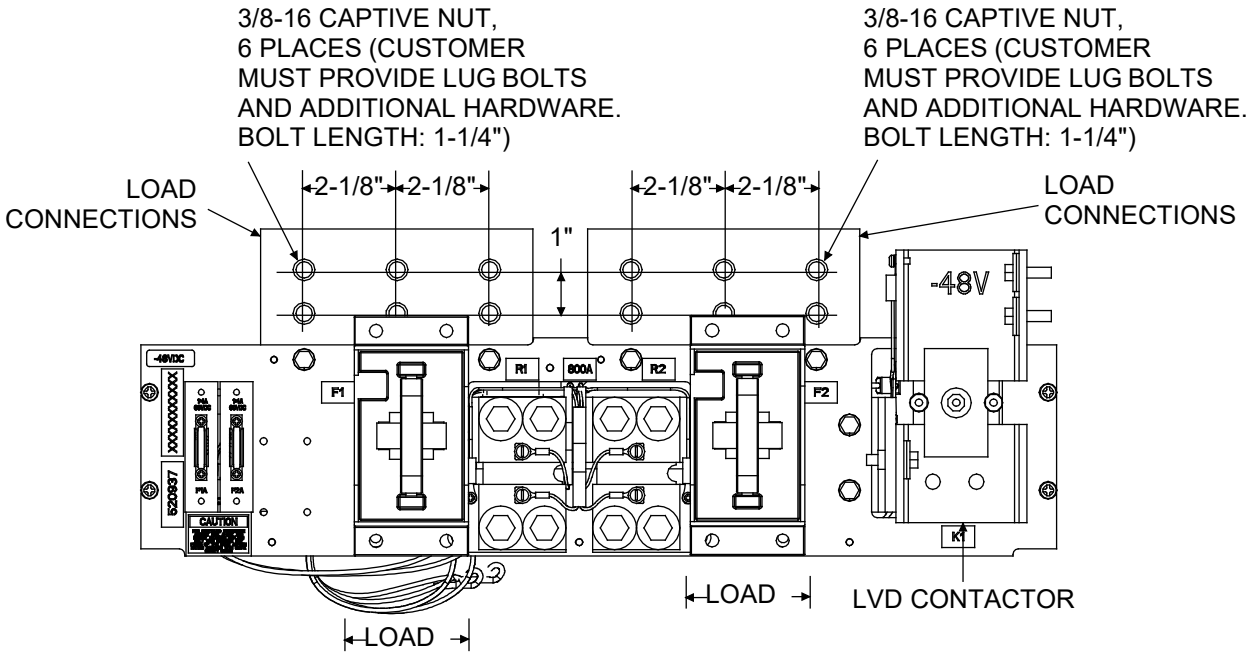
**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

Does not provide connection for load returns (see **Ordering Notes**).

**Ordering Notes**

1) To terminate load returns within the distribution cabinet, order one (1) List AH for up to two (2) List CJ.
2) Order fuses as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.
3) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List EA: Distribution Bus Module (P/N 509852)**
**(16) Fuse/Circuit Breaker System Positions and (4) Fuse/Circuit Breaker Battery Disconnect Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (16) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (4) Battery Disconnect Fuse / Circuit Breaker Mounting Positions
  (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose-Type Circuit Breakers).

**Restrictions**

Limit one bus arrangement of this type per Distribution Cabinet.

Must be installed in bus position A or B (row 1 or 2) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

**Cannot** be used in second row of a 3-bus row cabinet in List 1 if used with List 2.

**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

**Cannot** be used in second row of a 3-bus row cabinet in List 2.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

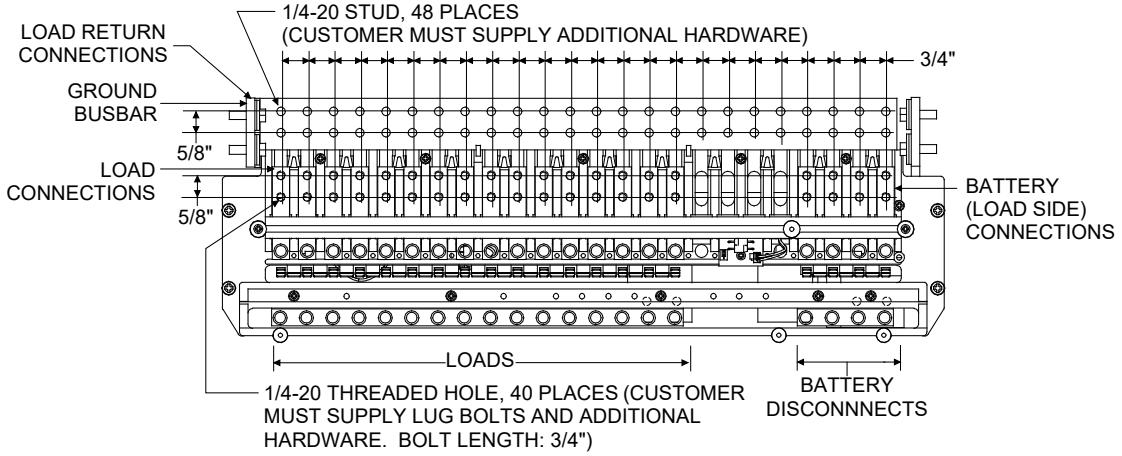
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List GB: Distribution Bus Module (P/N 513963)**
**(8) Fuse/Circuit Breaker System Positions w/LVD and (1) TPH Fuse Battery Disconnect Position**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (8) Load Distribution Fuse / Circuit Breaker Mounting Positions (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (1) Battery Disconnect Fuse Mounting Position (70 to 600A TPH-Type).
- Low Voltage Load Disconnect Contactor.

**Restrictions**

Limit one bus arrangement of this type per Distribution Cabinet.

Must be installed in bus position A (row 1) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

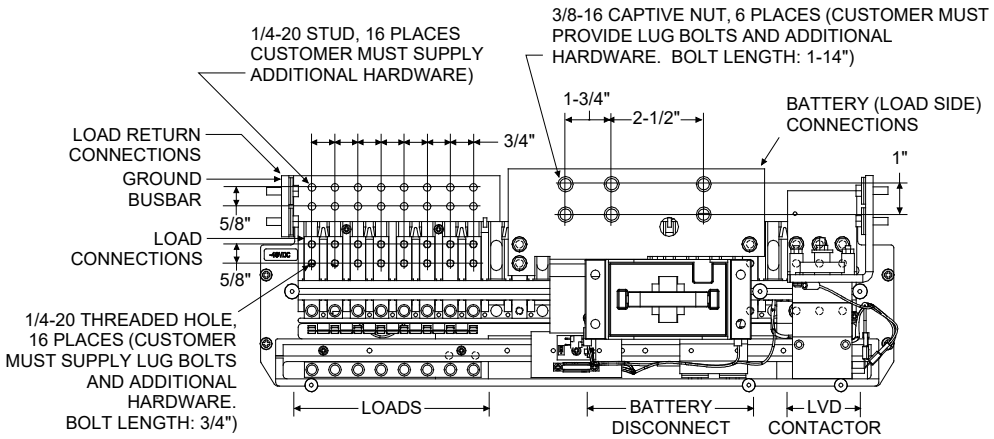
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single TPS/TLS-type fuseholder or Bullet Nose-type circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order load distribution fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order battery disconnect fuse as required per Table 4. Order replacement alarm fuse (1/4A) per Table 3.
4) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
5) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.
6) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



## List JA: Distribution Bus Module (Part No. 524482) (4) –48V Fuse/Circuit Breaker System Positions and (16) +24V Fuse/Circuit Breaker Subsystem Positions

### Features

- Dual Voltage Distribution (–48V and +24V).
- 500A Maximum Total Capacity, 200A Maximum +24V Subsystem Capacity.
- (4) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers).
- (16) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

### Restrictions

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3- or 4-bus row cabinet. If a distribution bus module is mounted directly beneath, that module must be a List AA, AE, AK, AM, AN, BA, CA, CF, EA, NA, NB, RA or RB.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

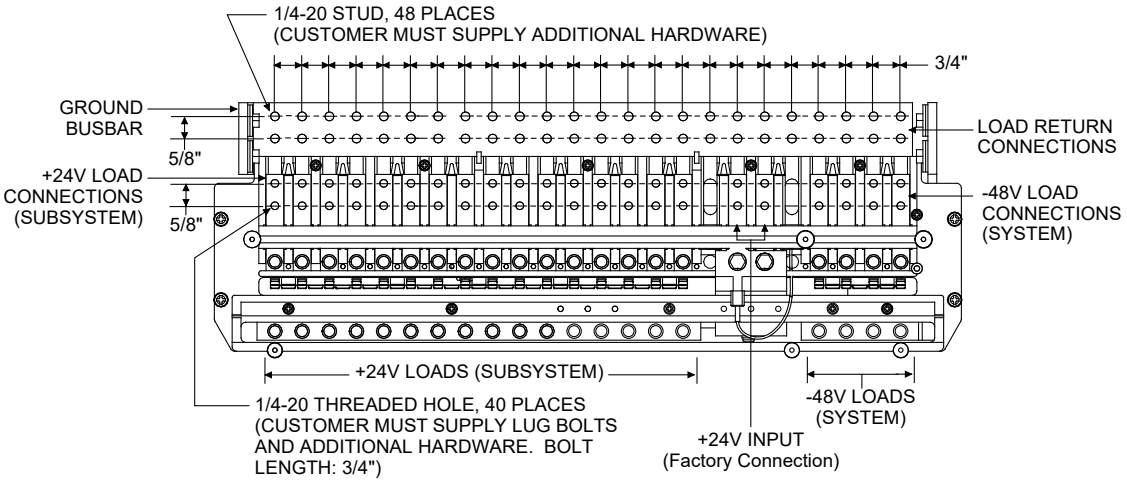
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

### Ordering Notes

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List JB: Distribution Bus Module (Part No. 524496)**
**(12) –48V Fuse/Circuit Breaker System Positions and**
**(8) +24V Fuse/Circuit Breaker Subsystem Positions**

**Features**

- Dual Voltage Distribution (–48V and +24V).
- 500A Maximum Total Capacity, 200A Maximum +24V Subsystem Capacity.
- (12) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (8) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

**Restrictions**

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3- or 4-bus row cabinet. If a distribution bus module is mounted directly beneath, that module must be a List AA, AE, AK, AM, AN, BA, CA, CF, EA, GB, NA, NB, RA or RB.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

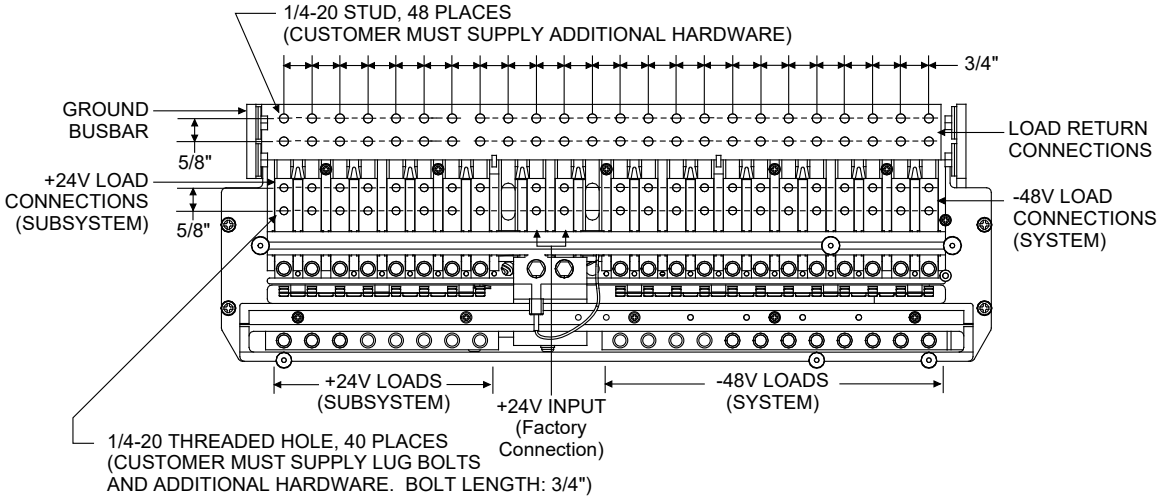
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List JC: Distribution Bus Module (Part No. 524620)**
**(14) –48V Fuse/Circuit Breaker System Positions and**
**(6) +24V Fuse/Circuit Breaker Subsystem Positions**

**Features**

- Dual Voltage Distribution (–48V and +24V).
- 500A Maximum Total Capacity, 200A Maximum +24V Subsystem Capacity.
- (14) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (6) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

**Restrictions**

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3- or 4-bus row cabinet. If a distribution bus module is mounted directly beneath, that module must be a List AA, AE, AK, AM, AN, BA, CA, CF, EA, GB, NA, NB, RA or RB.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

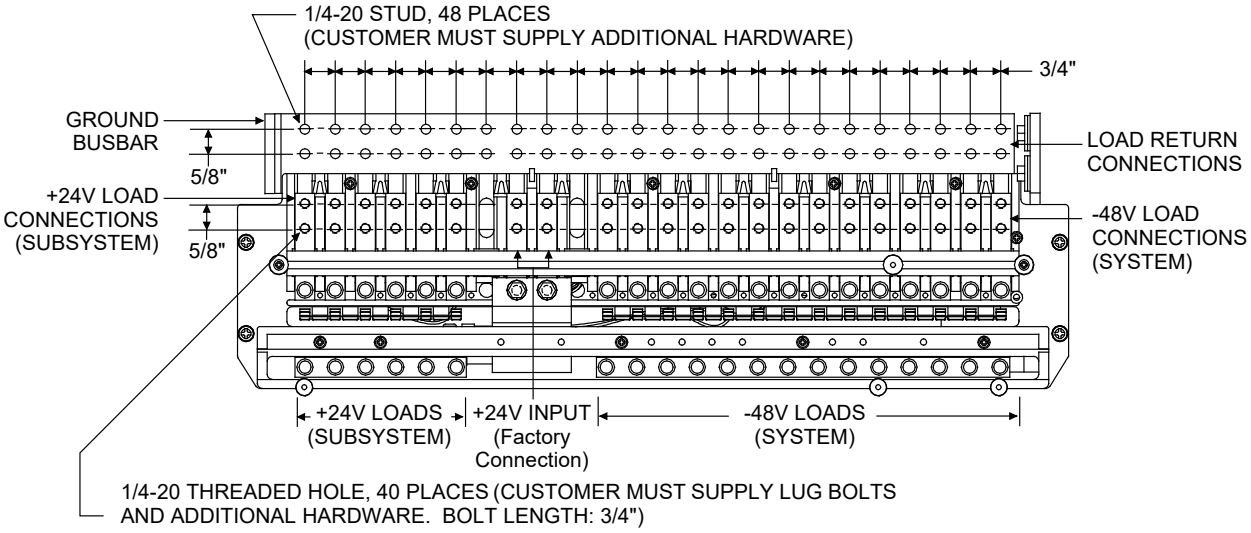
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



## List JD: Distribution Bus Module (Part No. 524788) (14) –48V Fuse/Circuit Breaker System Positions and (8) +24V Fuse/Circuit Breaker Subsystem Positions

### Features

- Dual Voltage Distribution (–48V and +24V).
- 500A Maximum Total Capacity, 200A Maximum +24V Subsystem Capacity.
- (14) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (8) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

### Restrictions

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3- or 4-bus row cabinet. If a distribution bus module is mounted directly beneath, that module must be a List AA, AE, AK, AM, AN, BA, CA, CF, EA, GB, NA, NB, RA or RB.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

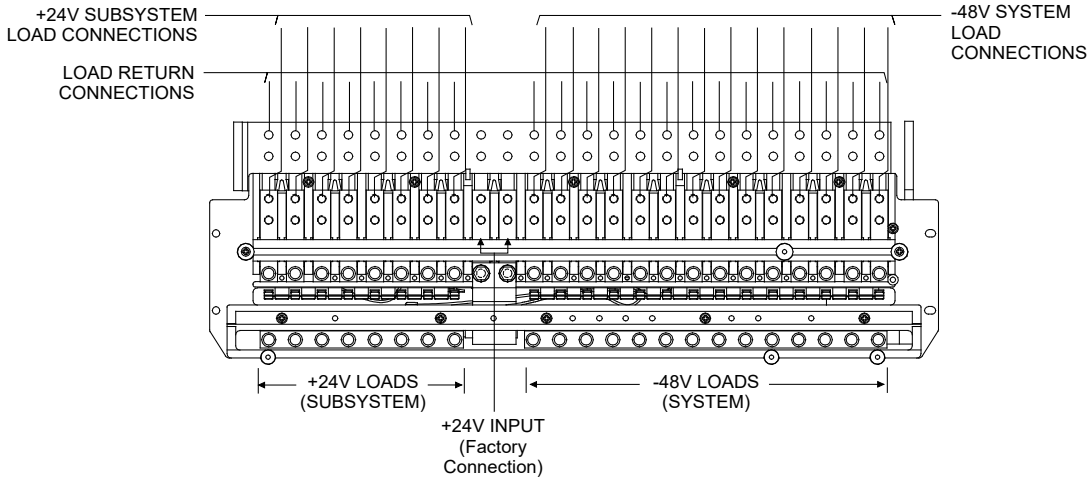
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

### Ordering Notes

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



## List KA: Distribution Bus Module (Part No. 524571) (4) –48V Fuse/Circuit Breaker System Positions and (16) +24V Fuse/Circuit Breaker Subsystem Positions

### Features

- Dual Voltage Distribution (–48V and +24V).
- 320A Maximum –48V System bus capacity, 480A Maximum +24V Subsystem bus capacity.
- (4) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers.
- (16) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).

### Restrictions

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Must be installed in bus position A (row 1) of a 1-, 2-, 3- or 4-bus row cabinet.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

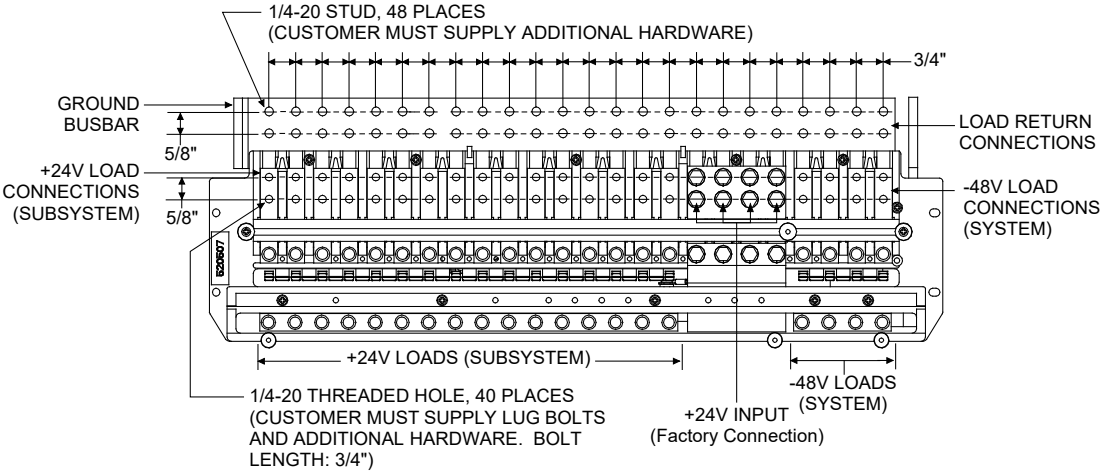
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

### Ordering Notes

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List LB: Distribution Bus Module (Part No. 524578)**
**(8) –48V Fuse/Circuit Breaker System Positions w/LVD and**
**(8) +24V Fuse/Circuit Breaker Subsystem Positions**

**Features**

- Dual Voltage Distribution (–48V and +24V).
- 500A Maximum Total Capacity, 200A Maximum +24V Subsystem Capacity.
- (8) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (8) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- Low Voltage System Load Disconnect Contactor.

**Restrictions**

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3- or 4-bus row cabinet. If a distribution bus module is mounted directly beneath, that module must be a List AA, AE, AK, AM, AN, BA, CA, CF, EA, GB, NA, NB, RA or RB.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

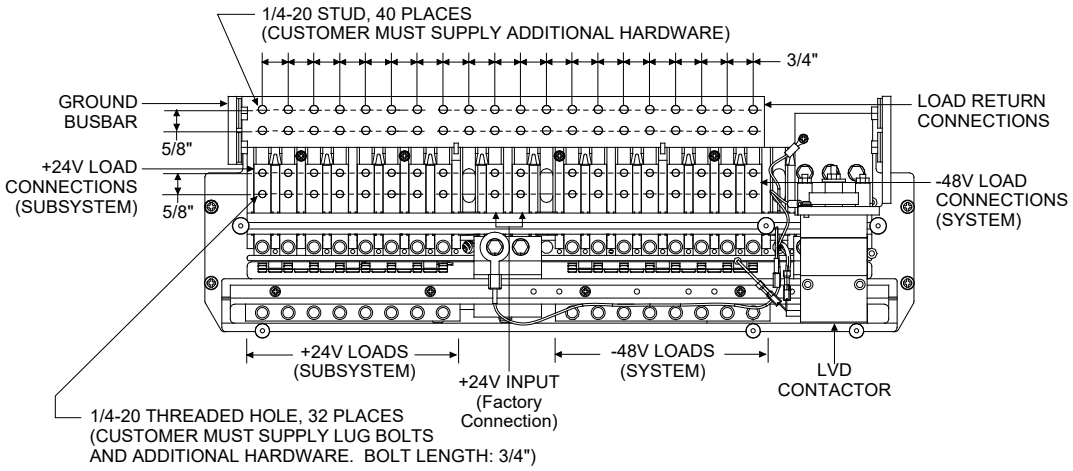
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List LC: Distribution Bus Module (Part No. 524583)**
**(12) –48V Fuse/Circuit Breaker System Positions w/LVD and**
**(4) +24V Fuse/Circuit Breaker Subsystem Positions**

**Features**

- Dual Voltage Distribution (–48V and +24V).
- 500A Maximum Total Capacity, 200A Maximum +24V Subsystem Capacity.
- (12) Load Distribution Fuse / Circuit Breaker Mounting Positions (–48V System Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers), or accepts GMT Load Distribution Fuse Block Assembly Kit (P/N 514432).
- (4) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V Subsystem Voltage) (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose Type Circuit Breakers).
- Low Voltage System Load Disconnect Contactor.

**Restrictions**

Limit one dual voltage bus (List JA, JB, JC, JD, KA, LB, LC) per power system.

Must be installed in Main Bay **only**.

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3- or 4-bus row cabinet. If a distribution bus module is mounted directly beneath, that module must be a List AA, AE, AK, AM, AN, BA, CA, CF, EA, GB, NA, NB, RA or RB.

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

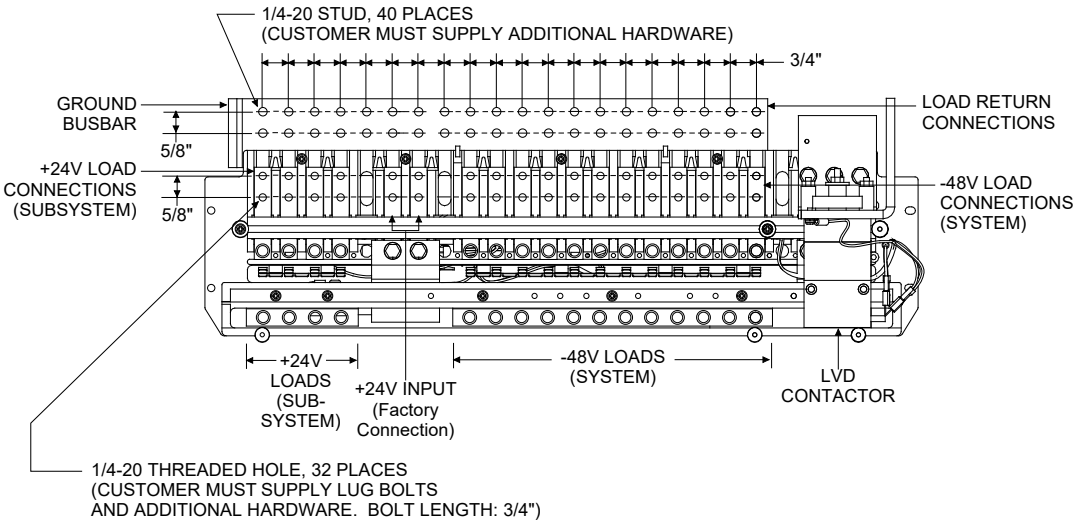
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 AWG.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order load lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List NA: Distribution Bus Module (P/N 514336)**
**(20) Fuse/Circuit Breaker Battery Disconnect Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (20) Battery Disconnect Fuse / Circuit Breaker Mounting Positions
  (3 to 100A TPS/TLS-Type Fuses / 1 to 250A Bullet Nose-Type Circuit Breakers).

**Restrictions**

Limit one bus arrangement of this type per Distribution Cabinet.

Must be installed in bus position A (row 1) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

Unless otherwise specified fuses and/or circuit breakers are mounted from left to right, starting with the highest capacity and working to the lowest capacity.

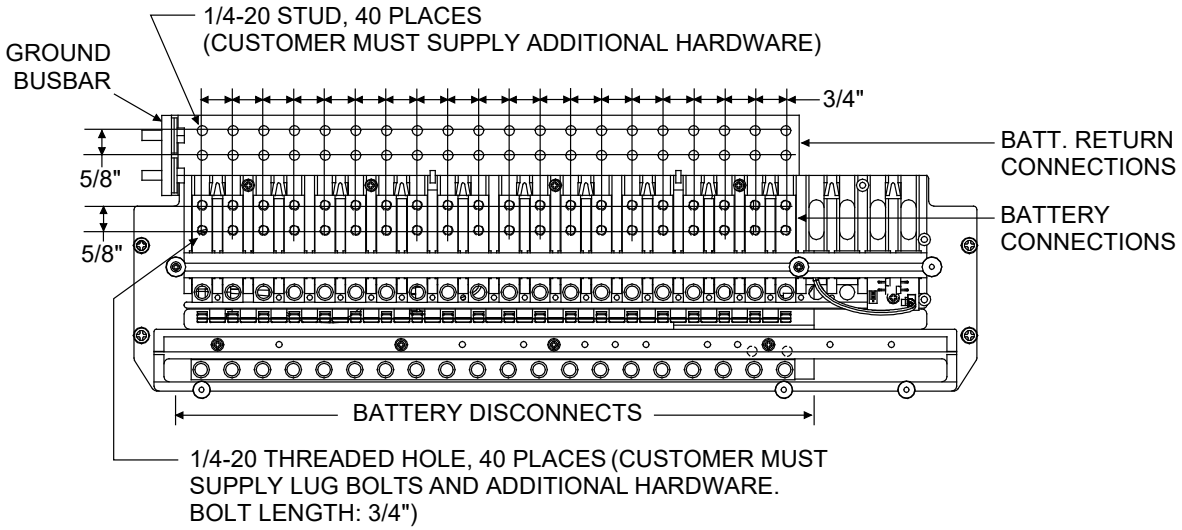
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

***Caution:*** ***A circuit breaker or fuse with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.***

Maximum size of wire to be connected to a single fuseholder or circuit breaker position is 2 gauge.

**Ordering Notes**

1) Order circuit breakers as required per Table 7 or Table 8.
2) Order fuses as required per Table 9.
   Also order one (1) P/N 117201 bullet nose-type fuseholder per fuse ordered.
3) Order battery and return lugs (two hole, 1/4" bolt clearance hole, 5/8" centers) as required for each distribution position per Table 10 or 12.
4) Order lug hardware kit, P/N 520332, as required. Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly.



**List NB: Distribution Bus Module (P/N 513809)**
**(3) GJ/218 Circuit Breaker Battery Disconnect Positions**

**Features**

- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (3) Battery Disconnect Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type). **NOTE RESTRICTIONS.**

**Restrictions**

Limit one bus arrangement of this type per Distribution Cabinet.

Must be installed in bus position A or B (row 1 or 2) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

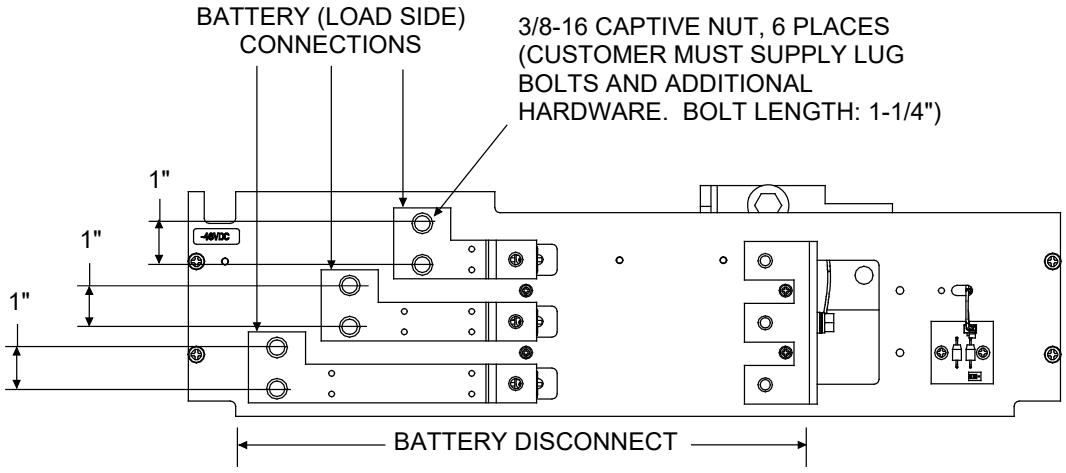
**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

Panel is designed to mount circuit breakers in the following possible combinations:

(3) 100A to 250A
(1) 100A to 250A and (1) 300A or 400A
(1) 600A

**Ordering Notes**

1) Order circuit breakers and associated jumper kits as required per Tables 5 and 6.
2) Order battery lugs (two hole, 3/8" bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List NC: Distribution Bus Module (P/N 514025)**
**(1) TPH Fuse Battery Disconnect Position**

**Features**

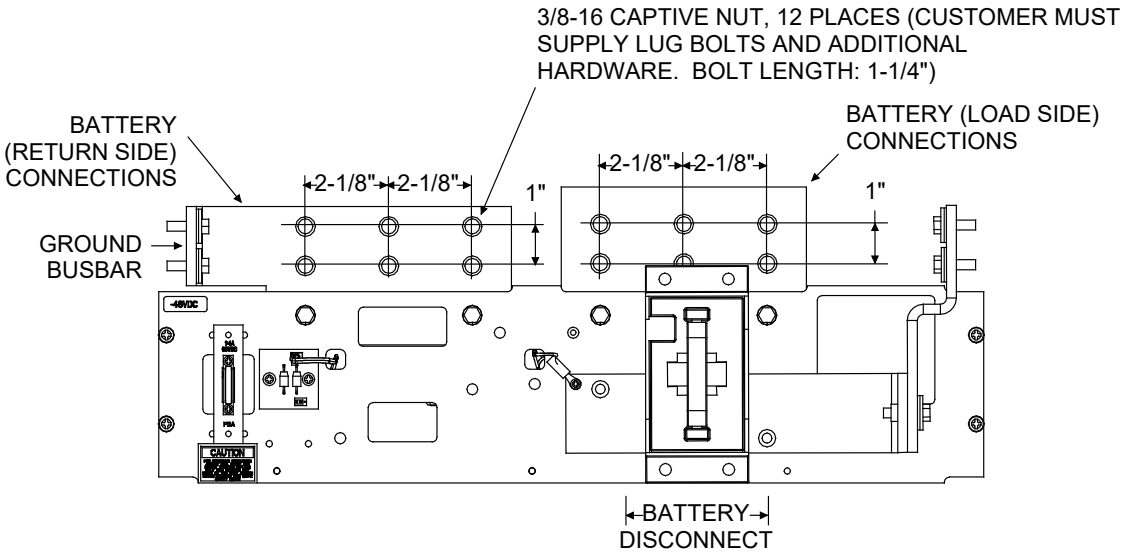
- Single Voltage Distribution (-48V).
- 500A Maximum Capacity.
- (1) Battery Disconnect Fuse Mounting Position (70 to 600A TPH-Type).

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Ordering Notes**

1) Order fuses as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.
2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List ND: Distribution Bus Module (P/N 514030)**
**(2) TPH Fuse Battery Disconnect Positions**

**Features**

- Single Voltage Distribution (-48V).
- 960A Maximum Capacity.
- (2) Battery Disconnect Fuse Mounting Positions (70 to 600A TPH-Type).

**Restrictions**

Limit one bus arrangement of this type per Distribution Cabinet.

Must be installed in bus position A (row 1) of a 1-, 2-, 3-, or 4-bus row cabinet.

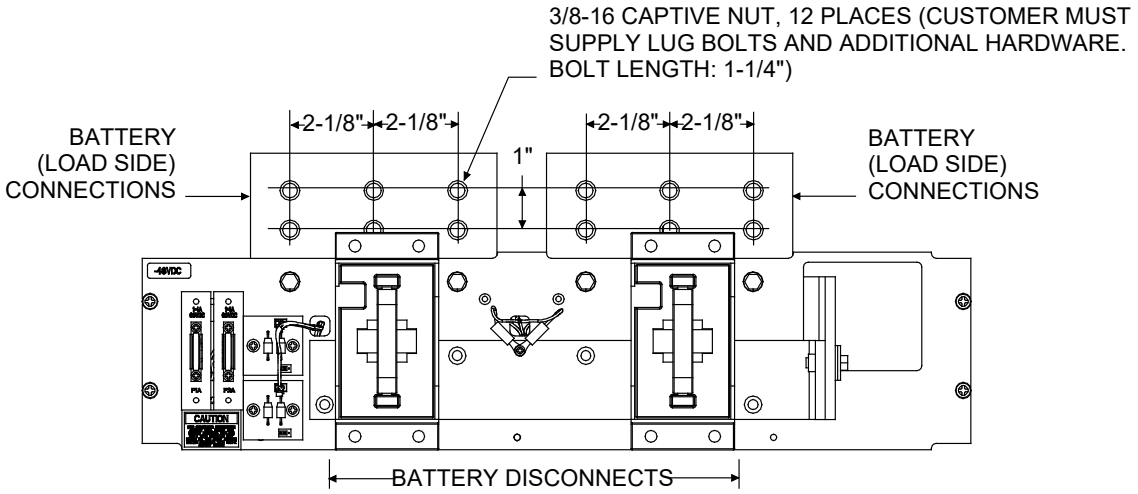
**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

**Ordering Notes**

1) Order fuses as required per Table 4. Order replacement alarm fuses (1/4A) per Table 3.

2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



## Battery Disconnect

**List RA: 1200A Low Voltage Battery Disconnect (LVBD) Contactor and Control Circuit (P/N 528442)**

**Features**

- Provides a battery disconnect contactor, which is mounted in bus position A (row 1) of the Distribution Cabinet.

**Restrictions**

Limit one bus arrangement of this type per System.

Must be installed in bus position A (row 1) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

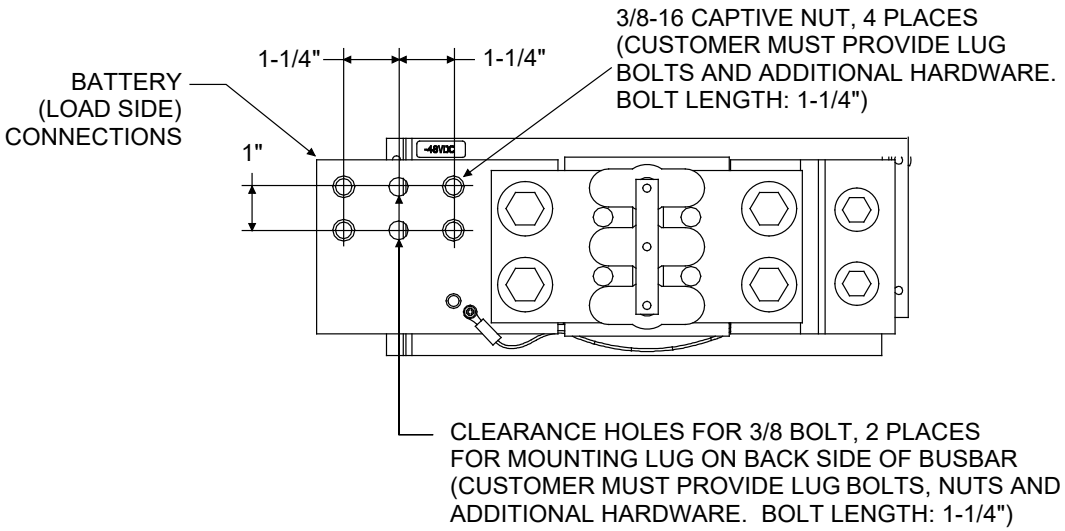
**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

**Cannot** be used with List 92, 93, RB, RC, RD, or RE.

**Ordering Notes**

1) Order as required.

2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required Table 11.



**List RB: 1200A Manual Battery Disconnect Contactor with Local and Remote Alarm (P/N 528443)**

**Features**

- Provides a battery disconnect contactor with manual control circuit, which is mounted in bus position A (row 1) of the Distribution Cabinet.
- Also provides one set of Form C relay contacts for connection to customer external alarms.

**Restrictions**

Limit one bus arrangement of this type per System.

Must be installed in bus position A (row 1) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Cannot** be used in a 2-bus row cabinet in List 1 if List 1 is used with List 2. (**Can** be used in a 2-bus row cabinet in List 1 if List 1 is used alone or with List 5.)

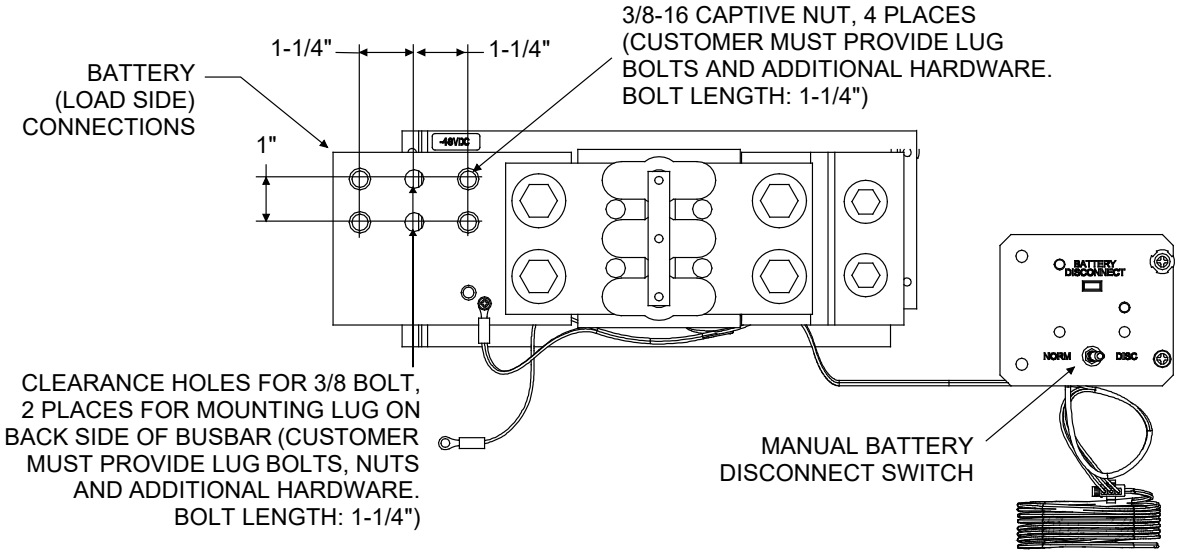
**Cannot** be used in a 2-bus row cabinet in List 2. (**Can** be used in a 2 bus-row cabinet in List 5.)

**Cannot** be used with List 92, 93, RA, RC, RD, or RE.

**Ordering Notes**

1) Order as required.

2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required Table 11.



**List RC: 2000A Manual Battery Disconnect Contactor with Local and Remote Alarm (P/N 528446)**

**Features**

- Provides a battery disconnect contactor with manual control circuit.
- Mounted on external rear of the Distribution Cabinet; uses no distribution row positions inside cabinet.
- Includes (1) extension plate (P/N 514713) for the Distribution Cabinet ground return busbar. Plate provides three pairs of clearance holes for 3/8" hardware on 1" centers. Allows back-to-back lug landing for up to six lugs. See "Electrical Connection Locations and Dimensions, Input Battery (Connections to Optional Battery Busbar Extension Kit P/N 514713 Installed in Lists 21 through 24 Distribution Cabinets)" under PHYSICAL SIZE INFORMATION for a dimensional drawing.
- Also provides one set of Form C relay contacts for connection to customer external alarms.

**Restrictions**

Must be installed in Main Bay (List 1) **only**.

Limit one List RC per Distribution Cabinet.

**Cannot** be used in a 1-bus row cabinet.

**Cannot** be used if List 1 is used with List 2. (**Can** be used if List 1 is used alone or with List 5.)

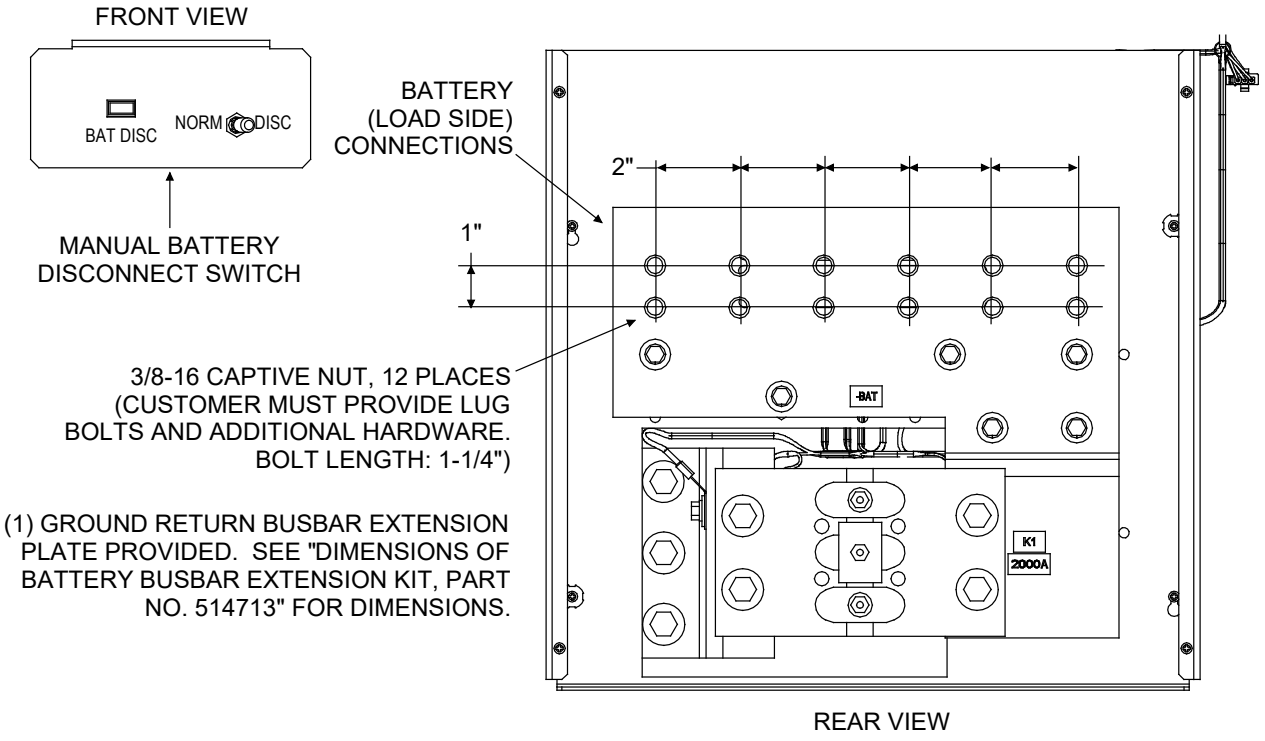
**Cannot** be used with List 92, 93, RA, RB, RD, or RE.

Rear access required for installation and maintenance.

**Ordering Notes**

1) Order as required.

2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required Table 11.



**List RD: 2000A Low Voltage/Manual Battery Disconnect Contactor with Battery Current Monitoring (P/N 528447)**

**Features**

- Provides a battery disconnect contactor with Low Voltage and manual control.
- Includes shunt for battery charge/discharge current monitoring (25mV @ 2000A).
- Mounted on external rear of the Distribution Cabinet; uses no distribution row positions inside cabinet.
- Includes (1) extension plate (P/N 514713) for the Distribution Cabinet ground return busbar. Plate provides three pairs of clearance holes for 3/8" hardware on 1" centers. Allows back-to-back lug landing for up to six lugs. See "Electrical Connection Locations and Dimensions, Input Battery (Connections to Optional Battery Busbar Extension Kit P/N 514713 Installed in Lists 21 through 24 Distribution Cabinets)" under PHYSICAL SIZE INFORMATION for a dimensional drawing.
- Also provides one set of Form C relay contacts for connection to customer external alarms.

**Restrictions**

Must be installed in Main Bay (List 1) **only**.

Limit one List RD per Distribution Cabinet.

**Cannot** be used in a 1-bus row cabinet.

**Cannot** be used if List 1 is used with List 2. (**Can** be used if List 1 is used alone or with List 5.)

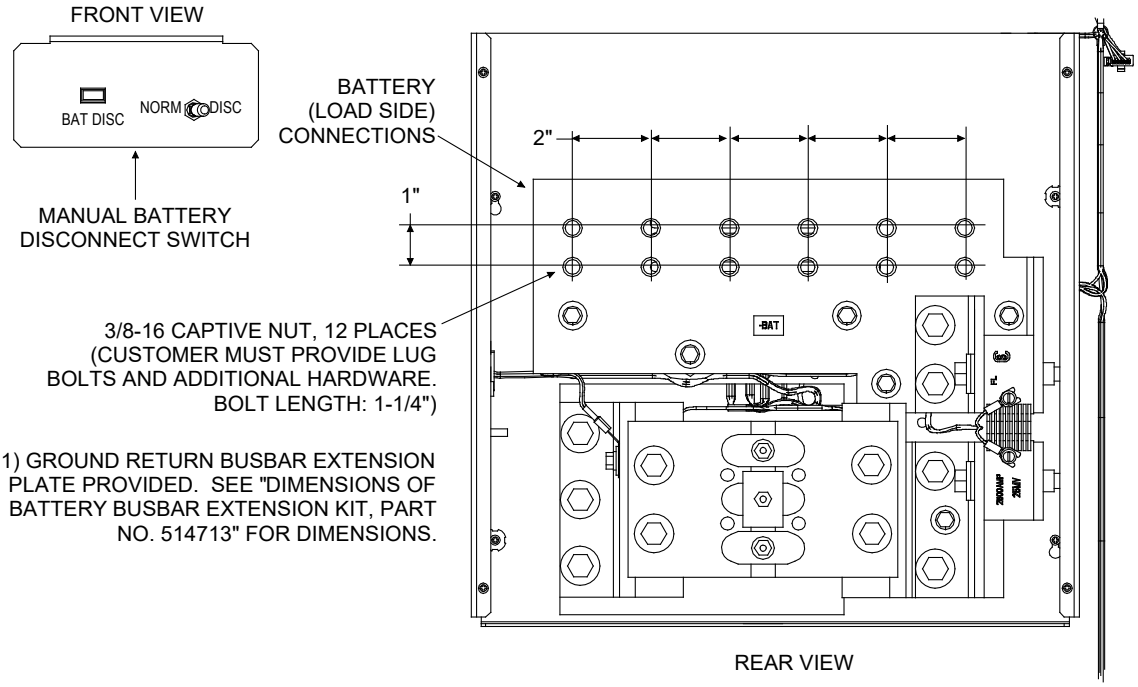
**Cannot** be used with List 92, 93, RA, RB, RC, or RE.

Rear access required for installation and maintenance.

**Ordering Notes**

1) Order as required.

2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required Table 11.



**List RE: 2000A Low Voltage Battery Disconnect Contactor with Battery Current Monitoring (P/N 535064)**

**Features**

- Provides a battery disconnect contactor with low voltage control.
- Includes shunt for battery charge/discharge current monitoring (25mV @ 2000A).
- Mounted on external rear of the Distribution Cabinet; uses no distribution row positions inside cabinet.
- Includes (1) extension plate (P/N 514713) for the Distribution Cabinet ground return busbar. Plate provides three pairs of clearance holes for 3/8" hardware on 1" centers. Allows back-to-back lug landing for up to six lugs. See "Electrical Connection Locations and Dimensions, Input Battery (Connections to Optional Battery Busbar Extension Kit P/N 514713 Installed in Lists 21 through 24 Distribution Cabinets)" under PHYSICAL SIZE INFORMATION for a dimensional drawing.
- Also provides one set of Form C relay contacts for connection to customer external alarms.

**Restrictions**

Same as List RD except does NOT include manual battery disconnect switch.

Must be installed in Main Bay (List 1) **only**.

Limit one List RE per Distribution Cabinet.

**Cannot** be used in a 1-bus row cabinet.

**Cannot** be used if List 1 is used with List 2. (**Can** be used if List 1 is used alone or with List 5.)

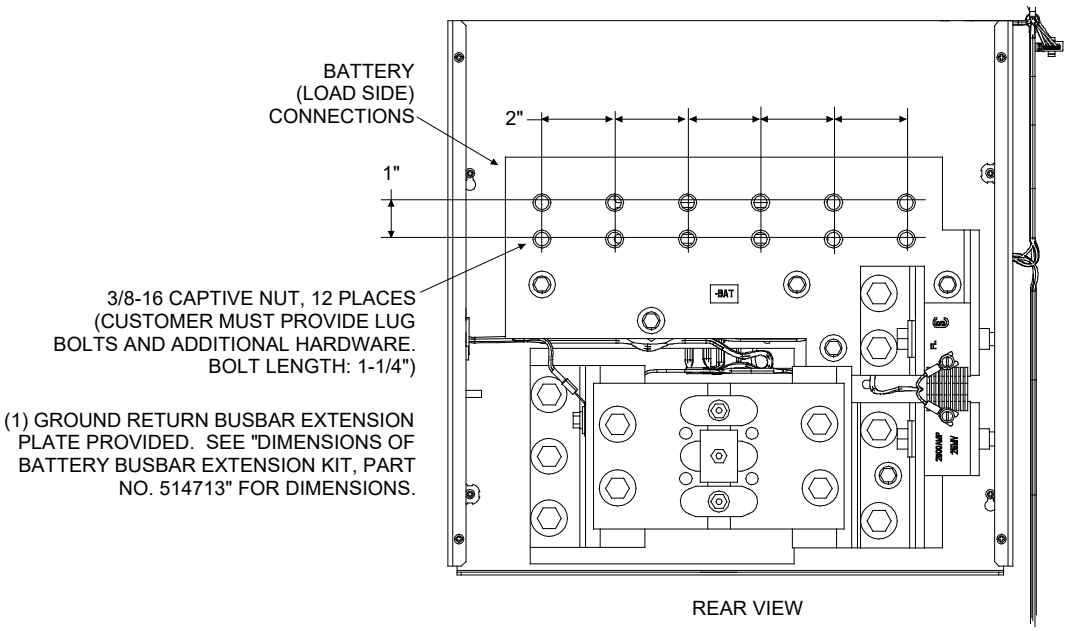
**Cannot** be used with List 92, 93, RA, RB, RC, or RD.

Rear access required for installation and maintenance.

**Ordering Notes**

1) Order as required.

2) Order battery lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required Table 11.




REAR VIEW

## Bulk Feed Panels

**List TA: 800A Bulk Feed Distribution Bus Module (P/N 541530) (Internal Shunt)**

**Features**

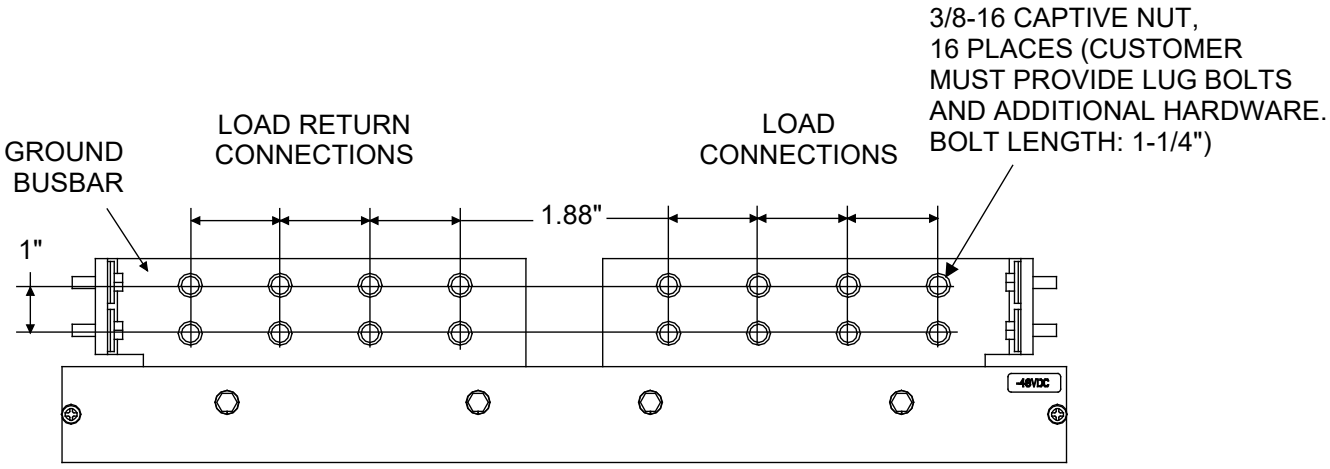
- Single Voltage Bulk Feed Distribution (-48V).
- 800A Maximum Capacity.
- Uses the Internal Bus Module Shunt Monitoring Circuit.

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Ordering Notes**

1) Order as required.
2) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



**List TB: 1200A Bulk Feed Distribution Bus Module (P/N 541530), Bypass Shunt Busbar (P/N 541535), and External Shunt Monitoring Kit (P/N 541134) (External Shunt)**

**Features**

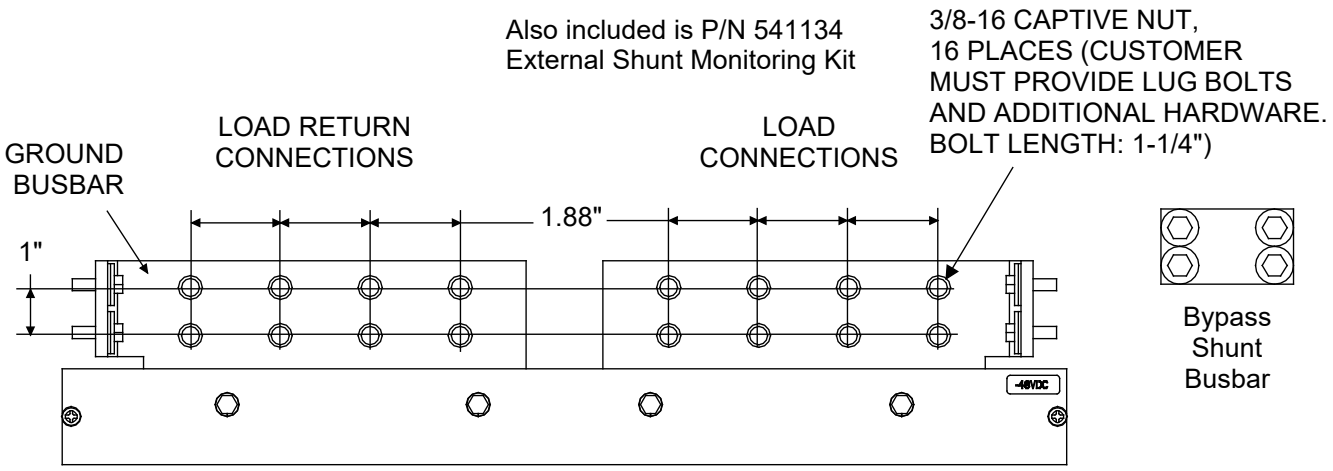
- Single Voltage Bulk Feed Distribution (-48V).
- 1200A Maximum Capacity.
- Provides a Bypass Shunt Busbar (to bypass internal shunt monitoring) and an External Shunt Monitoring Kit to Monitor a Remote Shunt.

**Restrictions**

Can be installed in any bus position A-D (row 1-4) of a 1-, 2-, 3-, or 4-bus row cabinet.

**Ordering Notes**

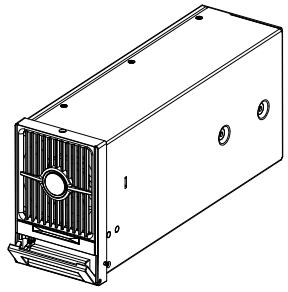
1) Order as required.
2) Order load lugs (two hole, 3/8 bolt clearance hole, 1" centers) as required for each distribution position per Table 11.



## ACCESSORY DESCRIPTIONS

### Rectifier Modules

**Rectifier Module (PCU), High-Efficiency (P/N 1R483200e)**



**Features**

- Provides one (1) Model R48-3200e, Spec. No. 1R483200e, 3200 watt / 48 volt rectifier module.
- Refer to UM1R483500e (Rectifier User Instructions) for Rectifier Module specifications.

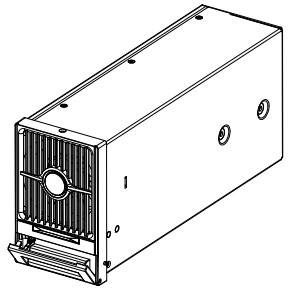
**Restrictions**

For use in Spec. No. 588705000 Rectifier Module Mounting Shelve(s).

**Ordering Notes**

1) Order as required. Each shelf holds up to six (6) Rectifier Modules.

**Rectifier Module (PCU) (P/N 1R483200)**



**Features**

- Provides one (1) Model R48-3200, Spec. No. 1R483200, 3200 watt / 48 volt rectifier module.
- Refer to UM1R483500e (Rectifier User Instructions) for Rectifier Module specifications.

**Restrictions**

For use in Spec. No. 588705000 Rectifier Module Mounting Shelve(s).

**Ordering Notes**

1) Order as required. Each shelf holds up to six (6) Rectifier Modules.

## Relay Racks

### Features

- The system is factory mounted to the relay rack specified when ordered.
- All relay racks are 23" standard mounting with 3" deep uprights.
- System components may be ordered without a relay rack. When ordered without a relay rack, the system is mounted on shipping brackets bolted to a shipping skid. The shipping brackets can mount a system up to 20U high.

### Ordering Notes

1) Order from relay racks listed in Table 1.

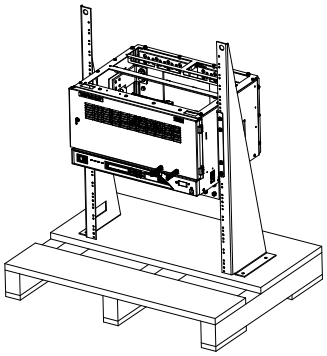
| Part Number | Size | Available Mounting Positions (1RU = 1-3/4") | Notes |
|---|---|---|---|
| 543151 | 25.656"H x 24.376"W x 15"D | 13RU | Welded (Notes 1, 3) |
| 543152 | 27.406"H x 24.376"W x 15"D | 14RU | Welded (Notes 1, 3) |
| 543153 | 36.156"H x 24.376"W x 15"D | 19RU | Welded (Notes 1, 3) |
| 543154 | 39.656"H x 24.376"W x 15"D | 21RU | Welded (Notes 1, 3) |
| 543155 | 43.156"H x 24.376"W x 15"D | 23RU | Welded (Notes 1, 3) |
| 543156 | 51.906"H x 24.376"W x 15"D | 28RU | Welded |
| 543157 | 71.156"H x 24.376"W x 15"D | 39RU | Welded |
| 543161 | 6'0"H x 24.375"W x 15"D | 37RU | Welded |
| 543162 | 7'0"H x 24.375"W x 15"D | 45RU | Welded |
| 543160 | 7'0"H x 25.0"W x 15"D | 45RU | Seismic (Notes 1, 2, and 3) |
| 543163 | 7'6"H x 24.375"W x 15"D | 48RU | Welded |
| 543164 | 8'0""H x 24.375"W x 15"D | 51RU | Welded |

***Note 1:*** *Complies with Bellcore Seismic Zone 4 requirements.*

***Note 2:*** *The DC output cabling may be restricted by the top angle of the relay rack.*

***Note 3:*** *Seismic (Zone 4) compliant ONLY when system DOES NOT contain any of the following components:* List 93 Battery Tray

Table 1
Available Relay Racks



Ship Loose Option

## Transition Plates to Mount Relay Rack on Top of GNB Absolyte IIP Batteries

**Features**

- Transition Plate Kits can be ordered to mount relay rack P/Ns 543151, 543152, 543153, 543154, 543155, 543156, and 543157 on top of GNB Absolyte IIP Battery Stands.
- Each kit consists of two transition plates with three hole patterns and hardware (3/8") to mount the plates to the above listed relay racks. Customer must supply hardware to mount the transition plates to the battery stands.

**Restrictions**

Used with relay rack P/Ns 543151, 543152, 543153, 543154, 543155, 543156, and 543157only.

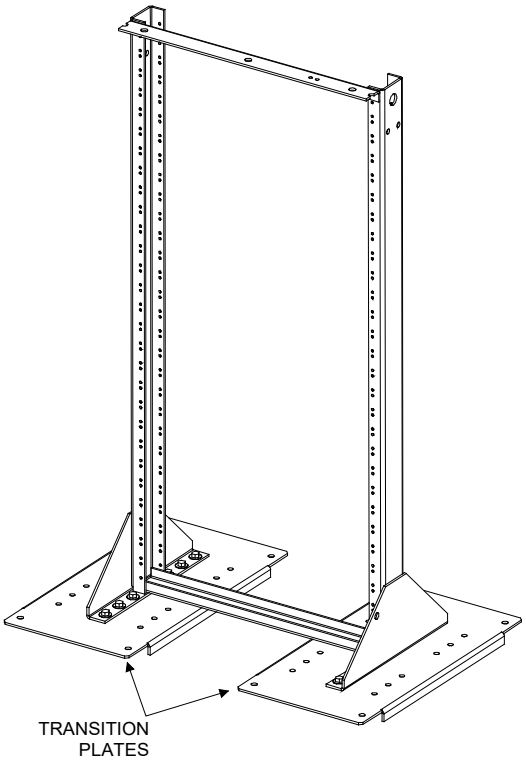
**Ordering Notes**

1) Order P/N 509819 for a Transition Plate Kit to mount relay rack on top of battery with outside dimensions of...

   26.75" x 26.38",
   35.75" x 26.38", or
   42.50" x 26.38".

2) Order P/N 514880 for a Transition Plate Kit to mount relay rack on top of battery with outside dimensions of...

   29.00" x 26.38",
   35.50" x 26.35", or
   40.25" x 26.38".



## Distribution Devices

### GMT Load Distribution Fuse Block Assembly Kit (P/N 514432)
### (10) GMT Fuse Positions

**Features**

- Provides ten (10) load distribution fuse positions (1/4A to 15A GMT alarm-type fuses).
- Single voltage distribution (-48V).
- Mounts in five (5) distribution positions of any “Bullet Nose” Distribution Bus Module.
- Screw clamp type load and load return terminals provided.
- Includes ten (10) dummy fuses equipped with safety fuse covers.
- Includes 35A input fuse and associate alarm fuse.

**Restrictions**

30A maximum capacity.

Terminal block wire size capacity: 24 to 14 AWG.

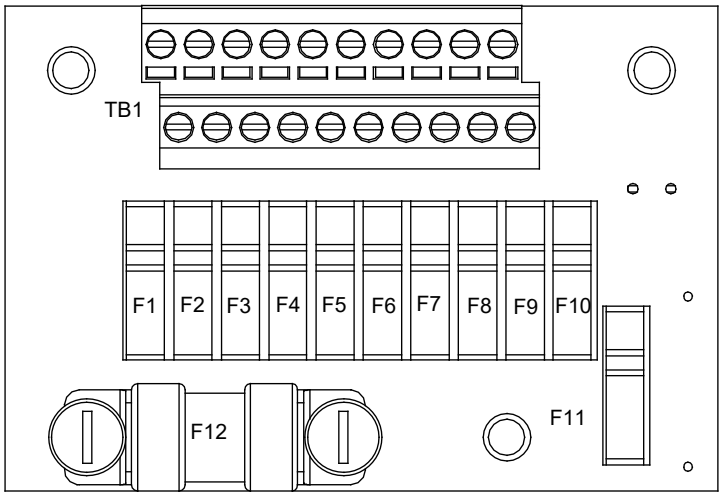
Can be used in a List AA, AK, AM, AN, BA, CA, EA, GB, JA, JB, JC, JD, KA, LB, and LC Distribution Bus Module only.

When factory-ordered, installation order of the assembly will be from top to bottom and right to left (see illustration below for 4-row example), unless otherwise specified.

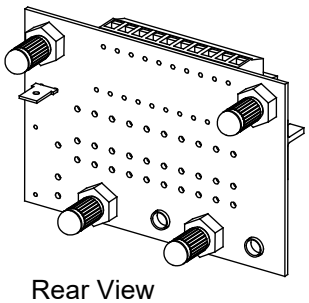
**Ordering Notes**

1) Order kit P/N 514432 as required. Provides one (1) 10-Position GMT Fuse Distribution Assembly P/N 509128, one (1) Ground Return Link, and hardware.
2) Order fuses as required per Table 2 (GMT Fuses).
3) Located on the P/N 509128 Assembly is an input fuse. If this fuse opens, an alarm type fuse (fuse position #11) also opens to activate the system's fuse alarm circuit. For replacement fuses, order as follows:

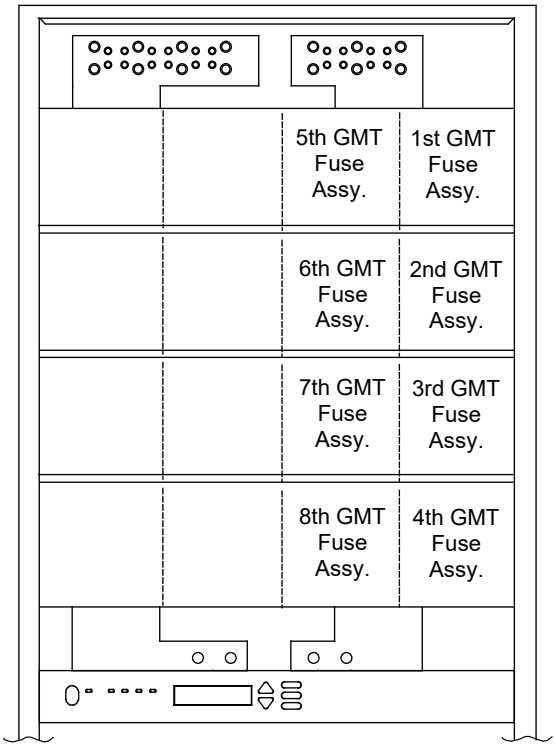
   Input Fuse F12: P/N 110982 (Bussmann TPS-35LB, 35A)
   Alarm Fuse F11: P/N 248610200 (Bussmann GMT-1/4, 1/4A)




Part No. 509128



Rear View




Mounting Order for Multiple Part No. 509128
(4 Row Cabinet Shown)

## GMT-Type Load Distribution Fuses

### Features

- An optional 'GMT Load Distribution Fuse Block Assembly Kit (P/N 514432)' (see previous section) is available for additional load distribution.

### Restrictions

When used for power distribution, load should not exceed 80% of device rating.

### Ordering Notes

1) Order fuses as required per Table 2 (GMT Fuses).

| Ampere Rating | Part Number | Fuse Color |
|---|---|---|
| 18/100 (GMT-A) | 248610301 | --- |
| 1/4 | 248610200 | VIOLET |
| 1/2 | 248610300 | RED |
| 3/4 | 248610500 | BROWN |
| 1-1/3 | 248610700 | WHITE |
| 2 | 248610800 | ORANGE |
| 3 | 248610900 | BLUE |
| 5 | 248611000 | GREEN |
| 7-1/2 | 248611300 | BLACK-WHITE |
| 10 | 248611200 | RED-WHITE |
| 15 | 248611500 | RED-BLUE |
| Replacement Safety Fuse Cover (GMT-Y) | 102774 | --- |
| Replacement Dummy Fuse | 248872600 | --- |

Table 2
GMT Fuses

## Replacement Alarm, Reference, and Control Fuses

### Ordering Notes

1) Order replacement fuses as required per Table 3 (Replaceable Alarm, Reference, and Control Fuses).

| Assembly | Desig. | Function | Size (Amperes) | Type | Part No. |
|---|---|---|---|---|---|
| Interconnect/ LVD Inhibit Circuit Card A1 (P/N 509532) | F1 | Subsystem Voltage Monitoring (not used - a subsystem is not installed in this power system) | 1-1/3 | Bussmann GMT | 248610700 |
| | F2 | System Voltage Monitoring | 1-1/3 | Bussmann GMT | 248610700 |
| | F3 | Fuse Alarm | 1-1/3 | Bussmann GMT | 248610700 |
| | F4 | LVD Side A | 1-1/3 | Bussmann GMT | 248610700 |
| | F5 | LVD Side B | 1-1/3 | Bussmann GMT | 248610700 |
| | F6 | Converter Fail Alarm Relays (List 71 only) (not used in this system) | 1-1/3 | Bussmann GMT | 248610700 |
| | F7 | LMS1000 Input | 5 | Bussmann GMT | 248611000 |
| | F8 | Sense Voltage | 1-1/3 | Bussmann GMT | 248610700 |
| | F9 | Battery Stand Shunt POD Circuit Card | 1-1/3 | Bussmann GMT | 248610700 |
| | -- | -- | -- | Safety Fuse Cover (GMT-X) | 248898700 |
| Distribution Bus Module with TPH Fuse Block(s) | FA | Fuse Alarm | 1/4 | Bussmann GMT | 248610200 |
| | -- | -- | -- | Safety Fuse Cover (GMT-X) | 248898700 |
| TPS/TLS Fuseholders (P/N 117201) | FA | Fuse Alarm | 18/100 | Bussmann GMT-A | 248610301 |
| | -- | -- | -- | Safety Fuse Cover (GMT-X) | 248898700 |
| GMT Fuse Block Assembly (P/N 509128) | See "GMT Load Distribution Fuse Block Assembly Kit (P/N 514432)" under ACCESSORY DESCRIPTIONS for replaceable fuses part numbers. | | | | |

Table 3
Replaceable Alarm, Reference, and Control Fuses

## TPH-Type Fuses

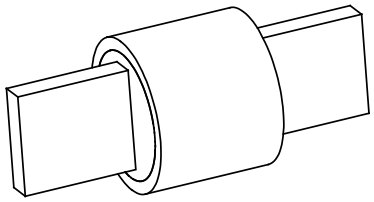
### Restrictions

A bus arrangement must be specified that contains a TPH-type fuseholder.

Load should not exceed 80% of device rating.

### Ordering Notes

1) Order fuses as required per Table 4 (TPH Fuses).



TPH Fuse

| Ampere Rating | Part Number | for wire size and lug selection, refer to the following table |
|---|---|---|
| 70 | 119437 | Table 14 |
| 80 | 119438 | |
| 100 | 119440 | |
| 150 | 119581 | |
| 200 | 119582 | |
| 225 | 119583 | |
| 250 | 119584 | |
| 300 | 119585 | |
| 400 | 119586 | |
| 500 | 119587 | |
| 600 | 119588 | |

Table 4
TPH Fuses

## GJ/218-Type Circuit Breakers

### Restrictions

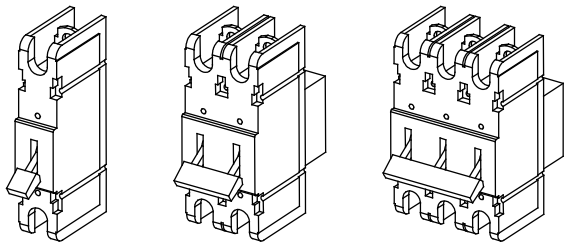
A bus arrangement must be specified that contains GJ/218-type circuit breaker positions.

Load should not exceed 80% of device rating.

Refer to Table 5 for required distribution row mounting positions.

### Ordering Notes

1) Order circuit breakers as required per Table 5 (GJ/218 Circuit Breakers).
2) Order a jumper kit as required for each circuit breaker per Table 6 (Breaker Jumper Kits).



GJ/218 Circuit Breakers

| Ampere Rating | Number of Positions | P/N Electrical/ Mechanical Trip[1] without Internal Shunt | P/N Electrical Trip[2] without Internal Shunt | P/N Electrical Trip[2] with Internal Shunt (25mV @ full rated load)[3] | P/N Electrical/ Mechanical Trip[1] with Internal Shunt (25mV @ full rated load)[3] | for wire size and lug selection, refer to the following table |
|---|---|---|---|---|---|---|
| 100 | 1 | 256621700 | 256621300 | 516184 | 123580 | Table 14 |
| 125 | 1 | 256621600 | 256621400 | 516187 | 123631 | |
| 150 | 1 | 256621800 | 256622400 | 516185 | 123632 | |
| 175 | 1 | 256621900 | 256622500 | 516186 | 123633 | |
| 200 | 1 | 256622200 | 256622600 | 516188 | 123634 | |
| 225 | 1 | 256622900 | 256622700 | 516189 | 123635 | |
| 250 | 1 | 256623500 | 256623400 | 516190 | 123636 | |
| 300 | 2 | 256625300 | 103572 | -- | -- | |
| 400 | 2 | 256626200 | 256626300 | -- | -- | |
| 600 | 3 | 256628200 | 103571 | -- | -- | |

[1, 2] Circuit Breaker Alarm Operation:
- [1] Provides an alarm during an electrical or manual trip condition.
- [2] Provides an alarm during an electrical trip condition only.

[3] Extended shunt leads are 22 AWG stranded wire, approximately 7-10 ft. long from exit point at bottom of Distribution Cabinet. Each shunt lead is equipped with a 49.9 ohm current limiting resistor. If a List 80 is ordered, shunt leads in the Main Bay are factory-connected to the LMS1000 unless otherwise specified. The LMS1000 must be equipped with the appropriate quantity of analog input cards capable of reading the shunts to have the factory connections made.

Table 5
GJ/218 Circuit Breakers

| Breaker Ampere Rating | Distribution Bus Module List No. | Breaker Jumper Kit P/N (Order 1 of the following kits for each circuit breaker W/O an internal shunt.) | Breaker Jumper Kit P/N (Order 1 of the following kits for each circuit breaker WITH an internal shunt.) |
|---|---|---|---|
| 100A-250A | AB, AC, AD, AE, CB, CD, CE, CF, NB | 503787 | 513731 |
| 300A, 400A | AB, CB, NB | 500133 | -- |
| | AC, CD | 509060 | -- |
| | AD, AE, CE, CF | 513961 | -- |
| 600A | AB, CB, NB | 500131 | -- |
| | AC, CD | 509061 | -- |
| | AD, AE, CE, CF | 513957 | -- |

Table 6
GJ/218 Circuit Breaker Jumper Kits

## Bullet Nose-Type Circuit Breakers and Bullet Nose-Type Fuseholders e/w TPS/TLS Fuses

### Features

- Each circuit breaker (as listed in Table 7 and Table 8) plugs into one, two, or three mounting position(s) on a Distribution Bus Module containing Bullet Nose-type distribution positions.
- A single fuseholder provides for installation of a 3 to 100 ampere Bussmann TPS-type or Littelfuse TLS-type fuse (as listed in Table 9). This fuseholder plugs into a single mounting position on a Distribution Bus Module containing Bullet Nose-type distribution positions. This fuseholder provides a GMT-A alarm type fuse, which operates open to provide an alarm indication if the associated distribution fuse opens.

### Restrictions

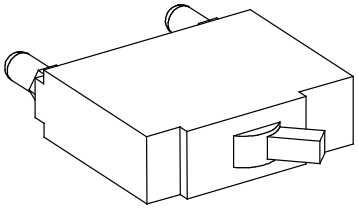
Load should not exceed 80% of device rating.

Install distribution devices from left to right, starting with the highest capacity and working to the lowest capacity.

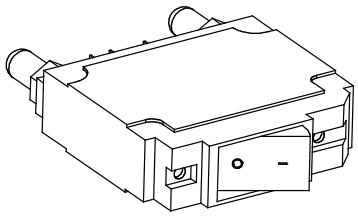
*Caution: A circuit breaker with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.*

### Ordering Notes

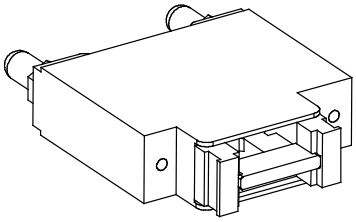
1) Order circuit breakers as required per Table 7 (Toggle Handle Bullet Nose Circuit Breakers) or Table 8 (Rocker Handle Bullet Nose Circuit Breakers).
2) Order fuses as required per Table 9 (Bullet Nose-Type Fuseholders and TPS/TLS Fuses). For each fuse ordered, also order one (1) P/N 117201 bullet nose-type fuseholder.
3) When ordering 125A, 150A, 175A, 200A, 225A, or 250A circuit breakers, associated crimp lugs must be ordered from Table 12 (Special Application Crimp Lug / Strap Combination) or see the following part numbers in ACCESSORY DESCRIPTIONS for available adapter bus bars: 514717, 53449, 514714.



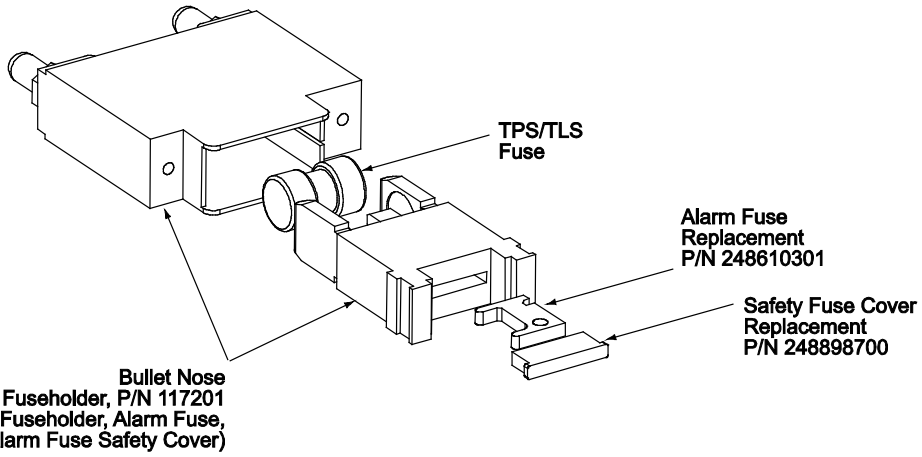
Toggle Handle Bullet Nose Circuit Breaker



Rocker Handle Bullet Nose Circuit Breaker



Bullet Nose Fuseholder



| Ampere Rating | Number of Poles (and Mounting Positions) | Part Number | | for wire size and lug selection, refer to the following table |
|---|---|---|---|---|
| | | Electrical Trip[1] (White Handle) | Electrical/ Mechanical Trip[2] (Black Handle) | |
| 1 | 1 | 102272 | 101596 | Table 13 |
| 3 | 1 | 102273 | 101597 | |
| 5 | 1 | 102274 | 101598 | |
| 10 | 1 | 102275 | 101599 | |
| 15 | 1 | 102276 | 101600 | |
| 20 | 1 | 102277 | 101601 | |
| 25 | 1 | 102278 | 101602 | |
| 30 | 1 | 102279 | 101603 | |
| 35 | 1 | 102280 | 101604 | |
| 40 | 1 | 102281 | 101605 | |
| 45 | 1 | 121998 | 121997 | |
| 50 | 1 | 102282 | 101606 | |
| 60 | 1 | 102283 | 101607 | |
| 70 | 1 | 102284 | 101608 | |
| 75 | 1 | 102285 | 101609 | |
| 80 | 1 | 121996 | 121995 | |
| 90 | 1 | 138887 | 138888 | |
| 100 | 1 | 102286 | 101610 | |
| 125 | 2 | 516991 | 516838 | |
| 150 | 2 | 516993 | 516839 | |
| 175 | 2 | 144883 | 144884 | |
| 200 | 2 | 121831 | 121832 | |
| 225 | 3 | 144885 | 144886 | Order (1) P/N 514717 adapter kit per 225A or 250A Bullet Nose Type circuit breaker ordered. Order lugs per Table 12. |
| 250 | 3 | 121835 | 121836 | |

Circuit Breaker Alarm Operation:

[1] Provides an alarm during an electrical trip condition only.

[2] Provides an alarm during an electrical or manual trip condition.

*Note: See the following part numbers in ACCESSORY DESCRIPTIONS for available adapter bus bars: 514717, 53449, 514714.*

Table 7
Toggle Handle Bullet Nose Circuit Breakers

| Ampere Rating | Number of Poles (and Mounting Positions) | Part Number | | for wire size and lug selection, refer to the following table |
|---|---|---|---|---|
| | | Electrical Trip[1] (White Handle) | Electrical/ Mechanical Trip[2] (Black Handle) | |
| 1 | 1 | 142856 | 142878 | Table 13 |
| 3 | 1 | 142857 | 142879 | |
| 5 | 1 | 142858 | 142880 | |
| 10 | 1 | 142859 | 142881 | |
| 15 | 1 | 142861 | 142882 | |
| 20 | 1 | 142862 | 142883 | |
| 25 | 1 | 142863 | 142884 | |
| 30 | 1 | 142864 | 142885 | |
| 35 | 1 | 142865 | 142886 | |
| 40 | 1 | 142866 | 142887 | |
| 45 | 1 | 142867 | 142888 | |
| 50 | 1 | 142868 | 142889 | |
| 60 | 1 | 142869 | 142890 | |
| 70 | 1 | 142870 | 142891 | |
| 75 | 1 | 142871 | 142892 | |
| 80 | 1 | 142872 | 142901 | |
| 100 | 1 | 142873 | 142902 | |
| 125 | 2 | 142874 | 142903 | |
| 150 | 2 | 142875 | 142904 | |
| 200 | 2 | 142876 | 142905 | |
| 250 | 3 | 142877 | 142906 | Order (1) P/N 514717 adapter kit per 225A or 250A Bullet Nose Type circuit breaker ordered. Order lugs per Table 12. |

Circuit Breaker Alarm Operation:

[1] Provides an alarm during an electrical trip condition only.

[2] Provides an alarm during an electrical or manual trip condition.

*Note: See the following part numbers in ACCESSORY DESCRIPTIONS for available adapter bus bars: 514717, 53449, 514714.*

Table 8
Rocker Handle Bullet Nose Circuit Breakers

| Ampere Rating | Part Number | Bussmann P/N | Littelfuse P/N | for wire size and lug selection, refer to the following table |
|---|---|---|---|---|
| 3 | 248230900 | TPS-3 | TLS003 | Table 13 |
| 5 | 248231000 | TPS-5 | TLS005 | |
| 6 | 248231200 | TPS-6 | TLS006 | |
| 10 | 248231500 | TPS-10 | TLS010 | |
| 15 | 248231800 | TPS-15 | TLS015 | |
| 20 | 248232100 | TPS-20 | TLS020 | |
| 25 | 248232400 | TPS-25 | TLS025 | |
| 30 | 248232700 | TPS-30 | TLS030 | |
| 40 | 248233300 | TPS-40 | TLS040 | |
| 50 | 248233900 | TPS-50 | TLS050 | |
| 60 | 248234200 | TPS-60 | TLS060 | |
| 70 | 248234500 | TPS-70 | TLS070 | |
| 80 | 118413 | -- | TLS080 | |
| 90 | 118414 | -- | TLS090 | |
| 100 | 118415 | -- | TLS100 | |
| Bullet Nose-Type Fuseholder | | P/N 117201 (Includes Fuseholder, 18/100A GMT-A Alarm Fuse, and GMT-X Safety Fuse Cover) | | |

Table 9
Bullet Nose-Type Fuseholders and TPS/TLS Fuses

## Rectifier Module Mounting Position Blank Cover Panel (P/N 21140440)

**Features**

- Covers one (1) unused Rectifier Module mounting position.

**Ordering Notes**

1) Order a Rectifier Module Mounting Position Blank Cover Panel, P/N 21140440, for each empty rectifier module mounting position in the system.

## Battery Charge Temperature Compensation Probe for Single Probe Digital Compensation (P/Ns 107021 and 106824)

**Features**

- This system can be used with a Battery Charge Temperature Compensation Probe. This probe must be mounted near the battery to sense battery ambient temperature. The probe connects to and allows the MCA to automatically increase or decrease the output voltage of the system to maintain battery float current as battery ambient temperature decreases or increases, respectively. Battery life can be extended when an optimum charge voltage to the battery with respect to temperature is maintained. Two probes are available. P/N 107021 has a 25-foot long cord. P/N 106824 has a 100 foot-long cord. See "Overall Dimensions, Optional Digital Battery Charge Temperature Compensation Probe (P/N 107021 and 106824)" under PHYSICAL SIZE INFORMATION for a dimensional drawing.
- Allows Rectifier Module Battery Charge Temperature Compensation.
- Temperature Curve: Refer to Figure 1.

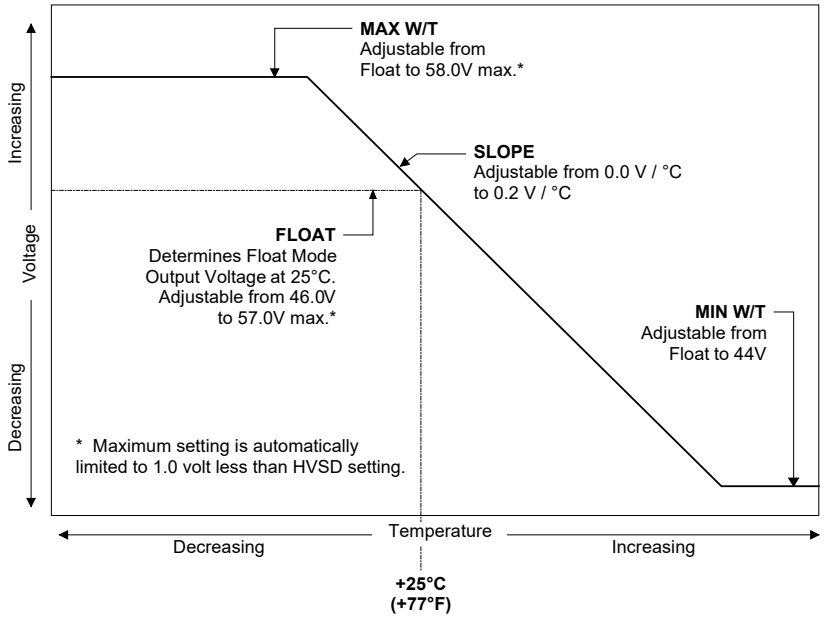
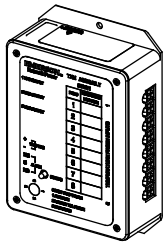



Figure 1
Typical Float Charge Thermal Characteristics
Using Optional Battery Charge Digital Temperature Compensation Probe
(Indicated parameters are user-adjustable via the associated MCA.)

**Ordering Notes**

1) Order one Battery Charge Temperature Compensation Probe per power system, as required.
2) Order 1 or more extension cable P/N 514153 as required to extend the length of the temperature probe in 25' increments.

## Battery Charge Temperature Compensation Probe Concentrator for Multiple Probe Use (TXM)



521211

### Battery Temperature Probe Concentrator Kit (P/N 524570)

#### Features

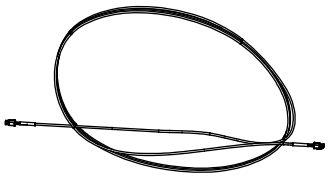
- The Battery Temperature Probe Concentrator (TXM) expands battery temperature monitoring capabilities by providing a means of monitoring up to eight (8) analog battery temperature probes. The TXM provides a digital output for connection to the MCA's battery temperature probe connector. The MCA can be programmed to compensate for the hottest probe reading, the average temperature of all connected probes, or the probe connected to the lowest numbered connector. The kit includes one TXM (P/N 521211) and one 25 ft. interface cable (P/N 521228) for connecting the TXM to the MCA.

#### Restrictions

Requires P/N 521262 analog probes. **Cannot** be used with digital probes (P/N 106824 and 107021).

#### Ordering Notes

1) Order one Battery Charge Temperature Compensation Probe Concentrator Kit (P/N 524570) per power system, and up to eight P/N 521262 probes, as required. Order extension cable P/N 514153 as required.



521228

### Analog Battery Temperature Probe (P/N 521262)

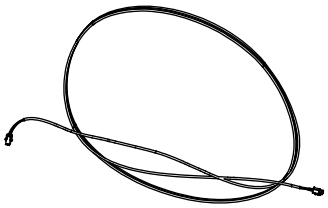
#### Features

- An analog probe designed to sense internal battery temperature. Mounts on the negative terminal of the battery; mounting hole clears 5/16" hardware. Includes 15 ft. cable with connector. See "Overall Dimensions, Optional Analog Battery Temperature Probe (P/N 521262)" under PHYSICAL SIZE INFORMATION for a dimensional drawing.

#### Ordering Notes

1) See above Ordering Notes.

### TXM Extension Cable (P/N 514153)



514153

#### Features

- 25 ft. long cable. Can be used between a P/N 521262 Analog Battery Temperature Probe and the TXM; or to extend a P/N 521228 interface cable between the TXM and MCA.
- Can also be used to extend Battery Charge Temperature Compensation Digital Probes (P/Ns 106824 and 107021).

#### Ordering Notes

1) See above Ordering Notes.

## Adding Additional Shelf in Field Output Busbar Kit (P/N 529139)

**Features**

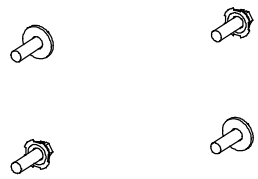
- Kit to tie the DC output busbars in a field installed Rectifier Module Mounting Shelf to the DC busbars in a Spec. No. 582126000 NetSure Power System.

**Restrictions**

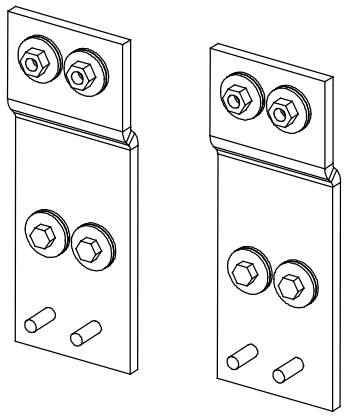
Only two rectifier shelves can be added to a system in the field for expansion.

**Ordering Notes**

1) Order kit P/N 529139 for each Rectifier Module Mounting Shelf to be added.



Shelf Mounting Hardware

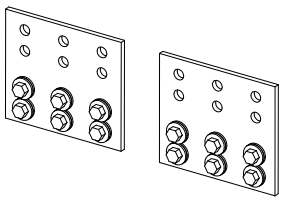


Interconnecting Busbars and Hardware

## Battery Busbar Kits

### Battery Busbar Extension Kit (P/N 514713)

#### Features



- Provides busbar extension plates and mounting hardware for extending battery busbars through the top of a Distribution Cabinet. Each busbar extension plate provides three pairs of clearance holes for 3/8" hardware on 1" centers. Allows back-to-back lug landing for up to six lugs per polarity. See "Electrical Connection Locations and Dimensions, Input Battery (Connections to Optional Battery Busbar Extension Kit P/N 514713 Installed in Lists 21 through 24 Distribution Cabinets)" under PHYSICAL SIZE INFORMATION.

#### Restrictions

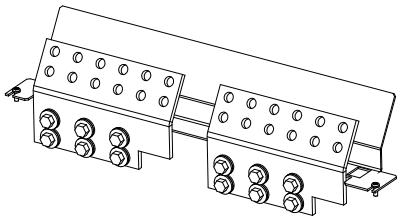
Required for cable connections between 1200A and 2000A per bay when interbay busbars are not provided.

#### Ordering Notes

1) Order one (1) kit P/N 514713 per bay that busbars are to be extended, as required.

### Battery Busbar Extension Kit (P/N 529143)

#### Features



- Provides busbar extension plates, mounting hardware, and rear plastic cover for extending battery busbars through the top of a Distribution Cabinet. Each busbar extension plate provides six pairs of clearance holes for 3/8" hardware on 1" centers. Allows back-to-back lug landing for up to twelve lugs per polarity. See "Electrical Connection Locations and Dimensions, Input Battery (Connections to Optional Battery Busbar Extension Kit P/N 529143 Installed in Lists 21 through 24 Distribution Cabinets)" under PHYSICAL SIZE INFORMATION.

#### Restrictions

Required for cable connections between 1200A and 2000A per bay when interbay busbars are not provided.

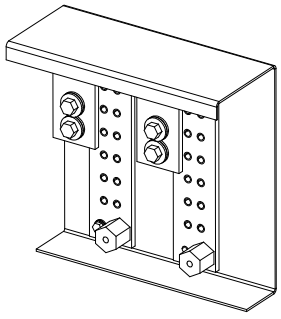
Cannot be used with List 45 and List 46 top mount AC input termination panels due to interference.

#### Ordering Notes

1) Order one (1) kit P/N 529143 per bay that busbars are to be extended, as required.

### Battery Landing Busbar Kit (P/N 541371)

#### Features



- Provides a Battery Landing Busbar Kit that attaches to the distribution cabinet's battery busbars and hangs off the back of the cabinet. Six (6) battery landing positions are provided (per polarity) (1/4-20 x 0.875" studs on 0.625" centers). See "Electrical Connection Locations and Dimensions, Input Battery (Connections to Optional Battery Landing Busbar Kit P/N 541371 Installed in Lists 21 through 24 Distribution Cabinets)" under PHYSICAL SIZE INFORMATION.

#### Restrictions

FACTORY INSTALLED ONLY

CANNOT be used with List 2.

#### Ordering Notes

1) Order one (1) kit P/N 541371 per bay, as required.

## Lug Adapter Busbars

### Lug Adapter Busbar for up to 500 MCM Cable on a two-pole GJ Breaker (P/N 559643)

#### Features

- Provides a busbar that can be used in positions 1-2, 3-4, 5-6 or 7-8 of 582126000 List AD and AE. It lands lugs for up to 500 MCM cable on a two-pole GJ Breaker. It can provide enough surface area to completely cover a lug with tongue width of 1.85 inches. This will let the adapter plate accommodate up to a 500 MCM standard lug.

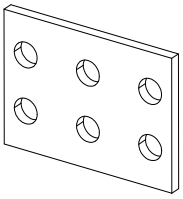
#### Ordering Notes

1) Order one (1) P/N 559643 per two-pole GJ Breaker.

**Lug Adapter Busbar for 225-250 Amp Bullet Nose Type Circuit Breaker (P/N 514717)**

**Features**

- Provides a busbar that mounts on the three lug landing positions of a 225A or 250A bullet nose circuit breaker, and provides a landing for a Special Application Crimp Lug / Strap Combination, which accepts required wire size.



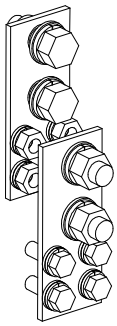
**Ordering Notes**

1) Order one (1) P/N 514717 per 225A or 250A Bullet Nose circuit breaker ordered.

**Lug Adapter Busbar Kit for 125-200 Amp Bullet Nose Type Circuit Breaker (P/N 534449)**

**Features**

- Includes one (1) busbar that mounts on the two lug landing positions of a 125-200A bullet nose circuit breaker, and provides a landing for one standard two-hole lug having 3/8" bolt clearance holes on 1" centers. Also includes one (1) busbar that mounts on two landings of the system ground return bar, and provides one landing for a standard two-hole lug having 3/8" bolt clearance Holes on 1" centers. All busbar and lug mounting hardware is included.



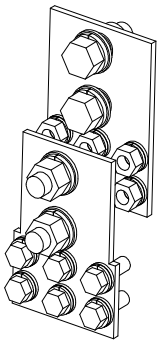
**Ordering Notes**

1) Order (1) Part No. 534449 per 125-200A Bullet Nose circuit breaker ordered.

**Lug Adapter Busbar Kit for 225-250 Amp Bullet Nose Type Circuit Breaker (P/N 514714)**

**Features**

- Includes one (1) busbar that mounts on the three lug landing positions of a 225A or 250A bullet nose circuit breaker, and provides one landing for a standard two-hole lug having 3/8" bolt clearance holes on 1" centers. Also includes one (1) busbar that mounts on three landings of the system ground return bar, and provides one landing for a standard two-hole lug having 3/8" bolt clearance Holes on 1" centers. All busbar and lug mounting hardware is included.



**Ordering Notes**

1) Order (1) Part No. 514714 per 225-250A Bullet Nose circuit breaker ordered.

## Lug Hardware Kits

**Bullet Distribution Assembly Lug Hardware Kit (P/N 520332)**

**Features**

- Kit provides all hardware required to connect load and ground lugs for four (4) positions of a bullet nose-type distribution assembly (all bullet nose-type distribution Lists except AN). Kit includes (8) 1/4-20 x 3/4" Bolt, (8) 1/4-20 Nut, (16) 1/4" Flat Washer, (16) 1/4" Lock Washer.

**Restrictions**

For Distribution Bus Modules that have studs on the ground bar and threaded holes on the load connections.

**Ordering Notes**

1) Order Kit P/N 520332, as required.

**Bullet Distribution Assembly Lug Hardware Kit (P/N 101212)**

**Features**

- Kit provides all hardware required to connect load and ground lugs for two (2) positions of a List AN bullet nose-type distribution assembly. Kit includes (8) 1/4-20 Nut, (8) 1/4" Flat Washer, (8) 1/4" Lock Washer.

**Restrictions**

For Distribution Bus Modules that have studs on the ground bar and studs on the load connections.

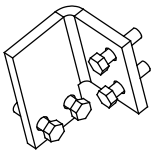
**Ordering Notes**

1) Order Kit P/N 101212, as required.

## LVD Contactor Bypass Kits (P/Ns 514910 and 514912)

**Features**

- Designed for field installation in a bullet nose type distribution bus module where the LVD function is no longer required. Each kit provides a busbar designed to bypass one (1) low voltage disconnect contactor in a List BA, CA, or GB.



Kit P/N 514910

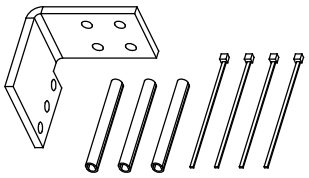
**Restrictions**

Kit P/N 514910 **may be** installed with power **applied** to system.

Kit P/N 514912 **must be** installed with power **removed** from system.

**Ordering Notes**

1) To **bypass** a contactor without removing it, order one (1) P/N 514910 kit (may be installed with power applied to system). Includes hardware.
2) To **replace** a contactor with busbar, order one (1) P/N 514912 kit (must be installed with power removed from system). Includes hardware.



Kit P/N 514912

## External Shunt Monitoring Kit (P/N 541134)

**Features**

- Allows an external shunt to be connected to and monitored by the power system.

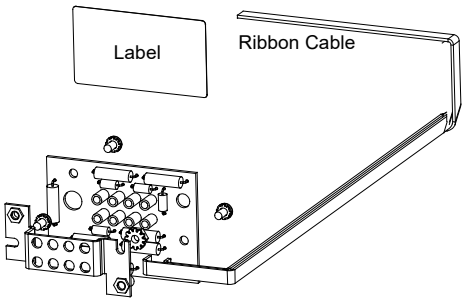
**Ordering Notes**

1) Order kit P/N 541134 to connect an external shunt to the power system.

## System Load Shunt Test Point Kit (P/N 545569)

**Features**

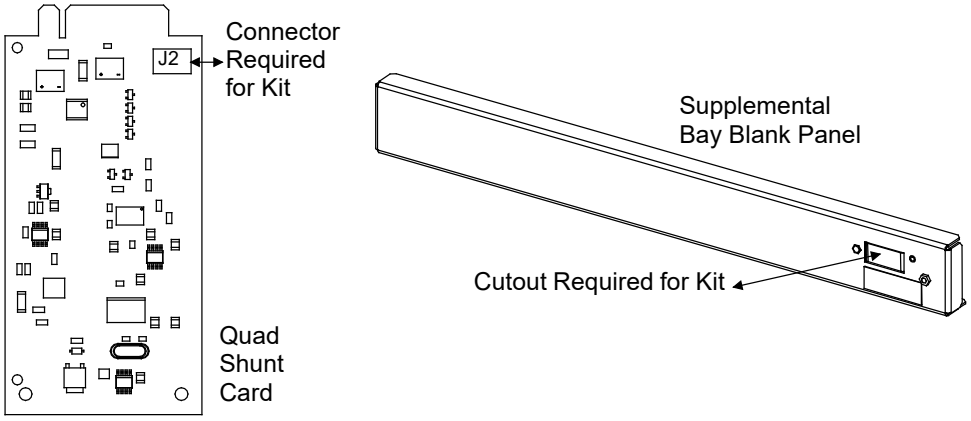
- Provides customer access test points for measuring the system load shunts with a multimeter (800A @ 50mV).
- Field installable in systems manufactured after the introduction of this kit (see Restrictions).
- Mounts to a cutout located on the MCA panel in a Main Bay and the similar blank panel in a Supplemental Bay.




**Restrictions**

CANNOT be used when the optional Front Access Ethernet Connector Kit (P/N 525110) is required (uses the same cutout for mounting).

For Installation into Systems in the Field:
Requires redesigned Quad Shunt Card (P/N 507431, Issue AE or greater), and
(if being installed in a Supplemental Bay) requires a cutout in the blank panel shown below.




**Ordering Notes**

1) Order System Load Shunt Test Point Kit (P/N 545569) as required.

## Optional Front Battery Cover Kits

**Features**

- Provides a front battery cover to the List 93 battery tray.

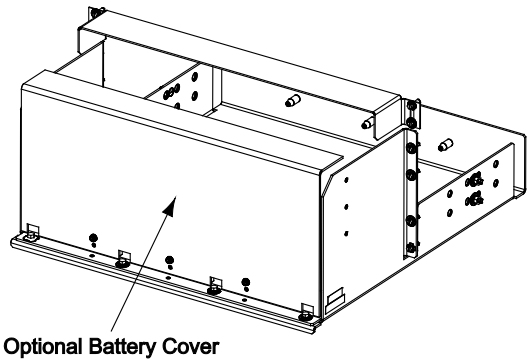
**Restrictions**

For 23" battery trays only.

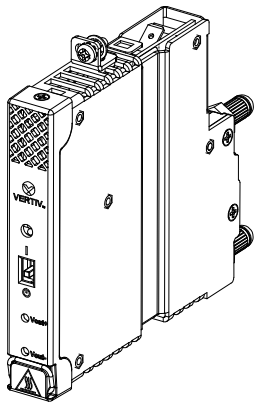
**Ordering Notes**

1) Order one (1) kit per tray, as required, from the following table.

| Part Number | Height |
|---|---|
| 548020 | 8U |
| 548021 | 7U |
| 548022 | 6U |



## Optional eSure™ Power Extend Converter



### Features

- The eSure Power Extend Converter (Model C48/58-1000B, Spec. No. 1C48581000B) is a compact DC/DC converter unit which offers efficient power conversion. It operates from a nominal -48 VDC source to provide regulated -58 VDC to the load for continuous operation to end of battery discharge. Refer to UM565050 and IM565391 for further information.

### Restrictions

Only install the power extend converter into a -48 VDC distribution position. Non-repairable damage will occur if the power extend converter is plugged into a +24 VDC distribution position.

### Ordering Notes

1) To add an eSure Power Extend Converter to a 582126000 List AA, AM, AN (24-position bullet) distribution panel or List JA, JB, JC (20-position bullet dual voltage) or List JD (22-position bullet dual voltage) distribution panel; refer to the material list in the eSure Power Extend Converter Calculator (link provided below).

   https://www.vertiv.com/en-us/products-catalog/critical-power/dc-power-systems/esure-power-extend-converter-c4858-1000/#/downloads

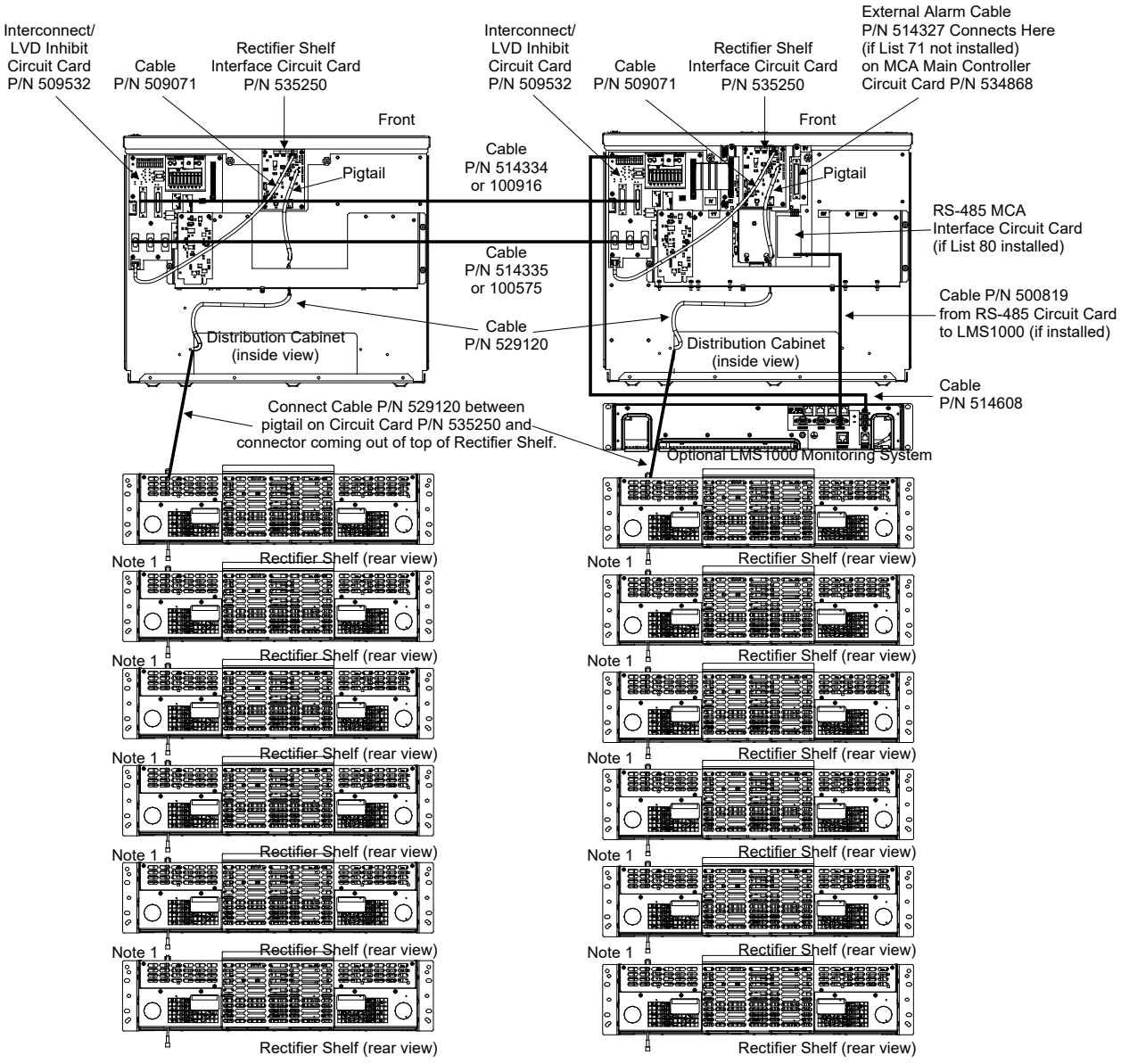
## Replacement Cables

**Ordering Notes**

1) Refer to the following table and illustration.

| Item | Part Number / Description |
|---|---|
| Standard External Alarm Interconnect Cable (cannot be used with List 71): | One 15 ft. cable is provided with List 1. For a replacement cable, order **P/N 514327**. Also available is **P/N 514380** (60 ft. cable).<br>Provides pre-assembled cable and mating connector for connecting the MCA external alarm connector to customer circuits.<br>Connects to J8 on the MCA Main Controller circuit card P/N 534868 located in the Main Bay Distribution Cabinet, and provides unterminated 28 AWG leads for splicing to customer leads. |
| Bay's Rectifier Shelf Interface Circuit Card to MCA Interconnect Cable: | **P/N 509071**<br>Provides pre-assembled cable and mating connectors for connecting the Bay's Rectifier Shelf Interface circuit card to the MCA (via the "Interconnect/Inhibit" circuit card).<br>Connects between the Rectifier Shelf Interface circuit card P/N 535250 located in the Bay's Distribution Cabinet and the "Interconnect/Inhibit" circuit card located in the same Distribution Cabinet. |
| Bay's Internal 'Rectifier Module Control' Interconnect Cable: | **P/N 529120**<br>Provides pre-assembled cable and mating connectors for connecting the Bay's Rectifier Shelf Interface circuit card to the top most Rectifier Module Mounting Shelf.<br>Connects between the pigtail located on Rectifier Shelf Interface circuit card P/N 535250 located in the Bay's Distribution Cabinet and the connector exiting the top of the top most installed Rectifier Module Mounting Shelf.<br>Note that subsequent Rectifier Module Mounting Shelves located within the same bay are interconnected via the shelf's internal wiring harness. Connect the mating connector of the cable exiting the bottom of one Rectifier Module Mounting Shelf with the connector exiting the top of the shelf installed below it. |
| Bay-to-Bay 'Distribution Control' Interconnect Cable: | A 6 ft. cable is provided with List 2. For a replacement cable, order **P/N 514334**.<br>A 25 ft. cable is provided with List 5. For a replacement cable, order **P/N 100916**.<br>Provides pre-assembled cable and mating connectors for connecting the alarm, reference, and control leads of the Supplemental Bay distribution to those of the Main Bay distribution (and to the MCA).<br>Connects between J1 on "Interconnect/Inhibit" circuit card 509532 located within the Main Bay Distribution Cabinet and J2 on "Interconnect/Inhibit" circuit card 509532 located within the Supplemental Bay Distribution Cabinet. |
| Bay-to-Bay 'Rectifier Module Control' Interconnect Cable: | A 7-1/2 ft. cable is provided with List 2. For a replacement cable, order **P/N 514335**.<br>A 25 ft. cable is provided with List 5. For a replacement cable, order **P/N 100575**.<br>Provides pre-assembled cable and mating connectors for Rectifier Module control signal interconnection between the MCA (in the Main Bay) and Rectifier Module Mounting Shelves located in the Supplemental Bay.<br>Connects between J8, J9, or J10 on "Interconnect/Inhibit" circuit card 509532 located in the Main Bay Distribution Cabinet and J8, J9, or J10 on "Interconnect/Inhibit" circuit card 509532 located in the Supplemental Bay Distribution Cabinet. |

| Item | Part Number / Description |
|---|---|
| MCA to LMS1000 Interface Cable: | **P/N 500819**<br>Provided with List 80. Connects between the RS-485 circuit card installed on the MCA located within the Main Bay Distribution Cabinet and the OEM3 jack labeled "Vortex RS485" located on back of the LMS1000 shelf. |
| LMS1000 Input Power Cable: | **P/N 514608**<br>Provided with List 80. Connects between the input power connector located on back of the LMS1000 shelf and the "Internally Fused Voltage Source" terminals located on “Interconnect/Inhibit” circuit card 509532 located within the Main Bay Distribution Cabinet. |




Note 1: P/O Rectifier Shelf internal wire harness.
Mating connectors provided so that harness
exiting bottom of one cabinet plugs into harness
exiting top of cabinet installed beneath it.

Replacement Cable Diagram

## Replacement Components

### Ordering Notes

1) Refer to the following table. Refer also to "Replacement Components" in PD588705000.

| Item | Part Number |
|---|---|
| Rectifier Module: | Order via P/N 1R483200e or 1R483200. |
| MCA<br>MCA Main Controller Circuit Card:<br><br><br><br><br><br><br><br>MCA Keypad/Display Circuit Card:<br>MCA Power Supply Circuit Card: | <br><br>534868 with 534876 Configuration (List 10 Standard Configuration)<br><br>534868 with 534877 Configuration (List 11 Special Application Configuration)<br><br>534868 with 534878 Configuration (List 12 Special Application Configuration)<br><br>534868 with 534879 Configuration (List 13 Special Application Configuration.)<br><br>288710900<br>514362 |
| Rectifier Shelf Interface Circuit Card: | 535250 |
| MCA Interface Circuit Cards: | Order via Lists 72, 74, 75, 76, 77, 78 |
| Audible Alarm and Alarm Termination Circuit Card | Order via List 71 |
| Quad Low Voltage Disconnect Circuit Card | 509477 |
| Interconnect/LVD Inhibit Circuit Card | 509532 |
| Quad Shunt POD Circuit Card | 507431 |
| Bypass Circuit Card (required for unused Quad LVD circuit card and Quad Shunt POD circuit card mounting positions) | 513737 |
| Shunt POD Circuit Card (List RD and RE Battery Disconnect Assembly with Shunt) | 501981 |
| DC-DC Converters | Converter Module: 486800128<br>Blank Module: 509288<br>Alarm Circuit Card: 514957 |

## RECOMMENDED WIRE SIZES, BRANCH CIRCUIT PROTECTION, AND CRIMP LUGS

### Load Distribution Wire Sizes and Lugs Selection

#### Features

- **When Distribution Bus Modules Using Bullet Nose-Type Devices (TPS/TLS Fuses and/or Bullet Nose-Type Circuit Breakers) are Provided:** Lug-terminated load leads are connected to the individual load busbars located on the Distribution Bus Module and the respective distribution ground busbar.

  The individual load busbars provide 1/4-20 threaded holes or studs for installation of customer-provided two-hole lugs that have 5/8 inch centers and 1/4 inch bolt clearance holes. Customer must provide additional hardware.

  The distribution ground busbar provides 1/4-20 studs for installation of the same type of customer-provided lugs. Customer must provide lug mounting hardware.

  Refer to the illustrations under the LIST DESCRIPTIONS for a dimensional drawing.

  Maximum size of wire to be connected to a single fuseholder/circuit breaker position is 2 AWG. For wiring up to 350 kcmil, see Table 12 (Special Application Crimp Lug / Strap Combination), or see the following part numbers in ACCESSORY DESCRIPTIONS for available adapter busbars: 514717, 534449, and 514714.

- **When Distribution Bus Modules Using GJ/218 Circuit Breakers or TPH Fuses are Provided:** Lug-terminated load leads are connected to the individual load busbars located on the Distribution Bus Module and the respective distribution ground busbar.

  The individual load busbars provide 3/8-16 captive nuts for installation of customer-provided two-hole lugs that have 1 inch centers and 3/8 inch bolt clearance holes. Customer must provide lug mounting bolts and hardware.

  The distribution ground busbar provides 3/8-16 captive nuts for installation of the same type of customer-provided lugs. Customer must provide lug mounting bolts and hardware.

  Refer to the illustrations under the LIST DESCRIPTIONS for a dimensional drawing.

#### Restrictions

See 'Features' above.

#### Ordering Notes

1) The rating of the distribution device determines the load lead wire size requirement. The Distribution Bus Module ordered determines the lug hole size and spacing requirements. For wire size and lug selection; refer to the following.
   a) **When Distribution Bus Modules Using Bullet Nose-Type Devices (TPS/TLS Fuses and/or Bullet Nose-Type Circuit Breakers) are Provided:** The individual load busbars and associated ground busbar are designed to accommodate the lugs listed in Tables 10 and 12. Use Table 13 to select recommended load distribution wire sizes and lugs for various loop lengths per fuse/circuit breaker ampere rating.
   b) **When Distribution Bus Modules Using GJ/218 Circuit Breakers or TPH Fuses are Provided:** The individual load busbars and associated ground busbar are designed to accommodate the lugs listed in Table 11. Use Table 14 to select recommended load distribution wire sizes and lugs for various loop lengths per fuse/circuit breaker ampere rating. Also use these tables when using lug adapters 534449 or 514714 for bullet panels.

2) For other available lugs and hardware, refer to drawings 031110100 through 031110300.

## Input Battery Wire Sizes and Lugs Selection

### Features

- **When Distribution Bus Modules Providing Battery Disconnect Fuse/Circuit Breaker Positions are Provided:**

  a) **When Distribution Bus Modules Using Bullet Nose-Type Devices (TPS/TLS Fuses and/or Bullet Nose-Type Circuit Breakers) are Provided:** Lug-terminated input battery leads are connected to the individual battery busbars located on the Distribution Bus Module and the respective battery return busbar.

  **Battery Load Side:** The individual input battery busbars provide 1/4-20 threaded holes for installation of customer-provided two-hole lugs that have 5/8 inch centers and 1/4 inch bolt clearance holes. Refer to the illustrations under the LIST DESCRIPTIONS for a dimensional drawing. Maximum size of wire to be connected to a single fuseholder/circuit breaker position is 2 AWG. For wiring up to 350 kcmil, see Table 12 (Special Application Crimp Lug / Strap Combination), or see the following part numbers in ACCESSORY DESCRIPTIONS for available adapter busbars: 514717, 534449, and 514714.

  **Battery Return Side:** The battery return busbar provides 3/8-16 and 1/4-20 captive nuts for installation of customer-provided two-hole lugs that have 1 or 5/8 inch centers and 3/8 or 1/4 inch bolt clearance holes, respectively. Refer to "Electrical Connection Locations and Dimensions" under PHYSICAL SIZE INFORMATION for a dimensional drawing. Customer must provide lug mounting bolts and hardware.

  b) **When Distribution Bus Modules Using GJ/218 Circuit Breakers or TPH Fuses are Provided:** Lug-terminated input battery leads are connected to the individual battery busbars located on the Distribution Bus Module and the respective battery return busbar.

  **Battery Load Side:** The individual input battery busbars provide 3/8-16 captive nuts for installation of customer-provided two-hole lugs that have 1 inch centers and 3/8 inch bolt clearance holes. Refer to the illustrations under the LIST DESCRIPTIONS for a dimensional drawing. Customer must provide lug mounting bolts and hardware.

  **Battery Return Side:** The battery return busbar provides 3/8-16 and 1/4-20 captive nuts for installation of customer-provided two-hole lugs that have 1 or 5/8 inch centers and 3/8 or 1/4 inch bolt clearance holes, respectively. Refer to "Electrical Connection Locations and Dimensions" under PHYSICAL SIZE INFORMATION for a dimensional drawing. Customer must provide lug mounting bolts and hardware.

- **When Distribution Bus Modules with Battery Disconnect Fuse/Circuit Breaker Positions are NOT Provided:** Lug-terminated input battery leads are connected to the battery busbar and battery return busbar. These busbars provide 3/8-16 and 1/4-20 captive nuts for installation of customer-provided two hole lugs that have 1 or 5/8 inch centers and 3/8 or 1/4 inch bolt clearance holes, respectively. Customer must provide lug mounting bolts and hardware. Refer to "Electrical Connection Locations and Dimensions" under PHYSICAL SIZE INFORMATION for a dimensional drawing.

### Restrictions

See 'Features' above.

### Ordering Notes

1) **When Distribution Bus Modules Providing Battery Disconnect Fuse/Circuit Breaker Positions are Provided:** The rating of the disconnect device determines the input battery lead wire size requirement. The Distribution Bus Module ordered determines the lug hole size and spacing requirements. For wire size and lug selection; refer to the following.

   a) **When Distribution Bus Modules Using Bullet Nose-Type Devices (TPS/TLS Fuses and/or Bullet Nose-Type Circuit Breakers) are Provided:** The individual input battery busbars and associated battery return busbar are designed to accommodate the lugs listed in Tables 10 and 12. Use Table 13 to select recommended battery wire sizes and lugs for various loop lengths per battery disconnect fuse/circuit breaker ampere rating. Table 14 may be used to select two-hole lugs with 3/8 inch bolt clearance holes and 1 inch centers for the battery return busbar.

   b) **When Distribution Bus Modules Using GJ/218 Circuit Breakers or TPH Fuses are Provided:** The individual input battery busbars and associated battery return busbar are designed to accommodate the lugs listed in Table 11. Use Table 14 to select recommended battery wire sizes and lugs for various loop lengths per battery disconnect fuse/circuit breaker ampere rating.

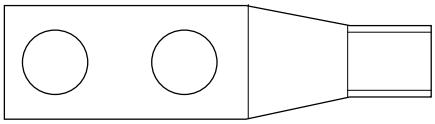
3) **When Distribution Bus Modules with Battery Disconnect Fuse/Circuit Breaker Positions are NOT Provided:** Battery wire size and lug requirements are determined by site requirements. For wire size and lug selection; refer to the following.

   The battery busbars are designed to accommodate the lugs listed in Tables 10 and 11. Use Table 14 to select recommended battery wire sizes and lugs for various loop lengths per required battery branch circuit ampere rating. Table 13 may be used to select two-hole lugs with 1/4 inch bolt clearance holes and 5/8 inch centers.

   ***Note:*** *Lists RA, RB, RC, RD, and RE do not provide 1/4-20 captive nuts on the battery busbar; only 3/8-16 captive nuts are furnished.*

4) For other available lugs and hardware, refer to drawings 031110100 through 031110300.

**Standard Crimp Lug Tables**



| Lead Size | Part Number |
|---|---|
| 14-10 AWG | 245342300 |
| 8 AWG | 245390200 |
| 6 AWG | 245346700 |
| 4 AWG | 245346800 |
| 2 AWG | 245346900 |

Table 10
Crimp Lug
Two-Hole, 1/4” Bolt Clearance Hole, 5/8” Centers

| Lead Size | Part Number |
|---|---|
| 6 AWG | 245349900 |
| 4 AWG | 245350000 |
| 2 AWG | 245348200 |
| 1/0 AWG | 245347100 |
| 2/0 AWG | 245347200 |
| 3/0 AWG | 245347300 |
| 4/0 AWG | 245347400 |
| 250 kcmil | 245347500 |
| 300 kcmil | 245347600 |
| 350 kcmil | 245347700 |
| 400 kcmil | 245347800 |
| 500 kcmil | 245347900 |
| 600 kcmil | 245348000 |
| 750 kcmil | 245348100 |

Table 11
Crimp Lug
Two-Hole, 3/8” Bolt Clearance Hole, 1” Centers

## Special Application Crimp Lug / Strap Combination Table

### Features

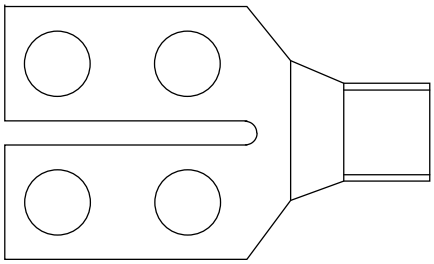
- Straps two fuseholder/circuit breaker wiring positions together, and provides a crimp-type lug which allows distribution wiring up to 350 kcmil size (maximum size of wire to be connected to a single position is 2 AWG). Designed for use with 125 ampere and larger bullet nose-type circuit breakers or TPS/TLS-type fuses, which require at least two mounting positions.

### Restrictions

If used with bullet nose-type circuit breakers or TPS/TLS-type fuses smaller than 125 amperes, an empty mounting position is required adjacent to the distribution device.

### Ordering Notes

1) Specify part number from Table 12 for desired lead size.



| Lead Size | Part Number |
|---|---|
| 1/0 AWG | 245393500 |
| 2/0 AWG | 245393600 |
| 3/0 AWG | 245393700 |
| 4/0 AWG | 245393800 |
| 250 kcmil | 514872 |
| 350 kcmil | 514873 |

Table 12
Special Application Crimp Lug / Strap Combination
(Two-Hole Lug, 1/4” Bolt Clearance Hole, 5/8” Centers)

**Wire Size and Lug Selection Tables for Load and Battery Connections to TPS/TLS Fuses and Bullet Nose-Type Circuit Breakers or Battery Branch Circuits**

| Fuse/ Circuit Breaker Amperage | Recm 90°C Wire Size [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 14 AWG | 12 AWG | 10 AWG | 8 AWG | 6 AWG | 4 AWG | 2 AWG | 1/0 AWG |
| | Loop Length (feet) [2] | | | | | | | |
| 1, 3, 5, 6, 10A | 37 [3, 4] | 58 [3, 4] | 93 [3, 4] | -- | -- | -- | -- | -- |
| 15A | 24 [3, 4] | 39 [3, 4] | 62 [3, 4] | -- | -- | -- | -- | -- |
| 20A | -- | 29 [3, 4] | 46 [3, 4] | 74 [3, 4] | -- | -- | -- | -- |
| 25A | -- | -- | 37 [3, 4] | 59 [3, 4] | 94 [3, 4] | -- | -- | -- |
| 30A | -- | -- | 31 [3, 4] | 49 [3, 4] | 78 [3, 4] | -- | -- | -- |
| 35A | -- | -- | -- | 42 [3, 4] | 67 [3, 4] | 107 [3, 4] | -- | -- |
| 40A | -- | -- | -- | 37 [3, 4] | 59 [3, 4] | 94 [3, 4] | -- | -- |
| 45A | -- | -- | -- | 33 [3, 4] | 52 [3, 4] | 83 [3, 4] | -- | -- |
| 50A | -- | -- | -- | 29 [3, 4] | 47 [3, 4] | 75 [3, 4] | -- | -- |
| 60A | -- | -- | -- | -- | 39 [3, 4] | 62 [3, 4] | 99 [3, 4] | -- |
| 70A | -- | -- | -- | -- | 33 [3] | 53 [3, 4] | 85 [3, 4] | 135 [4] |
| 75A | -- | -- | -- | -- | 31 [3] | 50 [3, 4] | 79 [3, 4] | 126 [4] |
| 80A | -- | -- | -- | -- | -- | 47 [3, 4] | 74 [3, 4] | 118 [3, 4] |
| Recommended Crimp Lug [5] | | | | | | | | |
| Lug | 245342300 | 245342300 | 245342300 | 245390200 | 245346700 | 245346800 | 245346900 | 245393500 [6] |

1 Wire sizes based on recommendations of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC). Table 310-16 for copper wire at **90°C** conductor temperature operating in ambients of **30°C** and **40°C** was used. For other operating ambient temperatures, refer to the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

2 Recommended wire sizes are sufficient to restrict voltage drop to 1.0 volt or less at listed branch current for the loop lengths shown. Loop length is the sum of the lengths of the positive and negative leads.

3 Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.

4 Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.

5 Two-hole lug, 1/4" bolt clearance hole, 5/8" centers. Refer to drawing 031110100 for lug crimping information.

6 Special application crimp lug / strap combination.

Table 13 (cont'd on next page)
Recommended Wire Sizes and Lugs for Load and Battery Connections to Various **TPS/TLS Fuses** and **Bullet Nose-Type Circuit Breakers** or **Battery Branch Circuits**

| Fuse/ Circuit Breaker Amperage | Recm 90°C Wire Size [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 4 AWG | 2 AWG | 1/0 AWG | 2/0 AWG | 3/0 AWG | 4/0 AWG | 250 kcmil | 350 kcmil |
| | Loop Length (feet) [2] | | | | | | | |
| **90A** | 41 [3] | 66 [3, 4] | 105 [3, 4] | 133 [4] | -- | -- | -- | -- |
| **100A** | -- | 59 [3, 4] | 95 [3, 4] | 119 [3, 4] | -- | -- | -- | -- |
| **125A** | -- | 47 [3] | 76 [3, 4] | 95 [3, 4] | 120 [4] | -- | -- | -- |
| **150A** | -- | -- | 63 [3, 4] | 79 [3, 4] | 100 [3, 4] | -- | -- | -- |
| **175A** | -- | -- | -- | 68 [3, 4] | 86 [3, 4] | 108 [3, 4] | -- | -- |
| **200A** | -- | -- | -- | -- | 75 [3, 4] | 95 [3, 4] | 112 [3, 4] | -- |
| **225A** | -- | -- | -- | -- | 67 [3] | 84 [3, 4] | 100 [3, 4] | -- |
| **250A** | -- | -- | -- | -- | -- | 76 [3, 4, 7] | 90 [3, 4, 7] | 126 [3, 4, 7] |
| **Recommended Crimp Lug** | | | | | | | | |
| **Lug** [5] | 245346800 | 245346900 | 245393500 [6] | 245393600 [6] | 245393700 [6] | 245393800 [6] | 514872 [6] | 514873 [6] |
| **Lug** [8, 9] | -- | 245348200 | 245347100 | 245347200 | 245347300 | 245347400 | 245347500 | 245347700 |

1 Wire sizes based on recommendations of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC). Table 310-16 for copper wire at **90°C** conductor temperature operating in ambients of **30°C** and **40°C** was used. For other operating ambient temperatures, refer to the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

2 Recommended wire sizes are sufficient to restrict voltage drop to 1.0 volt or less at listed branch current for the loop lengths shown. Loop length is the sum of the lengths of the positive and negative leads.

3 Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.

4 Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.

5 Two-hole lug, 1/4" bolt clearance hole, 5/8" centers. Refer to drawing 031110100 for lug crimping information.

6 Special application crimp lug / strap combination.

7 **MUST USE** P/N 514717 Lug Adapter Busbar for lugs having 1/4" bolt clearance hole, 5/8" centers.

8 Two-hole lug, 3/8" bolt clearance hole, 1" centers. Refer to drawing 031110100 for lug crimping information.

9 **MUST USE** P/N 534449 Lug Adapter Busbar Kit for 125-200A circuit breakers, or P/N 514714 Lug Adapter Busbar Kit for 225A-250A circuit breakers.

Table 13 (cont'd from previous page)
Recommended Wire Sizes and Lugs for Load and Battery Connections
to Various **TPS/TLS Fuses** and **Bullet Nose-Type Circuit Breakers**
or **Battery Branch Circuits**

**Wire Size and Lug Selection Tables for Load and Battery Connections to TPH Fuses and GJ/218-Type Circuit Breakers or Battery Branch Circuits**

| Fuse/ Circuit Breaker Amperage | Recm 90°C Wire Size (1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 6 AWG | 4 AWG | 2 AWG | 1/0 AWG | 2/0 AWG | 3/0 AWG | 4/0 AWG | 250 kcmil |
| | Loop Length (feet) (2) | | | | | | | |
| 70A | 33 (3) | 53 (3, 4) | 85 (3, 4) | 135 (4) | -- | -- | -- | -- |
| 80A | -- | 47 (3, 4) | 74 (3, 4) | 118 (3, 4) | -- | -- | -- | -- |
| 100A | -- | -- | 59 (3, 4) | 95 (3, 4) | 119 (3, 4) | -- | -- | -- |
| 125A | -- | -- | 47 (3) | 76 (3, 4) | 95 (3, 4) | 120 (4) | -- | -- |
| 150A | -- | -- | -- | 63 (3, 4) | 79 (3, 4) | 100 (3, 4) | -- | -- |
| 175A | -- | -- | -- | -- | 68 (3, 4) | 86 (3, 4) | 108 (3, 4) | -- |
| 200A | -- | -- | -- | -- | -- | 75 (3, 4) | 95 (3, 4) | 112 (3, 4) |
| Recommended Crimp Lug (5) | | | | | | | | |
| Lug | 245349900 | 245350000 | 245348200 | 245347100 | 245347200 | 245347300 | 245347400 | 245347500 |

1 Wire sizes based on recommendations of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC). Table 310-16 for copper wire at **90°C** conductor temperature operating in ambients of **30°C** and **40°C** was used. For other operating ambient temperatures, refer to the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

2 Recommended wire sizes are sufficient to restrict voltage drop to 1.0 volt or less at listed branch current for the loop lengths shown. Loop length is the sum of the lengths of the positive and negative leads.

3 Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.

4 Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.

5 Two-hole lug, 3/8" bolt clearance hole, 1" centers. Refer to drawing 031110100 for lug crimping information.

Table 14 (cont'd on next page)
Recommended Wire Sizes and Lugs for Load and Battery Connections
to Various **TPH Fuses** and **GJ/218-Circuit Breakers**
or **Battery Branch Circuits**

| Fuse/ Circuit Breaker Amperage | Recm 90°C Wire Size [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2/0 AWG | 3/0 AWG | 4/0 AWG | 250 kcmil | 300 kcmil | 350 kcmil | 400 kcmil | 500 kcmil |
| | Loop Length (feet) [2] | | | | | | | |
| 225A | -- | 67 [3] | 84 [3, 4] | 100 [3, 4] | 120 [4] | -- | -- | -- |
| 250A | -- | -- | 76 [3] | 90 [3, 4] | 108 [3, 4] | 126 [4] | -- | -- |
| 300A | 159 [4] (2) Wires | -- | -- | -- | 90 [3] | 105 [3, 4] | 120 [3, 4] | -- |
| 400A | -- | 75 [3, 4] (2) Wires | 95 [3, 4] (2) Wires | 112 [3, 4] (2) Wires | -- | -- | -- | -- |
| 500A | -- | -- | 76 [3] (2) Wires | 90 [3, 4] (2) Wires | 108 [3, 4] (2) Wires | 126 [4] (2) Wires | -- | -- |
| 600A | -- | -- | -- | -- | 90 [3] (2) Wires | 105 [3, 4] (2) Wires 157 [4] (3) Wires | 120 [3, 4] (2) Wires | -- |
| Recommended Crimp Lug [5] | | | | | | | | |
| Lug | 245347200 (per cable) | 245347300 (per cable) | 245347400 (per cable) | 245347500 (per cable) | 245347600 (per cable) | 245347700 (per cable) | 245347800 (per cable) | 245347900 (per cable) |

1 Wire sizes based on recommendations of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC). Table 310-16 for copper wire at **90°C** conductor temperature operating in ambients of **30°C** and **40°C** was used. For other operating ambient temperatures, refer to the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

2 Recommended wire sizes are sufficient to restrict voltage drop to 1.0 volt or less at listed branch current for the loop lengths shown. Loop length is the sum of the lengths of the positive and negative leads.

3 Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.

4 Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.

5 Two-hole lug, 3/8" bolt clearance hole, 1" centers. Refer to drawing 031110100 for lug crimping information.

Table 14 (cont'd from previous page)
Recommended Wire Sizes and Lugs for Load and Battery Connections
to Various **TPH Fuses** and **GJ/218-Circuit Breakers**
or **Battery Branch Circuits**

## AC Input Branch Circuit Protection and Wire Size Selection (when Optional List 45 Top Mount AC Input Termination Panel is Furnished)

### Features

- See List 45 under LIST DESCRIPTIONS.
- See "Electrical Connections Locations and Dimensions, AC Input (to Optional List 45 Top Mount AC Input Termination Panel)" under PHYSICAL SIZE INFORMATION for illustration.

### Ordering Notes

1) Refer to Table 15 for recommended wire sizes and branch circuit protection.

| AC INPUT (to Optional List 45 Top Mount AC Input Termination Panel) Connection Points for Individual Rectifier Module AC Input Branch Circuits are Provided | | | | |
|---|---|---|---|---|
| **Operating Ambient Temperature (1)** | **Recm Branch Circuit Protection (2, 3)** | **Recm 90°C Wire Size (1)** | **AC Input Terminals** | |
| | | | **Capacity** | **Type** |
| 30°C | 25 Amperes | 10 AWG | 10 to 24 AWG | Screw Clamp |
| 40°C | | | | |
| **AC INPUT GROUND (to Optional List 45 Top Mount AC Input Termination Panel) A Ground Bar is Provided on Each Side of the List 45 AC Input Termination Panel** | | | | |
| **Operating Ambient Temperature (1)** | **Recm 90°C Wire Size (5)** | | **Ground Bar Terminals (4)** | |
| | | | **Capacity** | **Type** |
| 30°C | 10 AWG | | 10 to 14 AWG | Screw Clamp |
| 40°C | | | | |

1 Wire sizes based on recommendations of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC). Table 310-16 for copper wire at **90°C** conductor temperature, operating in ambients of **30°C** and **40°C** was used. For operation in other ambients, apply derating factors listed in Table 310-16 of the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

2 The AC input branch circuit protective device should be of the time-delay or high inrush type.

3 Recommendations based on Nominal Line Full Load Input Current of 18 Amperes.

4 Equipment grounding conductors must be provided with the AC input conductors supplied to the panel. Frame ground terminals must be connected to earth ground, not power system neutral.

5 Equipment grounding conductor size based on recommendations of the NEC Table 250-122 for copper wire. If aluminum or copper clad aluminum grounding conductor is used, refer to Table 250-122 for increased conductor size. For operation in countries where the NEC is not recognized, follow applicable codes.

Table 15
Recommended AC Input Branch Circuit Protection and Wire Size
when Using List 45 Top Mount AC Input Termination Panel

## AC Input Branch Circuit Protection and Wire Size Selection (when Optional List 46 Top Mount AC Input Termination Panel is Furnished)

### Features

- See List 46 under LIST DESCRIPTIONS.
- See "Electrical Connections Locations and Dimensions, AC Input (to Optional List 46 Top Mount AC Input Termination Panel)" under PHYSICAL SIZE INFORMATION for illustration.

### Ordering Notes

1) Refer to Table 16 for recommended wire sizes and branch circuit protection.

| AC INPUT (to Optional List 46 Top Mount AC Input Termination Panel) Connection Points for Two 3-Phase AC Input Feeds per Shelf are Provided | | | | |
|---|---|---|---|---|
| **Operating Ambient Temperature (1)** | **Recm Branch Circuit Protection (2, 3)** | **Recm 90°C Wire Size (1)** | **AC Input Terminals** | |
| | | | **Capacity** | **Type** |
| 30°C | 40 Amperes, 3-Pole | 8 AWG | 6 to 14 AWG | Screw Clamp |
| 40°C | | | | |
| **AC INPUT GROUND (to Optional List 45 Top Mount AC Input Termination Panel) A Ground Bar is Provided on Each Side of the List 45 AC Input Termination Panel** | | | | |
| **Operating Ambient Temperature (1)** | **Recm 90°C Wire Size (5)** | | **Ground Bar Terminals (4)** | |
| | | | **Capacity** | **Type** |
| 30°C | 10 AWG | | 10 to 14 AWG | Screw Clamp |
| 40°C | | | | |

1 Wire sizes based on recommendations of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC). Table 310-16 for copper wire at **90°C** conductor temperature, operating in ambients of **30°C** and **40°C** was used. For operation in other ambients, apply derating factors listed in Table 310-16 of the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

2 The AC input branch circuit protective device should be of the time-delay or high inrush type.

3 Recommendations based on Nominal Line Full Load Input Current of 29.3 Amperes.

4 Equipment grounding conductors must be provided with the AC input conductors supplied to the panel. Frame ground terminals must be connected to earth ground, not power system neutral.

5 Equipment grounding conductor size based on recommendations of the NEC Table 250-122 for copper wire. If aluminum or copper clad aluminum grounding conductor is used, refer to Table 250-122 for increased conductor size. For operation in countries where the NEC is not recognized, follow applicable codes.

Table 16
Recommended AC Input Branch Circuit Protection and Wire Size
when Using List 45 Top Mount AC Input Termination Panel

**AC Input Branch Circuit Protection and Wire Size Selection (when wiring to Rectifier Module Mounting Shelf[s])**

Refer to PD588705000.

**Relay Rack Frame Grounding Requirements**

**Ordering Notes**

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

   A customer's grounding network lead can be attached to the top of each relay rack. Provision is made for installing a lead with a two-hole lug that has 1/4" bolt clearance holes on 5/8" centers. Refer to Table 10 for lug selection.

**External Alarm, Reference, and Control Wire Sizes**

**Features**

- ♦ External alarm, reference, and control connection points are located on...
  - the optional List 80 LMS1000 Monitoring System (refer to the documentation furnished with the LMS1000),
  - J1-J4 on the optional List 71 Audible Alarm and Alarm Termination Circuit Card P/N 524734,
  - TB1 on circuit card P/N 509532,
  - and J8 on circuit card P/N 534868 (if List 71 not installed).
- ♦ See "Electrical Connections Locations and Dimensions; External Alarm, Reference, and Control Connections" under PHYSICAL SIZE INFORMATION for illustration.

| J1-J4 on Optional List 71 Audible Alarm and Alarm Termination Circuit Card P/N 524734 | | |
|---|---|---|
| Terminals | | Recm Wire Size |
| Capacity | Type | |
| 26 to 16 AWG | Spring-Clamp | 22 AWG for Loop Lengths Up to 200 ft.<br>18-20 AWG for Loop Lengths Over 200 ft. |

| TB1 on Circuit Card P/N 509532 | | |
|---|---|---|
| Terminals | | Recm Wire Size |
| Capacity | Type | |
| 26 to 16 AWG | Spring-Clamp | 22 AWG for Loop Lengths Up to 200 ft.<br>18-20 AWG for Loop Lengths Over 200 ft. |

| J8 on Circuit Card P/N 534868 | |
|---|---|
| Terminals | Recm Wire Size |
| D-Type Connector | 22 AWG for Loop Lengths Up to 200 ft.<br>18-20 AWG for Loop Lengths Over 200 ft. |

## SPECIFICATIONS

***Note:*** *For List 31 and 51 Rectifier Shelf specifications, refer to PD588705000.*

*For Rectifier specifications; refer to UM1R483500e (Rectifier User Instructions).*

*For List 63, 64, and 62 DC-DC Converter specifications, refer to SAG588249700.*

*For List 80 LMS1000 Monitoring System specifications, refer to SAG586505500.*

*For List 92 Battery Stand specifications, refer to SAG588820000.*

1.1 Environmental Ratings

1.1.1 Operating Ambient Temperature Range: -40°C to +40°C (-40°F to +104°F).

1.1.2 Storage Ambient Temperature Range: -40°C to +85°C (-40°F to +185°F).

1.1.3 Humidity: This Power System is capable of operating in an ambient relative humidity range of 0% to 95%, non-condensing.

1.1.4 Altitude: see PD588705000

1.1.5 Mounting: This equipment is intended only for installation in a Restricted Access Location on or above a non-combustible surface. Clearance requirements are:

(A) Recommended minimum aisle space clearance for the front of each bay is 2' 6".

(B) Recommended minimum aisle space clearance for the rear of each bay is 2’ 0” for any of the following conditions:

1. Multiple bay arrangements that incorporate rear inter-bay busbars (List 2 bays).
2. Any bay equipped with a List RC, RD or RE battery disconnect option.
3. Making AC input connections to Spec. No. 5887005000 Rectifier Mounting Shelves (List 31) when a List 45 or 46Top Mount AC Input Termination Panel is **not** ordered.
4. Addition of a Rectifier Mounting Shelf in the field.
5. Addition of any DC-DC Converter Mounting Shelf or Frame (List 63 or 64) in the field.

For all other conditions, required minimum spacing from the rear of the bay to a wall or other solid surface is that which is specified for proper Rectifier Mounting Shelf ventilation. Refer to the specific Rectifier Mounting Shelf Power Data Sheet for ventilation spacing requirements. ***Note:*** *Minimum spacing specified for ventilation may not permit replacement of certain components such as busbars or Rectifier Mounting Shelves.*

1.1.6 Heat Dissipation: 402.6 Watts per square foot / foot. Special equipment room cooling may be required.

1.2 Compliance Information

1.2.1 Safety Compliance: This power board is UL Listed ("c UL") as a DC Power Distribution Center for Communications Equipment. This unit meets the requirements of CSA 22.2, No. 225 and is tested and Certified by UL ("c UL") as a Custom Built Power Distribution Center for Communications Equipment.

1.2.2 NEBS Compliance: Compliance verified by a Nationally Recognized Testing Laboratory (NRTL) per GR-1089-CORE and GR-63-CORE. Contact Vertiv Network Power for NEBS compliance reports.

1.3 MCA Features

1.3.1 MCA Interface: You can operate the MCA locally via the front panel accessed interface pad, or remotely via the WinLink option, WEB Pages, or Modbus® TCP. The following Interface Options are available for use with WinLink: Modem and RS-232/Modem. The following Interface Options are available for use with WEB Pages: Ethernet.

In lieu of WinLink, MCA operation can be controlled remotely by other equipment via the LMS1000.

***Note:*** *Only one interface (Modem, Combination Modem/RS-232, Ethernet, or RS-485) can be installed on the MCA.*

***Note:*** *Wiring options are provided to lockout changing Power System adjustment/configuration/ calibration settings locally and/or remotely.*

In addition, the Ethernet Interface Option provides a Web-Browser and a Modbus® TCP Interface. The following software options are also available.

SNMP Interface: Provides an Ethernet port for MCA connection into a TCP/IP network and support for SNMP V2 (Simple Network Management Protocol). Communications to and from the MCA is accomplished via a MIB (Management Information Browser). SNMP Traps are provided for alarms listed on the MCA Menu Tree under the "Alarms Menu".

Battery Monitoring: Provides Battery Monitoring via the Web Browser Interface.

1.3.2 Float Charging Output Mode: In this mode of operation, system output voltage is constant and output current does not exceed the current limit setting. During normal operation, the battery is not required to furnish load current and remains in a fully charged condition.

***Note:*** *If the current demanded by the load exceeds the current limit setting of the system, the battery is required to furnish the difference in load current and begins discharging.*

***Note:*** *If the system is used with a digital battery charge temperature compensation probe or TXM, the MCA automatically adjusts system output. This ensures proper voltage to the battery as battery ambient temperature fluctuates.*

1.3.3 Test/Equalize Charging Output Mode: This mode of operation is used if higher output voltage is required for equalizing the charge on all battery cells of a conventional flooded cell battery, or for recharging the battery following a commercial power failure.

If the installation site does not require system equalize mode of operation, the equalize feature can be used as a test feature. System equalize voltage can be adjusted to a test voltage value. Placing the system into the test/equalize mode causes system output voltage to increase or decrease to this test voltage value.

***Note:*** *If the system is used with a battery charge digital temperature compensation probe or TXM, typical equalize mode of operation is not used.*

1.3.4 Output Mode of Operation Selection: There are four methods of placing the system from the float mode to the test/equalize mode.

(A) Method 1 (Manual Test/Equalize): A user manually places the system into the test/equalize mode via the MCA interface. A user must manually return the system to the float mode via the MCA interface.

(B) Method 2 (Manually Initiated Timed Test/Equalize): A user manually places the system into the test/equalize mode via the MCA interface. The system automatically returns to the float mode after a preset programmable time period (1-99 hours, in increments of one hour).

(C) Method 3 (Automatic Test/Equalize):

THE AUTOMATIC EQUALIZE FEATURE IS INTENDED FOR USE ONLY WITH WET CELL BATTERIES. USING THIS FEATURE WITH VALVE REGULATED BATTERIES IS NOT RECOMMENDED.

This feature can be enabled or disabled by a user via the MCA. The default state is disabled.

The Automatic Equalize feature is a time based function that is controlled by a customer selectable multiplier and by the Battery On Discharge (BOD) alarm setpoint. The MCA's default setting is for a multiplier of zero, which disables the Automatic Equalize feature.

When the Automatic Equalize feature is enabled, if system voltage drops to less than the BOD alarm setpoint, the MCA initiates a timing cycle to measure the discharge time period. The MCA requires at least 15 minutes of continuous BOD alarm in order to prevent nuisance equalization cycles. When system voltage rises to above the BOD alarm setpoint, the MCA ends the discharge timing cycle and (assuming a minimum of 15 minutes has elapsed) places the Rectifier Modules into the equalize mode for a customer selectable multiple of the discharge time period (the discharge time period includes the initial 15 minutes).

The equalize time period can be set for 0 to 15 times the discharge time period, up to a maximum of 300 hours. A zero (0) setting disables the feature.

(D) Method 4 (External Test/Equalize): A user (or external equipment) places the system into the test/equalize mode by applying an external signal to the system. The system returns to the float mode when the external signal is removed. This method overrides the other three methods.

1.3.5 Remote On/Off (TR): The operation of any or all Rectifier Modules can be inhibited (TR) via the LMS1000, the WinLink option, the Ethernet option, or from the MCA front panel accessed interface pad.

1.3.6 MCA Local Display: Provides digital metering of system load voltage and current, individual Rectifier Module current, subsystem load voltage and current (a subsystem is not installed in this power system), and load current of subsystem, system, and/or battery shunts. Also displays system alarm messages and adjustment information, as detailed in Section 1.3.10 "MCA Display".

The MCA contains a "Power Down" mode. The MCA turns off its display and Rectifier Module communications to conserve power when system voltage falls below 40 volts. Full operation is restored when system voltage recovers to 47.0 volts. The display and communications can be temporarily reactivated by the user.

1.3.7 MCA Meter Accuracy: ±0.01 V, ±0.005% / °C

1.3.8 MCA Universal Adjustment Circuit: Provides single point control of float output voltage, test/equalize output voltage, high voltage shutdown, and current limit adjustments.

***Note:*** *If the MCA should fail, the Rectifier Modules remember the float and high voltage shutdown settings last delivered by the MCA. The current limit setting of each Rectifier Module goes to 66 amperes.*

Provides adjustments for all MCA alarm and control circuits. Adjustment ranges and factory settings as follows.

All adjustments can be performed locally via the MCA front panel accessed interface pad, and most can be performed remotely via the LMS1000 Remote Equipment Interface Link option, the WinLink option, or the Ethernet (Web-Browser Interface) option.

(A) Rectifier Module Output Voltage:

(1) Without Battery Charge Temperature Compensation: Float voltage is adjustable from 47.00 to 58.00 volts DC. Test/equalize voltage is adjustable from 44.00 to 58.00 volts DC. The output voltage temperature coefficient does not exceed 0.01% per degree centigrade from -40°C to +65°C. Factory set as follows unless otherwise specified.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 54.48 | 54.00 | 54.48 | 54.48 |

(2) With Battery Charge Digital Temperature Compensation Probe or TXM (multiple probe concentrator module): With an optional battery charge digital temperature compensation probe or TXM installed, the MCA automatically increases or decreases the output voltage as battery ambient temperature decreases or increases, respectively. The float and test/equalize voltage range is the same as without battery charge digital temperature compensation. Float voltage is factory set as follows at 25°C battery ambient.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 54.48 | 54.00 | 54.48 | 54.48 |

Using battery and equipment manufacturers' recommendations, the user selects the following temperature compensation curve parameters via the MCA. Refer to the Temperature Compensation Probe Curve provided in Figure 1.

a) The temperature compensation slope in volts/°C. Adjustable from zero to 200 millivolts/°C. Factory set at 0V/°C (DIGITAL TC OFF).

b) The maximum voltage limit in volts DC. Adjustable from float up to 58.00 volts DC, but automatically limited to 1.0 volt below the High Voltage Shutdown setting. Factory set as follows.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 56.50 | 55.50 | 56.50 | 56.50 |

c) The minimum voltage limit in volts DC. Adjustable from float down to 44.00 volts DC, but automatically limited to 1.0 volt above the Low Voltage Disconnect Reconnect setting. Factory set as follows.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 50.00 | 51.00 | 50.00 | 50.00 |

(B) Rectifier Module Current Limit: Adjustable from 10% to 121% of total system capacity at maximum rated output voltage. Factory set at 100% of rated full load, unless otherwise specified.

The MCA automatically adjusts the current limit circuit on each Rectifier Module so that this value is not exceeded. If a Rectifier Module fails, the MCA automatically resets each remaining Rectifier Module's current limit point to maintain this value. The MCA also insures that the current limit circuit on any Rectifier Module is not set above 121% of its capacity. The default current limit setting is the sum of each installed Rectifier Modules output rating. If an additional Rectifier Module is added to the system, the

system current limit is automatically increased by the rating of the new Rectifier Module and the new current limit value is displayed.

(C) Rectifier Module High Voltage Shutdown: Adjustable from 48.00 to 59.00 volts DC. Factory set at 57.50 volts, unless otherwise specified.

(D) High Voltage Alarm 1: Adjustable from 48.00 to 59.00 volts DC. Factory set as follows, unless otherwise specified.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 55.50 | 55.40 | 55.50 | 55.50 |

(E) High Voltage Alarm 2: Adjustable from 48.00 to 59.00 volts DC. Factory set as follows, unless otherwise specified.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 56.50 | 56.00 | 56.50 | 56.50 |

(F) Battery On Discharge Alarm: Adjustable from 40.00 to 56.00 volts DC. Factory set as follows, unless otherwise specified.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 48.00 | 47.00 | 48.00 | 48.00 |

(G) 50% Battery On Discharge (Very Low Voltage) Alarm: Adjustable from 40.00 to 56.00 volts DC. Factory set per table below, unless otherwise specified.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Setting (Volts) | 46.00 | 44.50 | 46.00 | 46.00 |

(H) System Load Current Alarm: Adjustable from 0 to 60,000 amperes. Factory set at 2,000 amperes, unless otherwise specified.

(I) High Battery Ambient Temperature Alarm (if battery charge digital temperature compensation probe or TXM installed): Adjustable from -50°C to +99°C. Factory set to off, unless otherwise specified. (If TXM installed, each temperature probe has an associated alarm.)

(J) Low Battery Ambient Temperature Alarm (if battery charge digital temperature compensation probe or TXM installed): Adjustable from -49°C to +100°C. Factory set to off, unless otherwise specified. (If TXM installed, each temperature probe has an associated alarm.)

(K) Low Voltage Disconnect (if LVD installed): Low voltage disconnect is adjustable from 40.0 to 50.0 volts DC. Reconnect is adjustable from 47.0 to 57.0 volts DC. The factory disconnect and reconnect settings are as follows, unless otherwise specified.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| Factory Disconnect Setting (Volts) | 42.0 | 43.5 | 42.0 | 42.0 |
| Factory Reconnect Setting (Volts) | 49.0 | 50.5 | 49.0 | 49.0 |

(L) Audible Alarm Cutoff Reset Feature: Adjustable from 0 to 15 minutes, in one minute intervals. A zero setting disables the feature. Factory set at 15 minutes, unless otherwise specified.

(M) Timed Test/Equalize Period (also enables/disables the manually initiated timed test/equalize feature): Adjustable from 1 to 99 hours, in one hour intervals. When a value is set, the feature is enabled. You

disable the feature by selecting the setting above 99. Factory set at 1 (one) hour, unless otherwise specified.

(N) Automatic Test/Equalize Period (also enables/disables the automatic test/equalize feature): Adjustable from 0 to 15 times the discharge time period, up to a maximum of 300 hours. A zero (0) setting disables the feature. Factory set at zero (0), unless otherwise specified.

(O) Relay Test Seconds: Adjustable from 5 to 120 seconds, in one second intervals. Factory set at 45 seconds, unless otherwise specified.

1.3.9 MCA Audible Alarm Cutoff (List 10 and List 11 MCA only): An audible alarm can be connected to the MCA that sounds when any alarm condition monitored by the MCA occurs. The alarm can be manually silenced (cut off) by pressing a local pushbutton. A local indicator illuminates when the audible alarm has been cut off. The alarm remains silenced for the current alarm condition only. If another alarm condition occurs, the audible alarm again sounds.

A programmable audible alarm cutoff reset feature is provided. Once an audible alarm has been cut off, it automatically resets (and sounds if the alarm condition is still present) after the time period programmed expires. If the audible alarm is again cut off while the same alarm condition is still present, the reset feature is inoperable, and the audible alarm remains silenced. If another alarm condition occurs, the audible alarm again sounds.

***Note:*** *External MCA audible alarm relay contacts are not available if the power system is equipped with a List 12 or List 13 special application MCA.*

1.3.10 Low Voltage Disconnect (if associated components are furnished in a Distribution Cabinet): Protects the battery from complete discharge. Automatically disconnects the battery and system output from the controlled load(s) (LVLD) or battery from system and loads (LVBD) if battery voltage decreases below a preset adjustable value. This can occur during a prolonged commercial AC power failure, where the battery is required to furnish power to the load, and subsequently starts to discharge.

For further information, refer to the description of the Low Voltage Disconnect circuit card under List 21 Features in the *List Descriptions* section of this document.

1.3.11 Load Sharing: Digital active load sharing circuitry in each Rectifier Module balances the load proportionately among all rectifiers in a bay. The MCA provides a load sharing feature that automatically balances the load among multiple bays.

1.3.12 MCA Load Share Alarm: If Rectifier Modules fail to share the load the MCA turns on a Load Share Alarm. This alarm can be enabled or disabled by the customer. The factory default setting is to have the MCA Load Share Alarm 'enabled'.

1.3.13 Local Controls: Refer to the "System Operating Procedures" chapter in the Power System User Instructions (Section 5975) for a complete description.

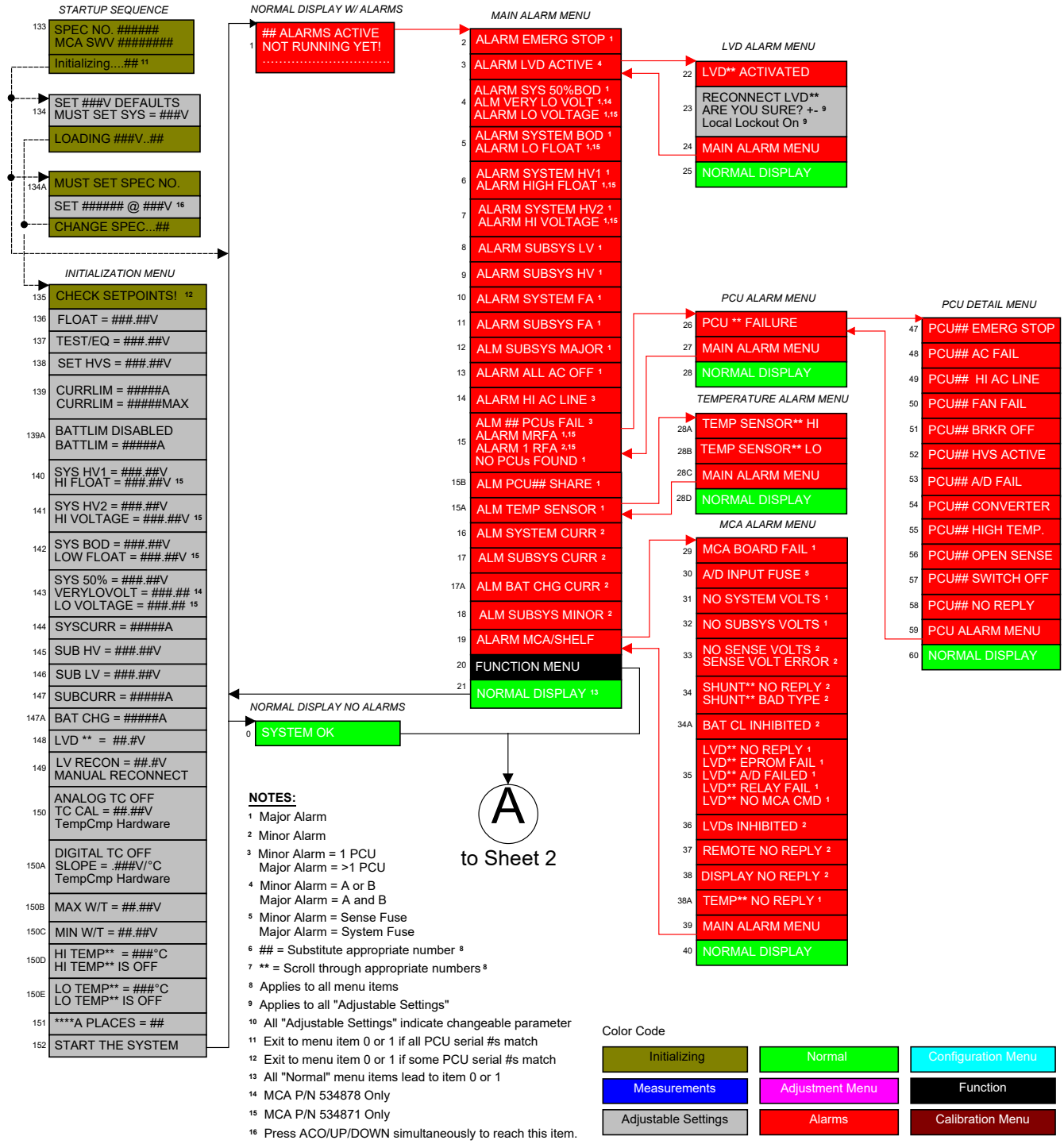
| Location | NAME / Description | Type |
|---|---|---|
| MCA | FUNCTION SELECT UP and DOWN | Pushbutton Switches |
| | FUNCTION SET ENTER | Pushbutton Switch |
| | FUNCTION SET YES (+) and NO (-) | Pushbutton Switches |
| | ALARM CUTOFF | Pushbutton Switch |

1.3.14 Local Status and Alarm Indicators: Refer to the "System Operating Procedures" chapter in the Power System User Instructions (Section 5975) for a complete description.

| Location | NAME / Description | Type |
|---|---|---|
| Rectifier Module | See PD588705000. | |
| MCA | Message Display, Shows...<br>• Active Alarms or "SYSTEM OK"<br>• Various Measurement Items and Values<br>• Various Adjustment Items and Values<br>• Various Configuration Items and Settings<br>• Various Calibration Items and Settings<br>See Paragraph 1.3.10. "MCA Display" | --- |
| | ALARM CUTOFF | LED - yellow |
| | MAJOR | LED - flashing red |
| | MINOR | LED - red |
| | AC | LED - green/red |
| | TEST/EQ | LED - yellow |

1.3.15 MCA Display: The following are illustrations from the MCA Menu Tree (Section 6022). Refer to the latest version of Section 6022 for the most recent MCA Menu Tree. Refer to the "Navigating the MCA" and "System Operating Procedures" chapters of the Power System User Instructions (Section 5975) for complete descriptions of menu items.

# NETSURE™ MCA Menu Tree (Sheet 1 of 2)




**NOTES:**

1 Major Alarm
2 Minor Alarm
3 Minor Alarm = 1 PCU
Major Alarm = >1 PCU
4 Minor Alarm = A or B
Major Alarm = A and B
5 Minor Alarm = Sense Fuse
Major Alarm = System Fuse
6 ## = Substitute appropriate number 8
7 ** = Scroll through appropriate numbers 8
8 Applies to all menu items
9 Applies to all "Adjustable Settings"
10 All "Adjustable Settings" indicate changeable parameter
11 Exit to menu item 0 or 1 if all PCU serial #s match
12 Exit to menu item 0 or 1 if some PCU serial #s match
13 All "Normal" menu items lead to item 0 or 1
14 MCA P/N 534878 Only
15 MCA P/N 534871 Only
16 Press ACO/UP/DOWN simultaneously to reach this item.

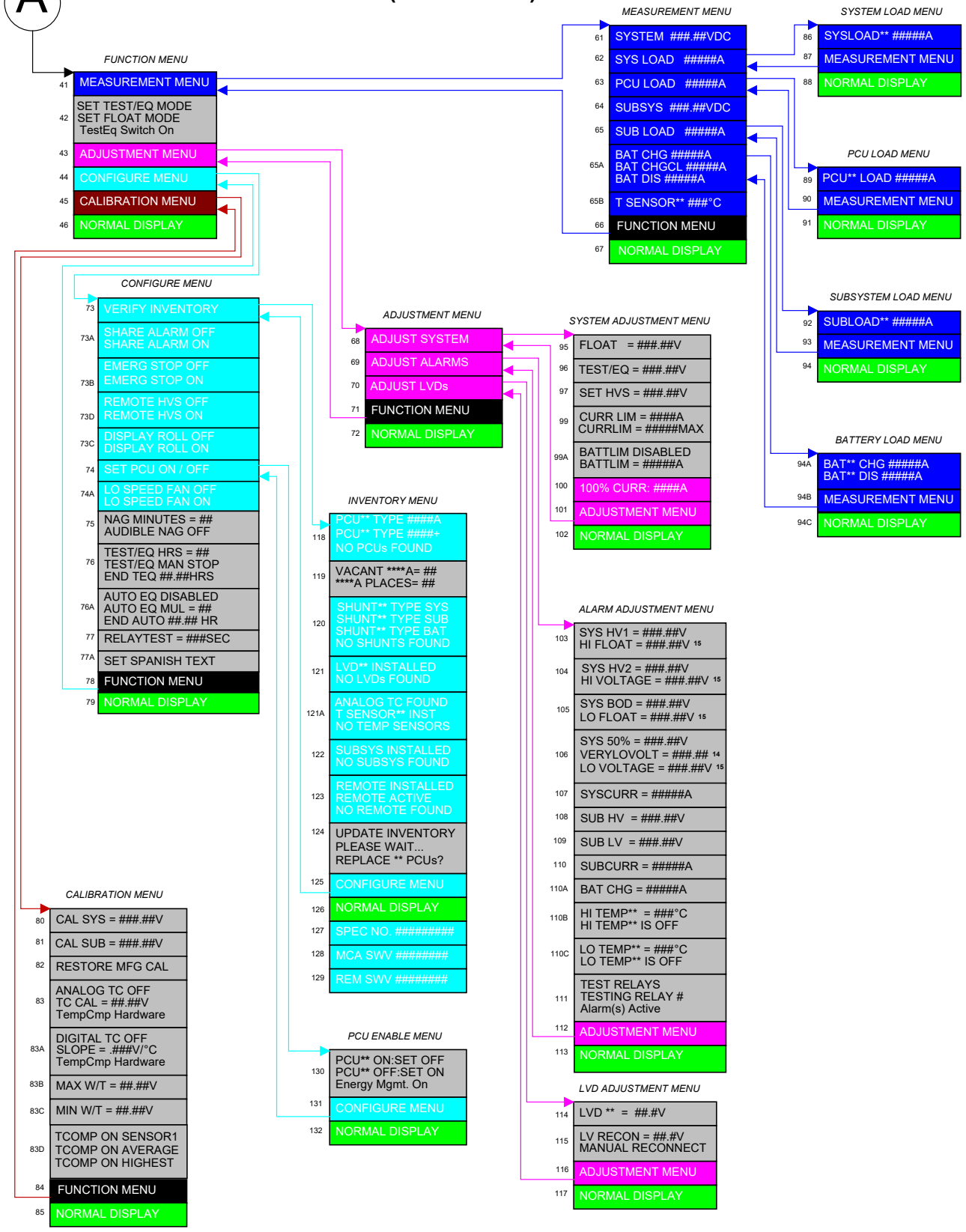
Color Code

| | | |
|---|---|---|
| Initializing | Normal | Configuration Menu |
| Measurements | Adjustment Menu | Function |
| Adjustable Settings | Alarms | Calibration Menu |

from Sheet 1

A

# NETSURE™ MCA Menu Tree (Sheet 2 of 2)



1.3.16 External Alarm Circuits: Nine (9) Form-C alarm relay contacts are provided and mapped by the MCA as detailed in the following table. Alarm relay contacts are rated for 0.5A at 125VAC, 1.0A at 30VDC, and 0.3A at 110VDC. Relay operation can be tested via an Alarm Relay Test feature. When activated, this feature consecutively places each relay in the alarm state for the programmed time period.

- Refer to the "Making Electrical Connections" chapter of the Power System Installation Instructions (Section 5974) for connection details.
- Refer to the "Navigating the MCA" and "System Operating Procedures" chapters of the Power System User Instructions (Section 5975) for alarm conditions. Additional descriptions are provided in a) and b) below.
  a) **MCA Audible Alarm:** These contacts change state if any alarm condition monitored by the MCA occurs, and are provided for connection to an audible alarm circuit.
  b) **Test/Equalize Indication:** These contacts change state if the system is placed in the test/equalize mode, locally or remotely.

| **Power System List No.** | **10** | **11** | **12** | **13** |
|---|---|---|---|---|
| **MCA Configuration No.** | **534876** | **534877** | **534878** | **534879** |
| **Relay K1** | Major Alarm | Major Alarm | Major Alarm | Major Alarm |
| **Relay K2** | Minor Alarm | Minor Alarm | Minor Alarm | Minor Alarm |
| **Relay K3** | High Voltage 1 Alarm | High Voltage 1 Alarm | High Voltage 1 Alarm | Test/EQ Mode Indication 2 |
| **Relay K4** | High Voltage 2 Alarm | Rectifier Module Fail Major Alarm | MCA Fail Alarm | Fuse Alarm |
| **Relay K5** | Battery On Discharge Alarm | Battery On Discharge Alarm | Battery On Discharge Alarm | Battery On Discharge Alarm |
| **Relay K6** | 50% Battery On Discharge Alarm | Rectifier Module Fail Minor Alarm | Very Low Voltage Alarm | AC Major Alarm |
| **Relay K7** | AC Fail Alarm | AC Fail Alarm | AC Fail Alarm | AC Fail Alarm |
| **Relay K8** | Audible Alarm | Audible Alarm | Fuse Alarm | LVD Alarm |
| **Relay K9** | Test/EQ Mode Indication | Fuse Alarm | Rectifier Module Fail Alarm | Test/EQ Mode Indication |

1.3.17 External Monitoring, Reference, and Control Signals

The MCA is connected to an “Interconnect/LVD Inhibit” circuit card. This circuit card provides spring-clamp type terminals for connection of customer wiring, as described below.

(A) Remote Test/Equalize: All Rectifier Modules can be placed into the test/equalize mode by applying an external ground signal. The Rectifier Modules operate in the float mode when the signal is absent.

(B) External "System Voltage" Meter Reading: Leads can be extended from the Power System to an external voltage source. This is the voltage source the MCA monitors for system alarms and displays as "System Output Voltage".

(C) External Voltage Sensing: Leads can be extended from the Power System to the point at which output voltage is to regulate, such as the battery.

(D) Emergency Shutdown and Fire Alarm Disconnect: Operation of the Rectifier Modules can be inhibited through application of an external ground signal. Manual restart is required (by turning AC power to the Rectifier Modules off then on, or by removing and re-inserting the Rectifier Modules). If low voltage disconnect is furnished, the battery and system output can be wired to also disconnect from the controlled load(s). If List RA is furnished, battery also disconnects from the system.

(E) System Fuse Alarm Input: The system fuse alarm circuit activates when a ±18 to 60 volts DC signal is applied this terminal.

## MECHANICAL SPECIFICATIONS

### Overall Dimensions

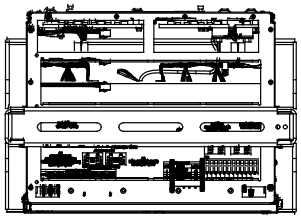
Refer to PD588705000 for Rectifier Module Mounting Shelf dimensions.

Refer to Table 1 for relay rack dimensions.

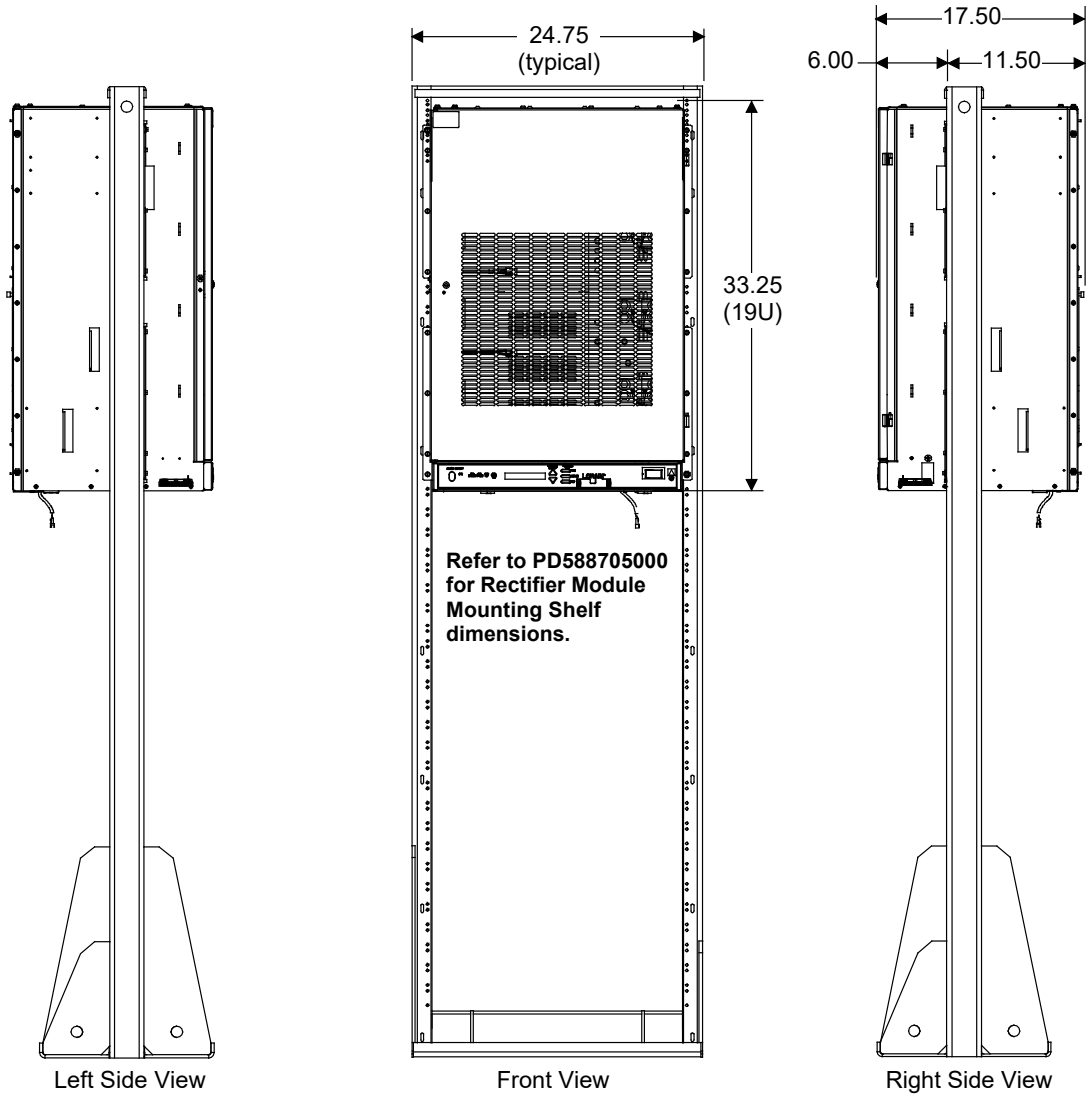
**List 24 (Four Bus Row Cabinet)**

Notes:

1. All dimensions are in inches, unless otherwise specified.
2. Weight in LBS.
   (minus relay rack)
   Four Bus Row Cabinet
   Net:
   Shipping:
3. Finish: Textured Gray (M500-147)



Top View



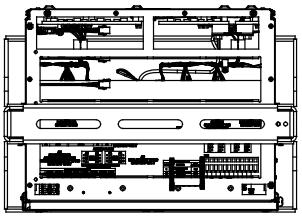

Left Side View | Front View | Right Side View

**List 23 (Three Bus Row Cabinet)**

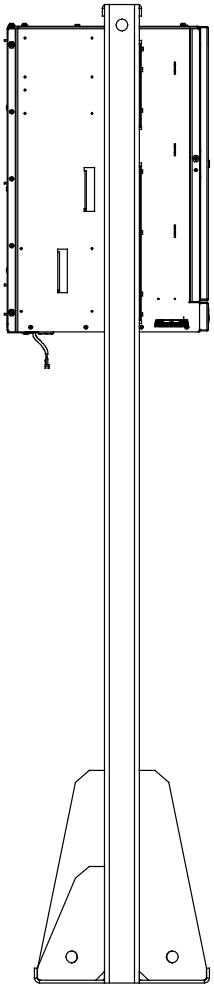
Refer to Table 1 for relay rack dimensions.

Notes:

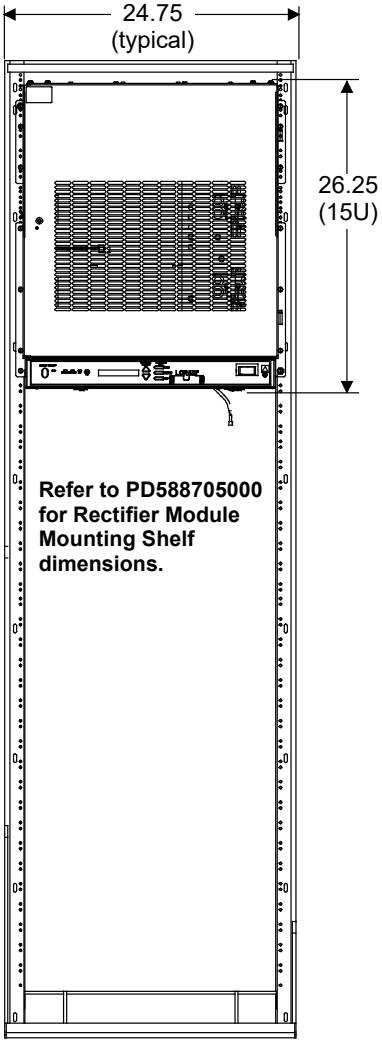
1. All dimensions are in inches, unless otherwise specified.
2. Weight in LBS.
   (minus relay rack)
   Three Bus Row Cabinet
   Net:
   Shipping:
3. Finish: Textured Gray (M500-147)



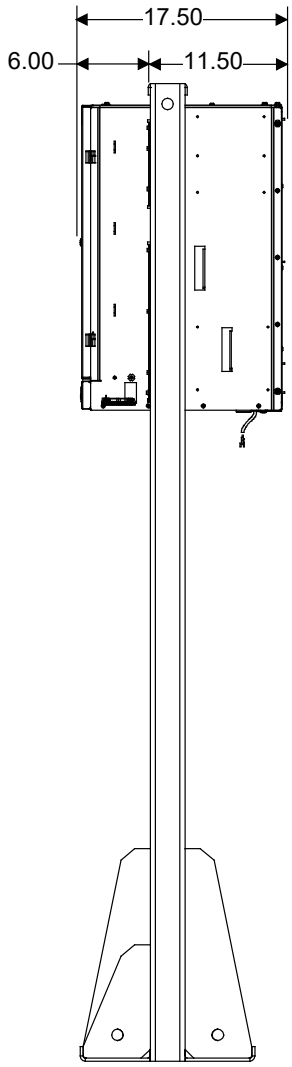
Top View



Left Side View




Front View



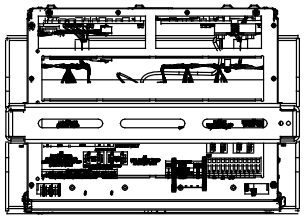

Right Side View

**List 22 (Two Bus Row Cabinet)**

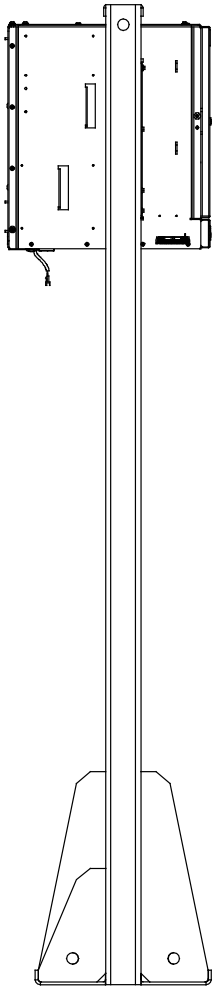
Refer to Table 1 for relay rack dimensions.

Notes:

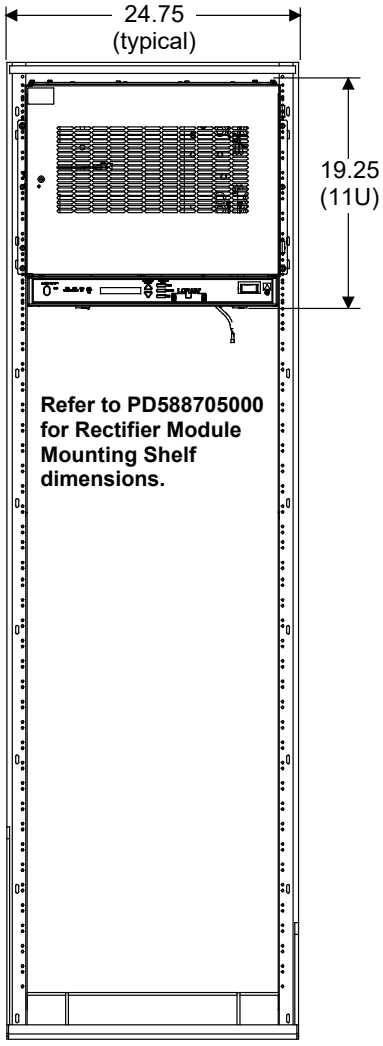
1. All dimensions are in inches, unless otherwise specified.
2. Weight in LBS.
   (minus relay rack)
   Two Bus Row Cabinet
   Net:
   Shipping:
3. Finish: Textured Gray (M500-147)



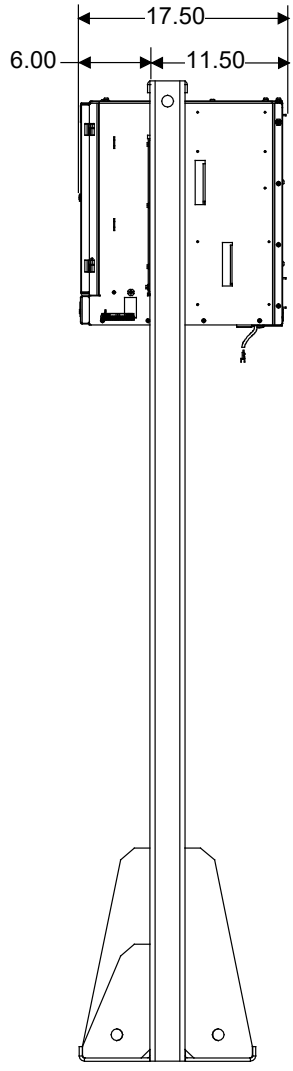
Top View



Left Side View




Front View



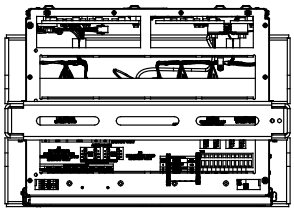

Right Side View

**List 21 (One Bus Row Cabinet)**

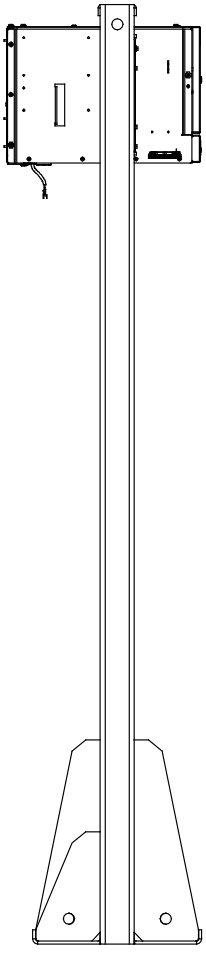
Refer to Table 1 for relay rack dimensions.

Notes:

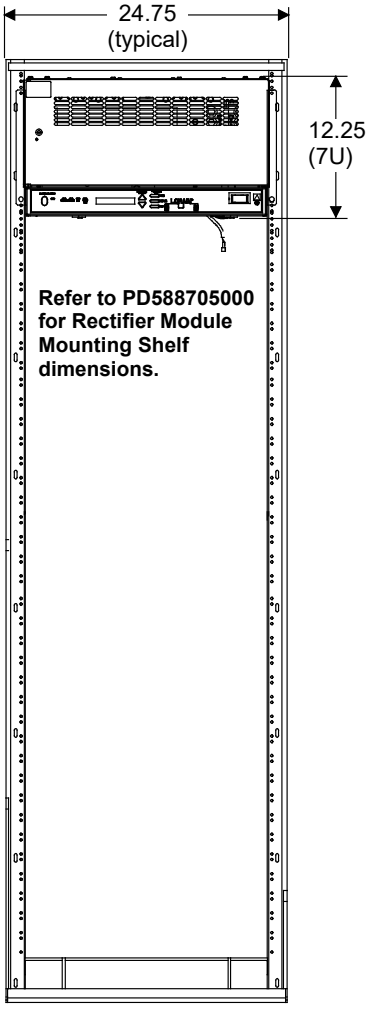
1. All dimensions are in inches, unless otherwise specified.
2. Weight in LBS.
   (minus relay rack)
   One Bus Row Cabinet
   Net:
   Shipping:
3. Finish: Textured Gray (M500-147)



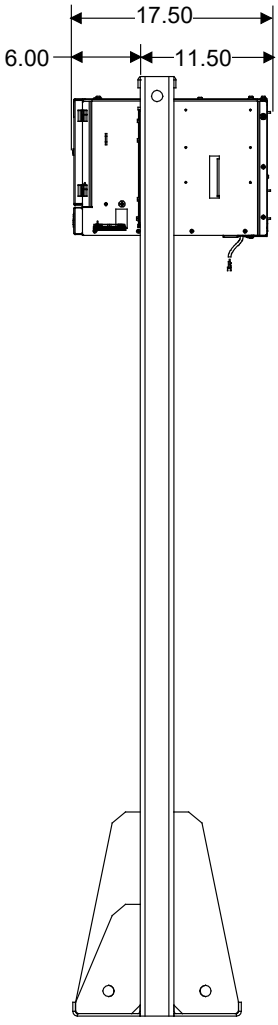
Top View



Left Side View




Front View

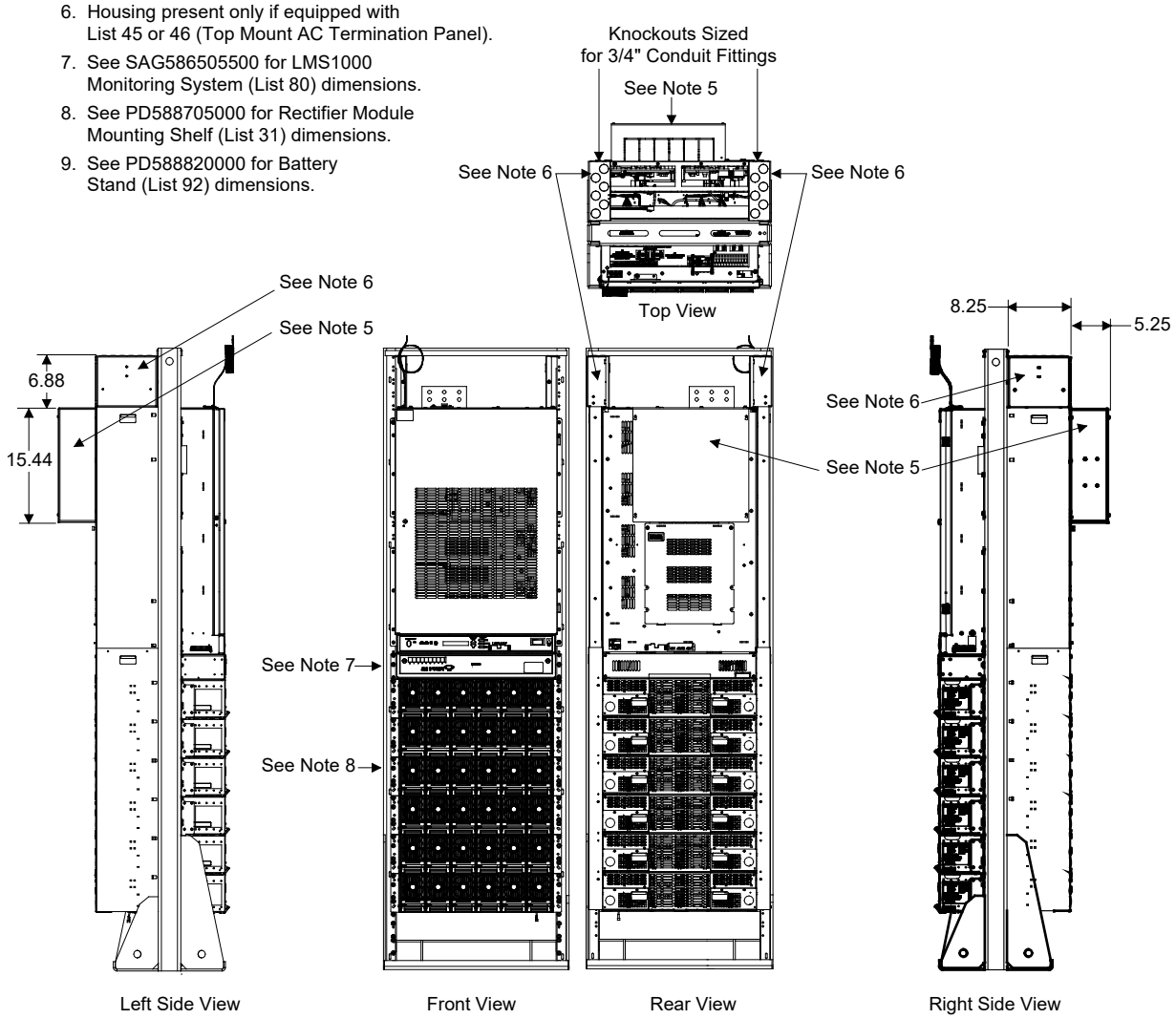



Right Side View

**List 31 (Rectifier Module Mounting Shelf), List 45 or 46 (Top Mount AC Termination Panel), List 80 (LMS1000 Monitoring System), List 92 (Battery Stands), and List RC, RD, and RE (Battery Disconnects)**

Notes:

1. All dimensions are in inches, unless otherwise specified.
3. Finish: Textured Gray (M500-147) except
   Rectifier Shelf and Rectifier Module Bodies:
   Bright Zinc Plating (M500-53)
   Rectifier Module Face Plates are
   Textured Gray (M500-147)
5. Housing present only if equipped with List RC, RD, RE (Battery Diconnects).
6. Housing present only if equipped with List 45 or 46 (Top Mount AC Termination Panel).
7. See SAG586505500 for LMS1000 Monitoring System (List 80) dimensions.
8. See PD588705000 for Rectifier Module Mounting Shelf (List 31) dimensions.
9. See PD588820000 for Battery Stand (List 92) dimensions.

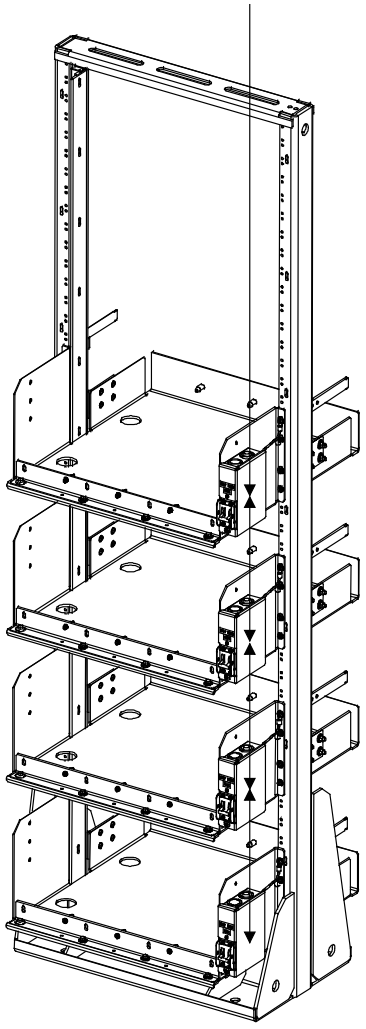


**List 93 (Battery Tray)**

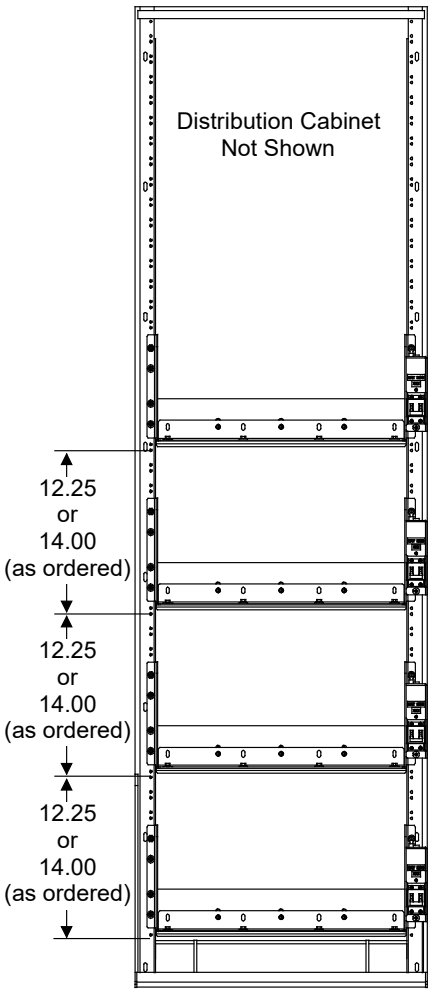
Notes:

1. All dimensions are in inches, unless otherwise specified.
2. Weight in LBS.
   (per tray, less batteries)
   With Circuit Breaker Option
   Net: 33
   Shipping:
   Without Circuit Breaker Option
   Net: 29
   Shipping:
3. Finish: Textured Gray (M500-147)
4. Maximum trays available per rack is four (4).

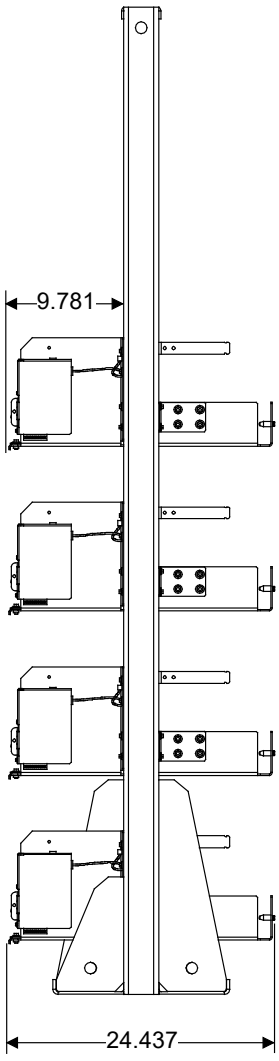
Optional Battery Disconnect Circuit Breakers
(Shown on Right Side, Available on Either Side)



ISO View

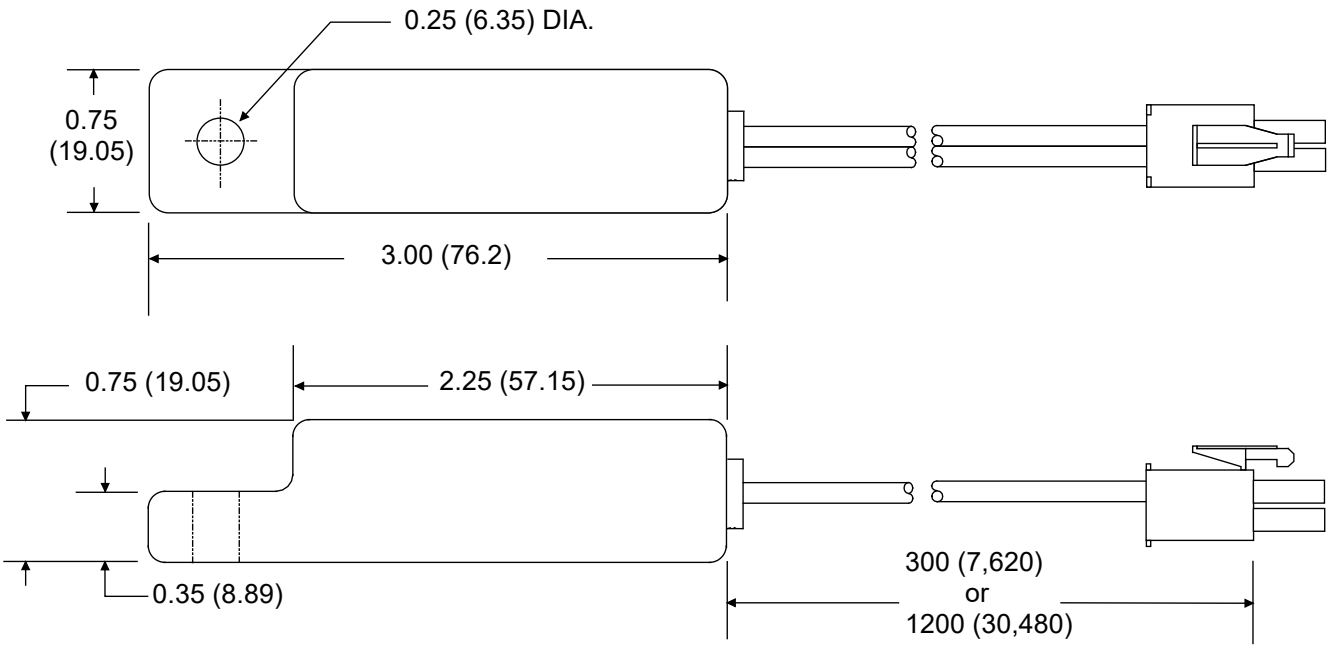



Front View




Right Side View

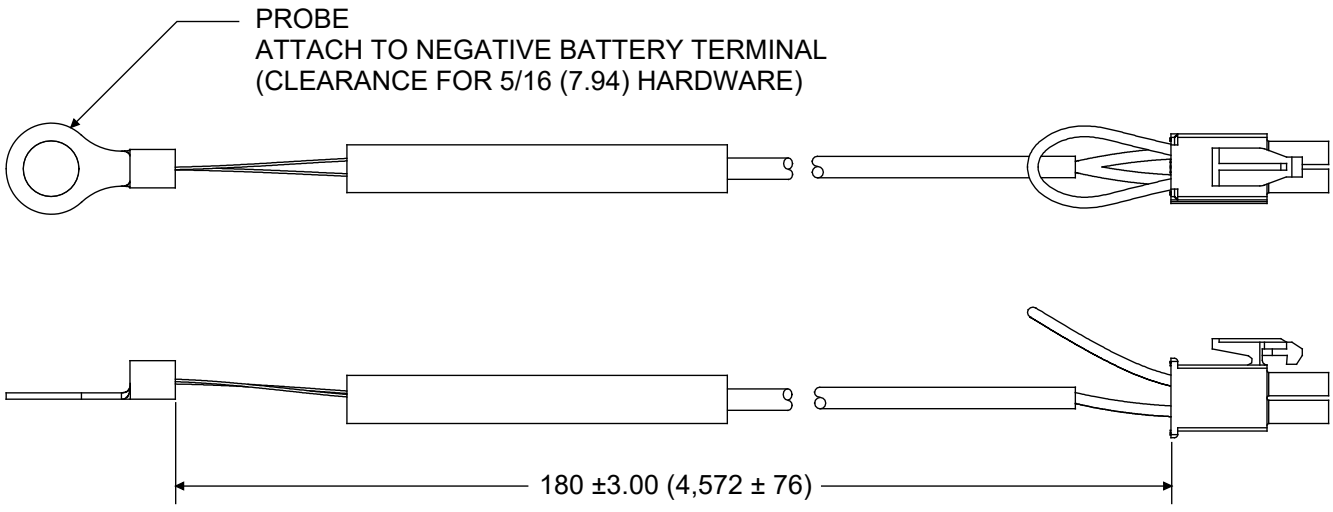
**Optional Digital Battery Charge Temperature Compensation Probe (P/N 107021 and 106824)**




Part No. 107021 (25 foot)
Part No. 106824 (100 foot)

Note: All dimensions are in inches and (millimeters).

**Optional Analog Battery Temperature Probe (P/N 521262)**



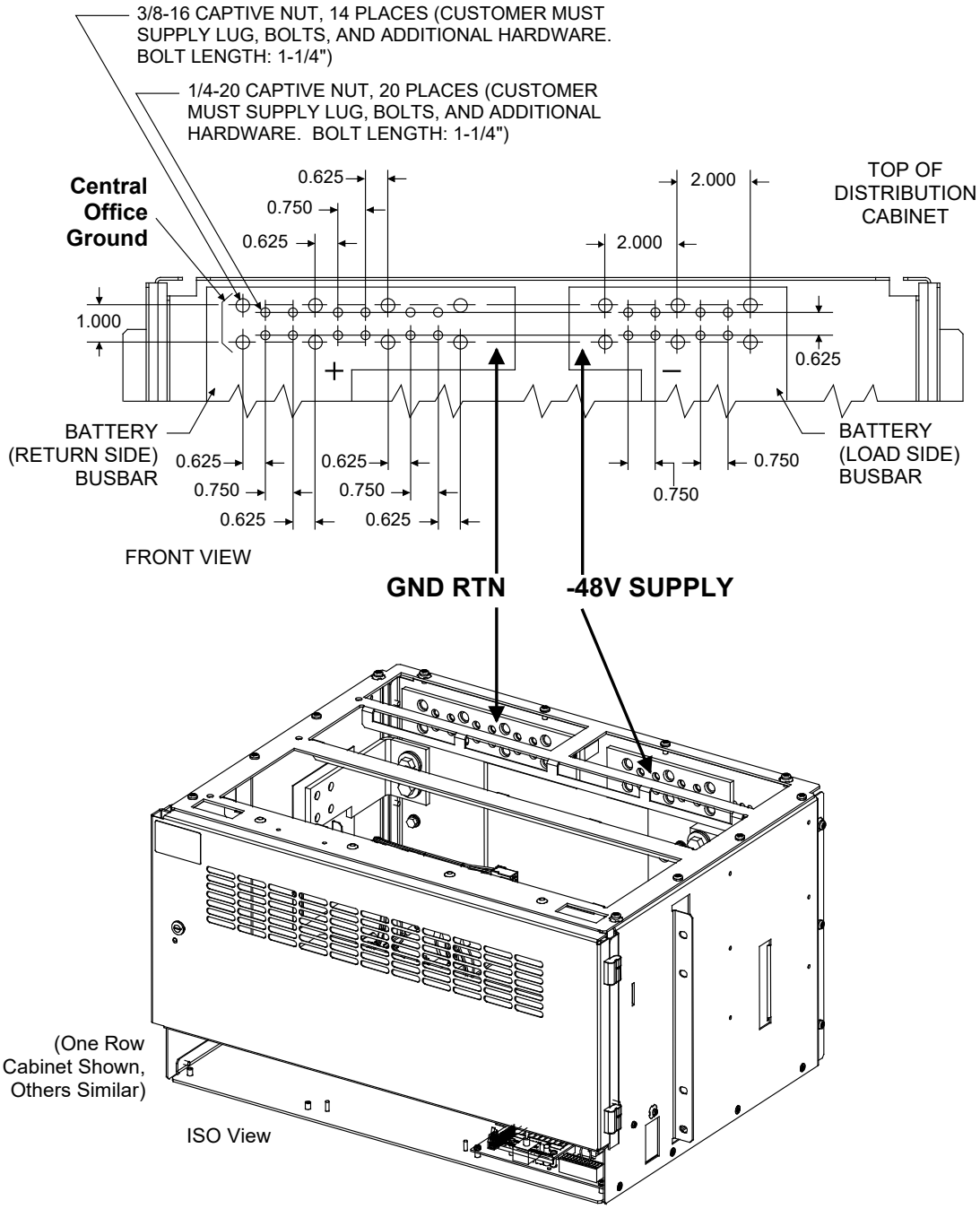

**NOTE:** All dimensions are in inches and (millimeters).

## Electrical Connection Locations and Dimensions

### Input Battery

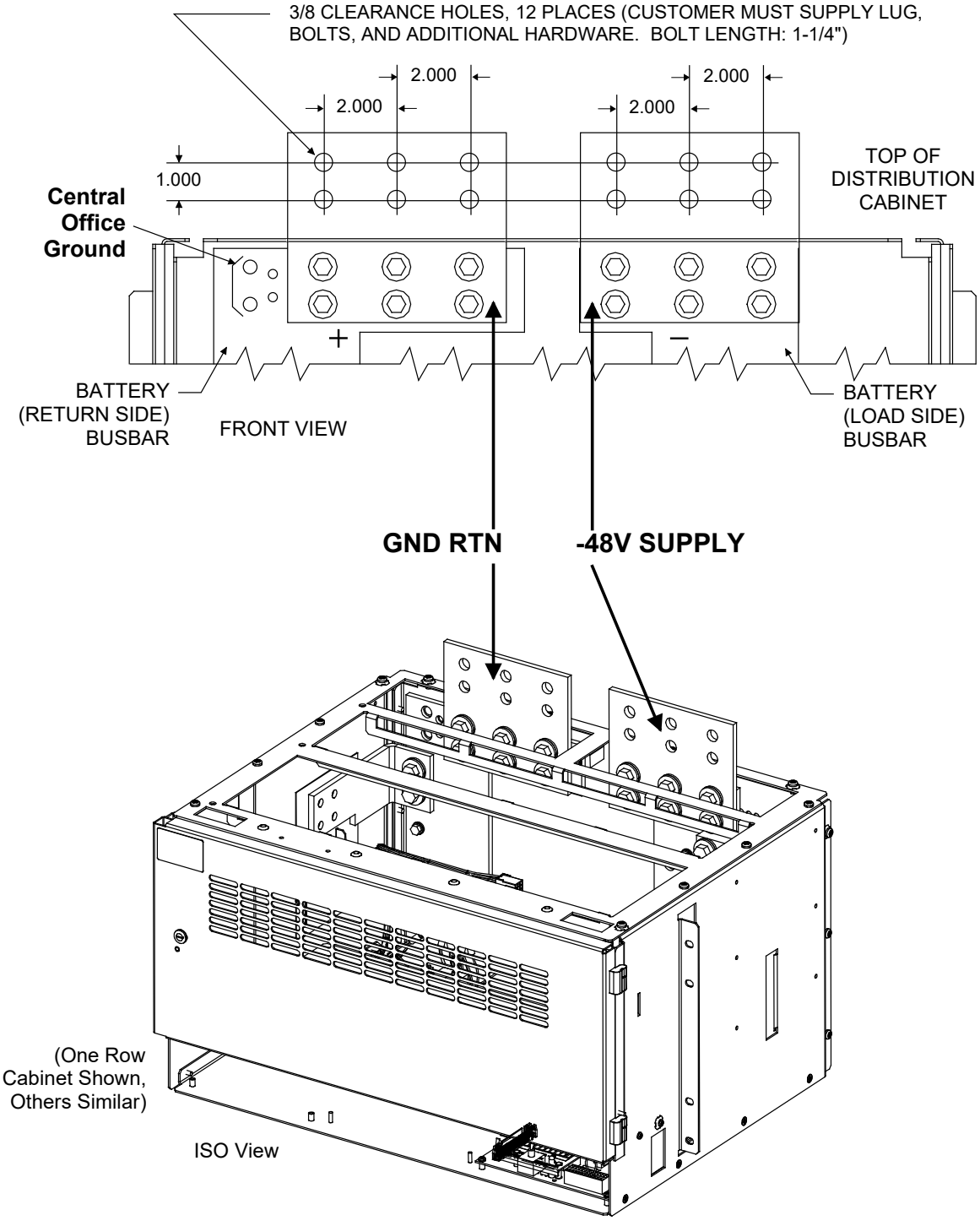
#### Connections to Lists 21 through 24 Distribution Cabinets

***Note:*** *Battery busbars within distribution cabinets are rated for 2000A max.*
*For 2000A-4000A in List 2, make additional battery connections to interbay busbars.*



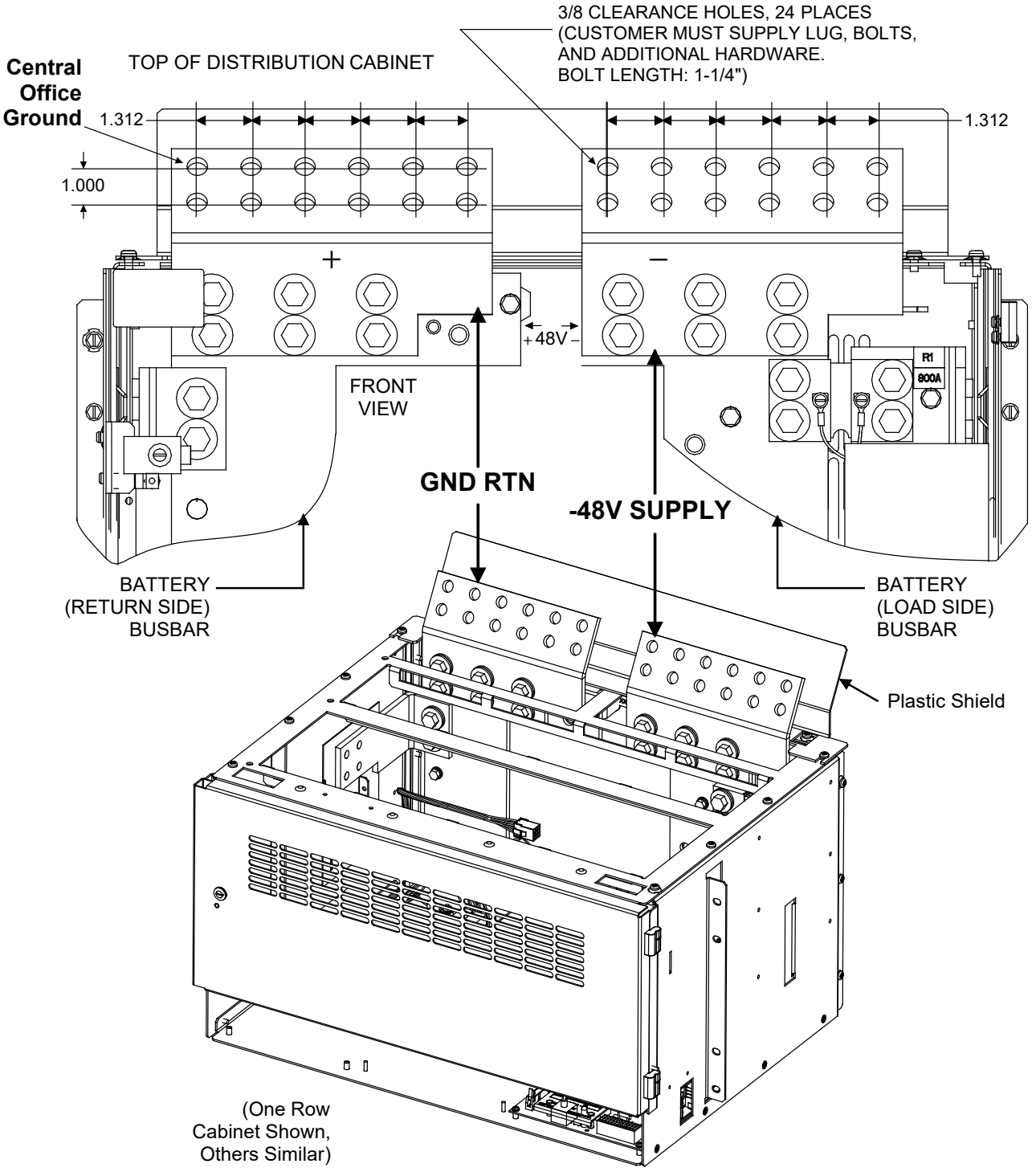
**Connections to Optional Battery Busbar Extension Kit P/N 514713**
**Installed in Lists 21 through 24 Distribution Cabinets**

***Note:*** *See Battery Busbar Extension Kit (P/N 514713) under ACCESSORY DESCRIPTIONS for description.*



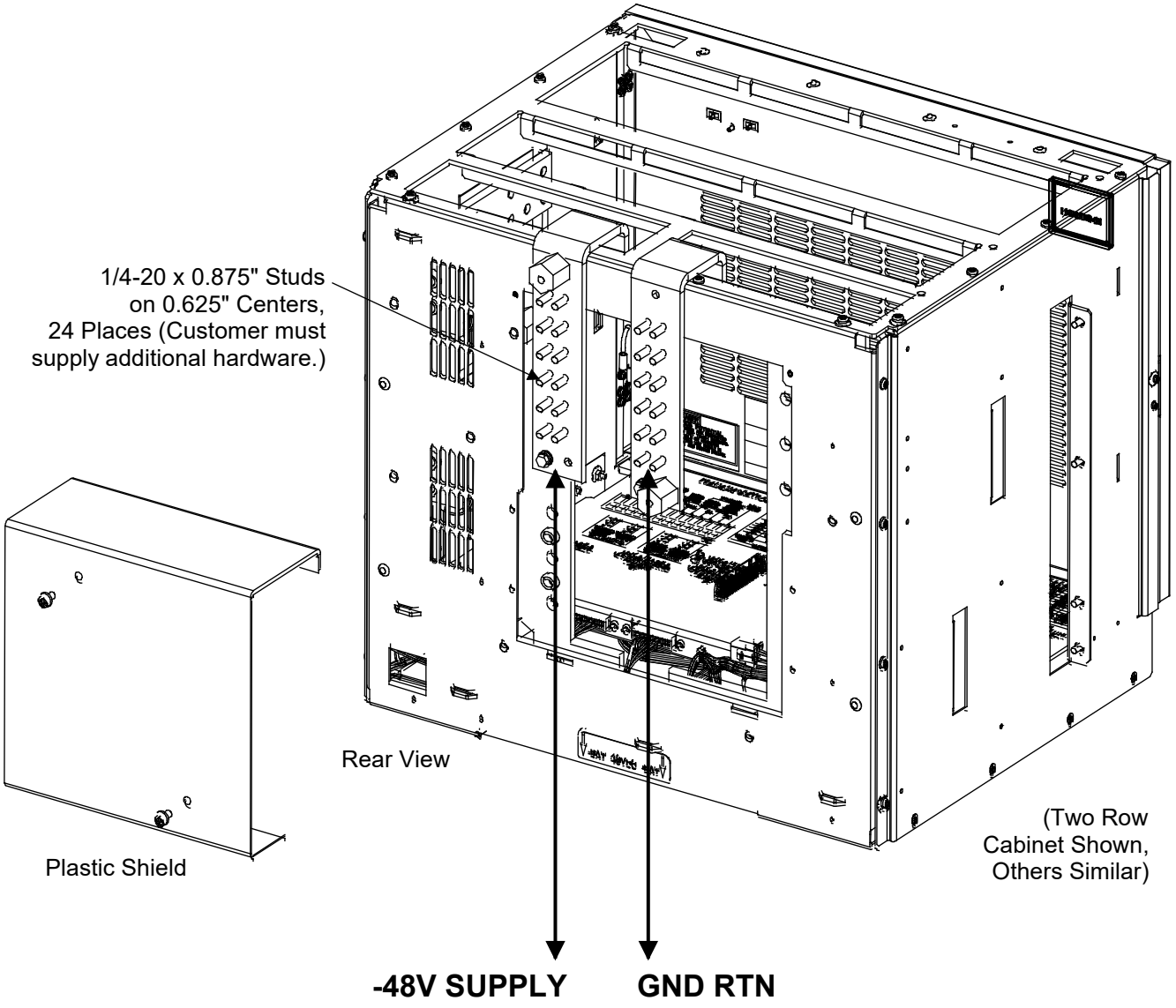
**Connections to Optional Battery Busbar Extension Kit P/N 529143**
**Installed in Lists 21 through 24 Distribution Cabinets**

***Note:*** *See Battery Busbar Extension Kit (P/N 529143) under ACCESSORY DESCRIPTIONS for description.*



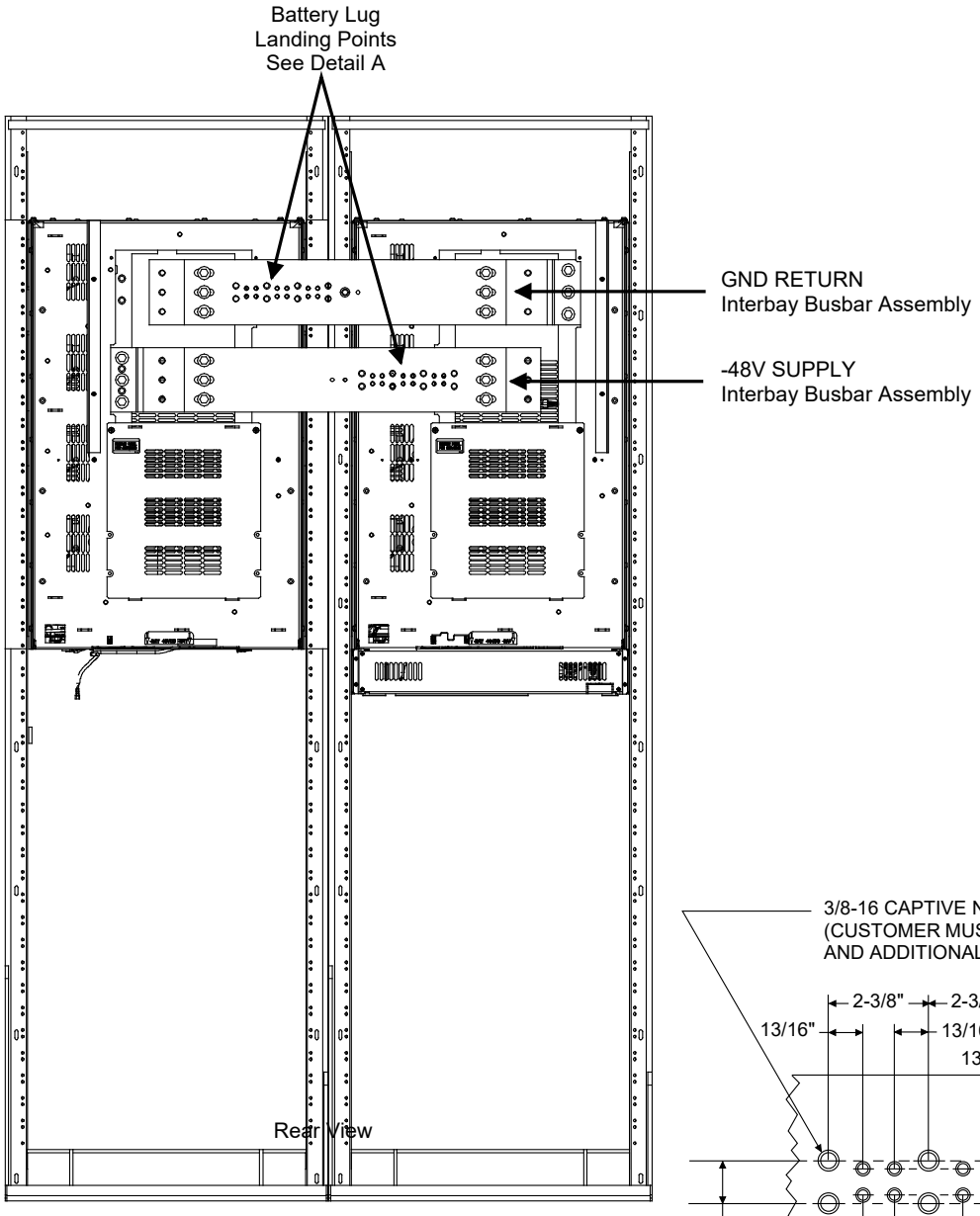
**Connections to Optional Battery Landing Busbar Kit P/N 541371**
**Installed in Lists 21 through 24 Distribution Cabinets**

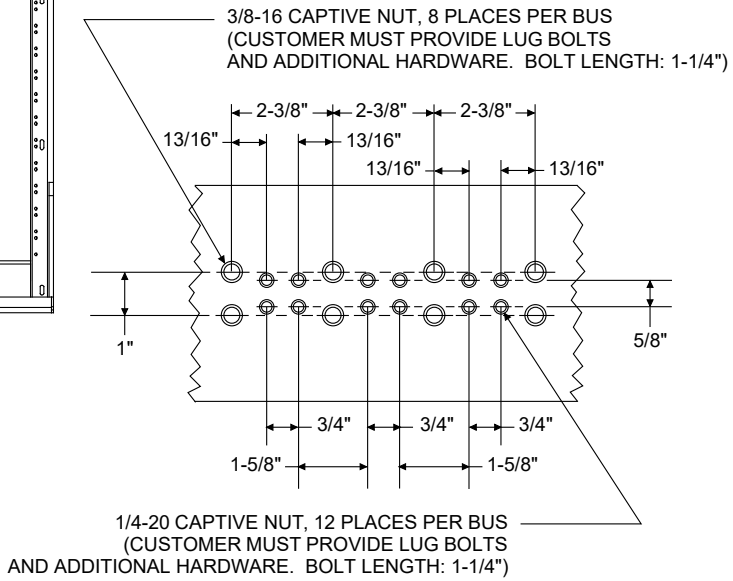
***Note:*** *See Battery Busbar Extension Kit (P/N 541371) under ACCESSORY DESCRIPTIONS for description.*



## Connections to Interbay Busbars (P/O List 2)

***Note:*** *Battery busbars within distribution cabinets are rated for 2000A max.*
*For 2000A-4000A in List 2, make battery connections to interbay busbars, shown here.*




**DETAIL A**

### Connections to Battery Disconnect Circuit Breakers and Low Battery Voltage Disconnect Options

Refer to the illustrations located under the Bus Module and Low Battery Voltage Disconnect List descriptions in this document.

## Load Distribution

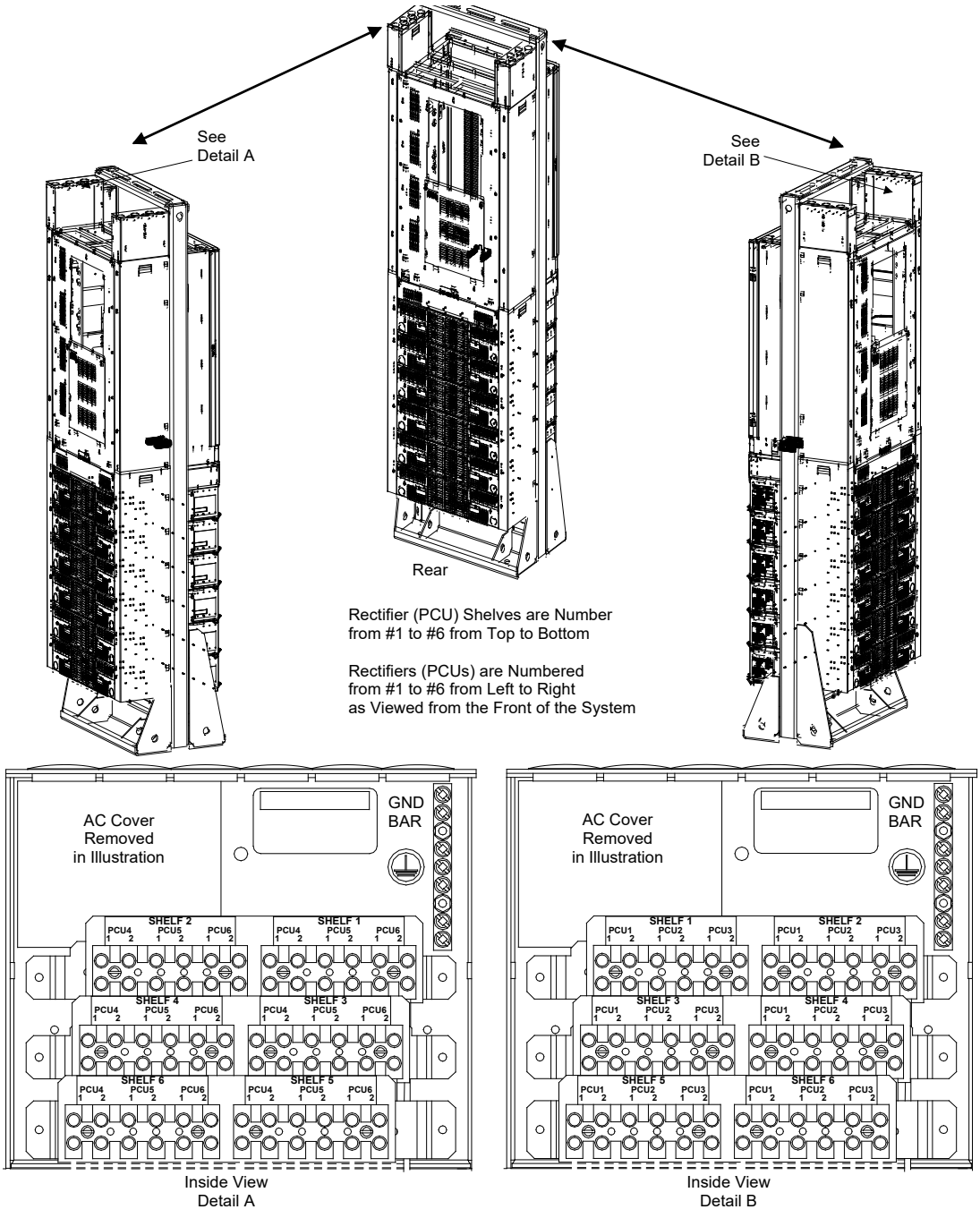
Refer to the illustrations located under the Bus Module List descriptions in this document.

## AC Input

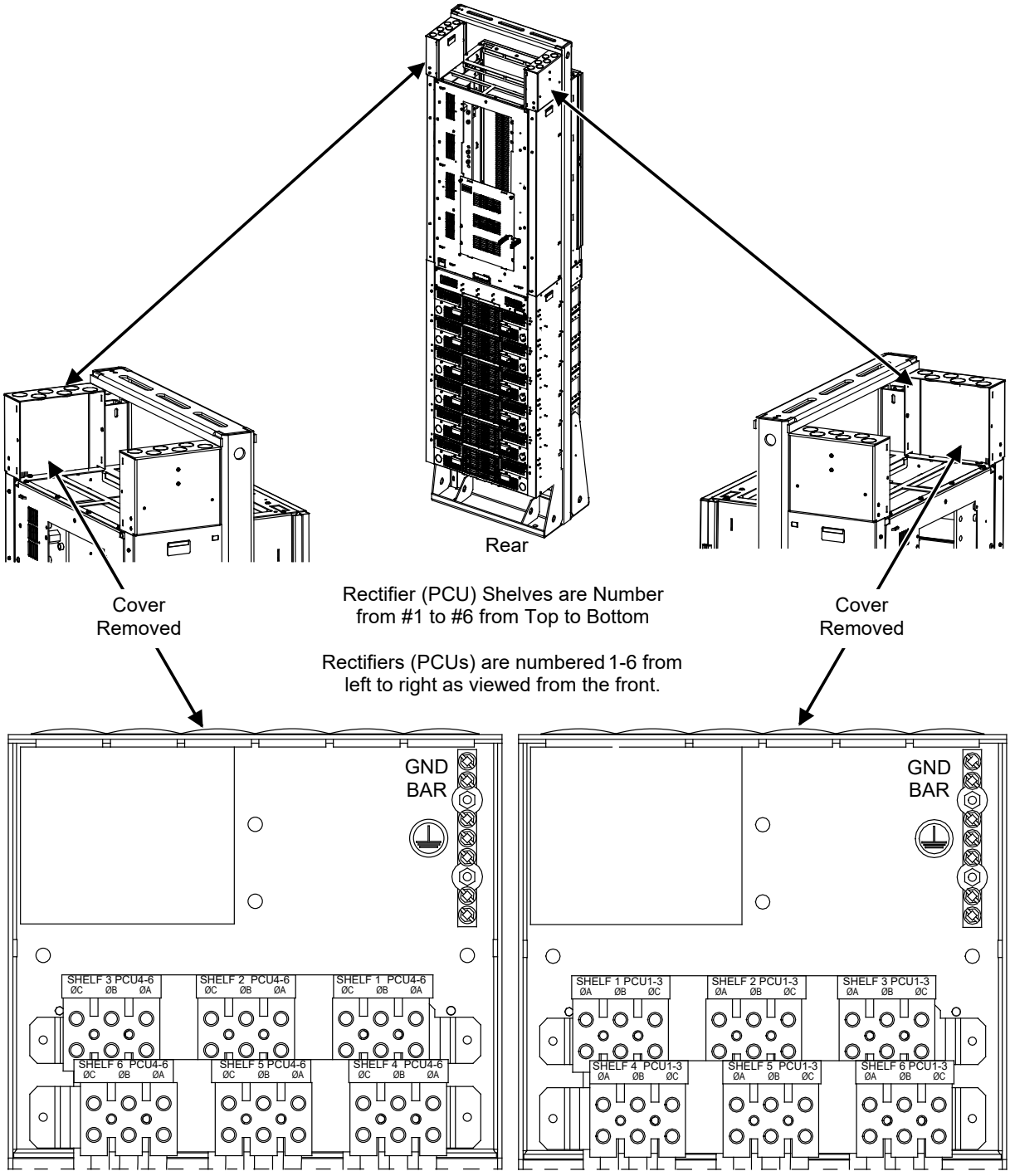
### Connections to 588705000 Rectifier Module Mounting Shelf(s)

Refer to the documentation package furnished with the Rectifier Module Mounting Shelf.

## Connections to Optional List 45 Top Mount AC Input Termination Panel (Single-Phase)



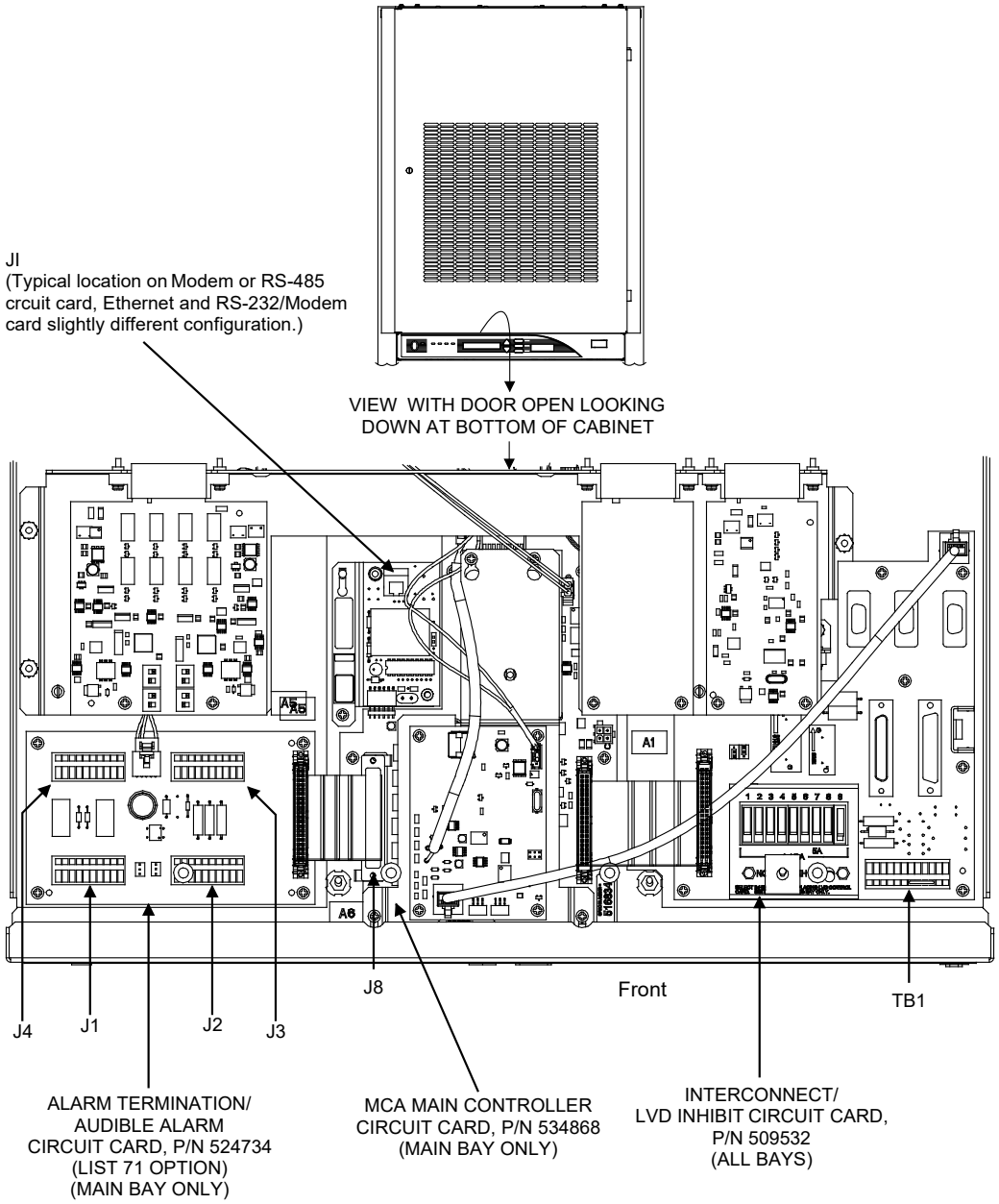
**Connections to Optional List 46 Top Mount AC Input Termination Panel (Three-Phase)**



**External Alarm, Reference, and Control**

External alarm, reference, and control connection points are located on...

- The optional List 80 LMS1000 Monitoring System (refer to the documentation furnished with the LMS1000 for connection point locations),
- J1-J4 on the optional List 71 Audible Alarm and Alarm Termination Circuit Card P/N 524734,
- TB1 on circuit card P/N 509532,
- J8 on circuit card P/N 534868 (if List 71 not installed).



## RELATED DOCUMENTATION

| | |
|---|---|
| **Power Data Sheets:** | PD588705000 (Model PSS4850-23GV Rectifier Module Mounting Shelf) |
| **System Application Guides:** | SAG588249700 (Model MHSB160CAB Converter Mounting Shelf) |
| **Schematic Diagrams:** | SD582126000 (NetSure™ Power System) |
| | SD588705000 (Model PSS4850-23GV Rectifier Module Mounting Shelf) |
| | SD528409 (1-Row Distribution Cabinet) |
| | SD528414 (2-Row Distribution Cabinet) |
| | SD528419 (3-Row Distribution Cabinet) |
| | SD528340 (4-Row Distribution Cabinet) |
| **Wiring Diagrams:** | T582126000 (NetSure™ Power System) |
| | T588705000 (Model PSS4850-23GV Rectifier Module Mounting Shelf) |
| | T528409 (1-Row Distribution Cabinet) |
| | T528414 (2-Row Distribution Cabinet) |
| | T528419 (3-Row Distribution Cabinet) |
| | T528340 (4-Row Distribution Cabinet) |
| **Color MCA Menu Tree:** | Section 6022 |
| **Instructions:** | Section 5974, System Installation Instructions (NetSure™ Power System, Spec. No. 582126000) |
| | Section 5975, System User Instructions (NetSure™ Power System, Spec. No. 582126000) |
| | Section 5823, Installation and User Instructions (Capacitor Precharge Assembly, Spec. No. 510142) |
| | Section 5940, Installation and User Instructions (Battery Temperature Probe Concentrator Module, P/N 521211) |
| | Section 5949, Installation Instructions (MCA Interface Option Kits) |
| | Section 5982, User Instructions (MCA Ethernet Interface Option - Using Ethernet Card Web Interface) |
| | UM1R483500e, Rectifier Instructions |
| **Load and Battery Lug Detail Drawings:** | 031110100<br>031110200<br>031110300 |

## BATTERY MANUFACTURER INFORMATION

Some equipment described in this System Application Guide is designed to accommodate batteries from various manufacturers. The following are referenced in this document.

**C&D:** C&D Technologies, Inc., Powercom Div., 1400 Union Meeting Road, Blue Bell, PA 19422-0858

**Deka®:** East Penn Mfg. Co., Inc., Lyon Station, PA 19536-0147

Douglas®: Douglas Battery Mfg. Co., 500 Battery Dr., Winston-Salem, NC 27117-2159

Fiamm: FIAMM T.I, 23880 Industrial Park Drive, Farmington Hills, Detroit, MI 48335

**Marathon™:** GNB Industrial Power, a Division of Exide Technologies, Princeton, NJ 08543.

**Northstar:** NorthStar Battery Co. LLC, 4000 Continental Way, Springfield, MO 65803

**PowerSafe Enersys™:** EnerSys Inc., Reading, PA, 196212-4145

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