

## SYSTEM OVERVIEW

**Description:** +24V DC @ up to 4000 amperes Power System

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

The NetSure 700NVBA DC Power System is a complete integrated power system containing rectifiers (PCUs), converters, 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 (one per bay), 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 Panel assemblies. A variety of Distribution Bus Panel assemblies are available that provide combinations of load distribution, battery distribution, low voltage load or battery disconnect, manual battery disconnect, and dual voltage load distribution for use with -48V converters. The Distribution Cabinet is factory mounted in the relay rack specified when ordered.

Most of the distribution panels 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.

- **Module Mounting Assembly**

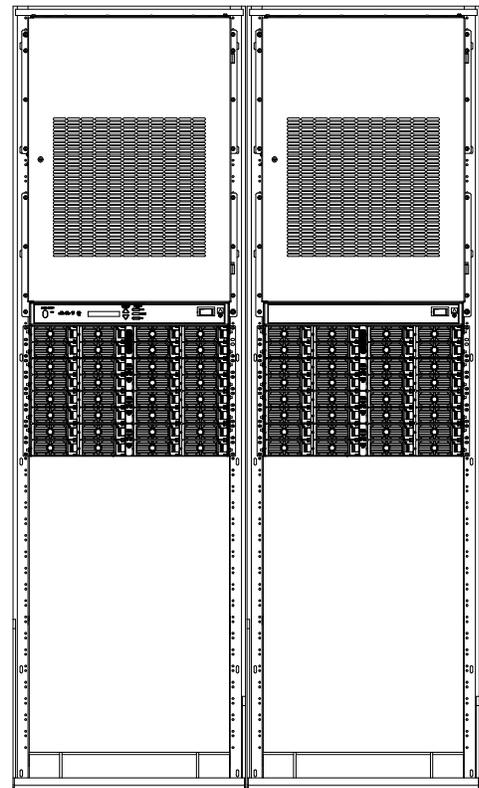
The system contains one or more Module Mounting Assemblies (one per bay), each of which houses Rectifier Modules (PCUs) and optional DC-DC Converter Modules. Refer to PD588705100 (PD588705101, PD588705102, PD588705103, PD588705104) for more information.

- **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 UM1R243000 (Rectifier User Instructions) for more information.

- **Optional DC-DC Converter Modules**

Where -48VDC load power is also required, DC-DC Converter Modules are available. Refer to UM1C24481500 (Converter User Instructions) for more information.



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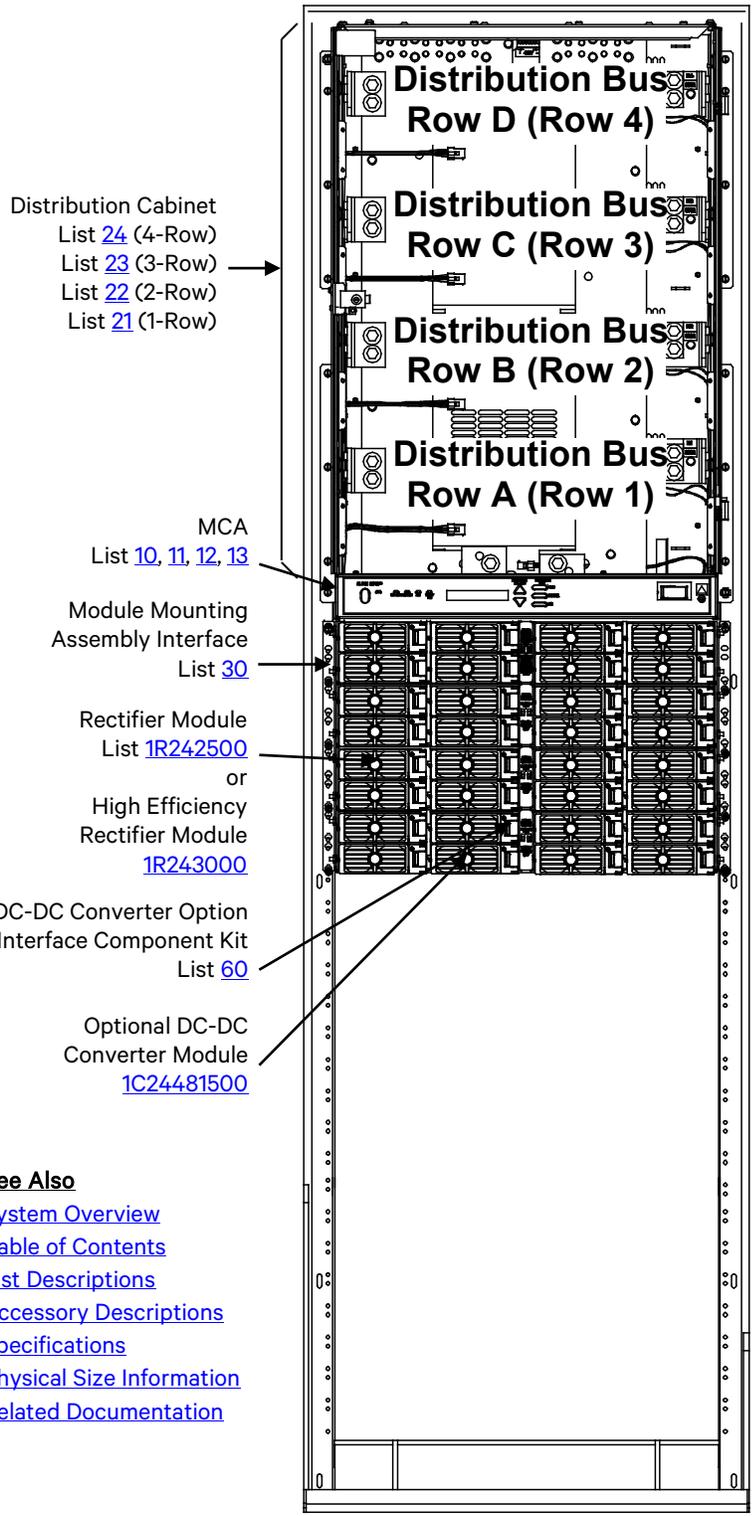
## System Application Guide

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Family:	NetSure
Spec. No.:	581126000
Model:	700NVBA
Rectifier Input Voltage	Nominal 208-240 volts AC, single phase, 50/60 Hz, with an operating range of 180 to 264 volts. Acceptable input frequency range is 47 to 65 Hz.
Rectifier Output Voltage:	+24 Volts DC
Converter Output Voltage:	-48 Volts DC
Output Capacity:	
System:	4000 Amperes, maximum
Bay:	2000 Amperes, maximum (1500A maximum when equipped with List <a href="#">AH</a> ; 1200A maximum when equipped with List <a href="#">RA</a> or <a href="#">RB</a> )
Distribution Bus Panel:	500 Amperes, maximum (List <a href="#">ND</a> rated for 960A)
Rectifier Module (PCU)	
1R242500:	87.7A @ +28.5VDC to 104.2A @ +24.0VDC, 2500 Watts
1R243000:	105.3A @ +28.5VDC to 125.0A @ 24.0VDC, 3000 Watts
Converter Module:	31 Amperes (1500W)
Agency Approval:	<a href="#">UL 1801 Listed ("c UL")</a> , <a href="#">NEBS (pending)</a>
Framework Type:	Relay Rack
Mounting Width:	23 Inches, nominal
Mounting Depth:	
Distribution Cabinet:	18 Inches (single-bay), 21 Inches (multi-bay) (List <a href="#">RC</a> , <a href="#">RD</a> , and <a href="#">RE</a> adds 5.25 inches to back of system, see <a href="#">Overall Dimensions Illustrations</a> )
Module Mounting Assembly:	22.34 Inches
Access:	Front, Sides, and Rear for Installation and Maintenance, Front for Operation
Supplemental Bay(s) Available:	One
Control:	Microprocessor
Color:	Bay and Rectifier Module Faceplates: Textured Gray (Spec. M500-147) Rectifier Shelf and Rectifier Modules Bodies: Bright Zinc Plating (Spec. M500-53)
Environment:	<a href="#">-40°C to +40°C (-40°F to +104°F)</a>

581126000

- 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](#), [BA](#), [CA](#), [CB](#), [CD](#), [CE](#), [CF](#), [CG](#), [CJ](#), [EA](#), [GB](#), [JA](#), [JB](#), [JC](#), [JD](#), [KA](#), [LB](#), [LC](#), [NA](#), [NB](#), [NC](#), [ND](#)

- 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 [31](#): Field Expansion Kit: One (1) 8-Position Module Mounting Assembly
- 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: WinLink Compatible + Web Interface
- List [76](#): MCA Interface Ethernet Option: WinLink Compatible + Web Interface + SNMP
- List [77](#): MCA Interface Ethernet Option: WinLink Compatible + Web Interface + Battery Monitoring
- List [78](#): MCA Interface Ethernet Option: WinLink Compatible + Web Interface + SNMP + Battery Monitoring
- List [92](#): Battery Stand System
- List [93](#): Battery Tray

**See Also**

- [System Overview](#)
- [Table of Contents](#)
- [List Descriptions](#)
- [Accessory Descriptions](#)
- [Specifications](#)
- [Physical Size Information](#)
- [Related Documentation](#)

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## LIST DESCRIPTIONS

### 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 one (1) Meter-Control-Alarm (MCA) Assembly.
- ◆ Accepts one (1) Module Mounting Assembly. The Module Mounting Assembly can consist of one (1), two (2), three (3), or four (4) factory interconnected 8-position Module Mounting Shelves. Each shelf in a Module Mounting Assembly provides eight (8) mounting positions for Rectifier Modules (PCUs). When a Module Mounting Shelf within the Module Mounting Assembly is equipped with a DC-DC Converter Option Kit, the four (4) middle positions will accept either Rectifier Modules (PCUs) or +24V/-48V DC-DC Converter Modules.

#### Restrictions

Cannot use a List [21](#) or [22](#) in a List 1 when List 1 is used with a List 2  
(List 21 and 22 are 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 P/N 543156 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 Panels as required per '[Distribution Bus Arrangements](#)' and the capacity of the Distribution Cabinet ordered.
- 4) Order one (1) List [10](#), [11](#), [12](#), or [13](#) MCA.
- 5) Order as required one (1) MCA Interface option per Lists [72](#), [74](#), [75](#), [76](#), [77](#), or [78](#). Also order as required WinLink Software per List [73](#).
- 6) Order one (1) List [30](#) (interface components for one (1) Module Mounting Assembly). Order a Module Mounting Assembly per PD588705101/PD588705102/PD588705103/PD58805104. List 30 is factory connected to the Module Mounting Assembly ordered.
- 7) Order one (1) List [60](#) (DC-DC Converter Option Kit) for each 8-position Module Mounting Shelf in which DC-DC Converters are required. Note that some Module Mounting Assemblies consist of multiple 8-position Module Mounting Shelves. The kit permits the middle four (4) positions in an 8-position Module Mounting Shelf to accept DC-DC Converter Modules or Rectifier Modules (PCUs). List 60 is factory installed within the 8-position Module Mounting Shelf. List 60 kits will be installed starting with bottom 8-position Module Mounting Shelf in the Module Mounting Assembly and working up.
- 8) Order Rectifier Modules (PCUs) per [1R242500](#) or by P/N [1R243000](#) as required.
- 9) Order DC-DC Converter Modules per [1C24481500](#) as required.
- 10) Order one (1) Module Mounting Position Blank Cover Panel, [Part No. 540959](#), for each empty module mounting position in the system.
- 11) Order fuses and/or circuit breakers, as required, per '[Distribution Devices](#)' under ACCESSORY DESCRIPTIONS.
- 12) Order input and load distribution lugs, as required, per '[Wiring Components](#)' under ACCESSORY DESCRIPTIONS.
- 13) Order as required additional options per Lists [29](#), [71](#), [92](#) and [93](#).
- 14) Order as required any additional accessories 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 a [List 1](#) Main Bay.
- ◆ Accepts one (1) Distribution Cabinet (options are 3-Row or 4-Row cabinet).

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- ◆ Accepts one (1) Module Mounting Assembly. The Module Mounting Assembly can consist of one (1), two (2), three (3), or four (4) factory interconnected 8-position Module Mounting Shelves. Each Module Mounting Shelf in a Module Mounting Assembly provides eight (8) mounting positions for Rectifier Modules (PCUs).  
or  
Can be configured for “distribution only” (no Module Mounting Assembly).

### **Restrictions**

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.

Supplemental Bays DO NOT accept Converter Modules. DO NOT order List [60](#) for Supplemental Bays.

List 2 Supplemental Bay DOES NOT accept List [21](#) or [22](#) Distribution Cabinet  
(List 21 and 22 are not provided with connection points for interbay busbars.)

Rear access is 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 P/N 543156 on Top of GNB Absolute 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 [23](#) or [24](#) Distribution Cabinet.
- 3) Order up to four (4) Distribution Bus Panels as required per '[Distribution Bus Arrangements](#)' and the capacity of the Distribution Cabinet ordered.
- 4) Order one (1) List [30](#) (interface components for one (1) Module Mounting Assembly). Order a Module Mounting Assembly per PD588705101/PD588705102/PD588705103/PD58805104. List 30 is factory connected to the Module Mounting Assembly ordered.  
or  
Order Supplemental Bay 'Distribution Only' option per List [4](#).
- 5) Order Rectifier Modules (PCUs) per P/N [1R242500](#) or by P/N [1R243000](#) as required.
- 6) Order one (1) Module Mounting Position Blank Cover Panel, [Part No. 540959](#), for each empty 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 as required additional options per Lists [29](#), [92](#) and [93](#).
- 10) Order as required any additional accessories described under [ACCESSORY DESCRIPTIONS](#).

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### List 4: “Distribution Only” Option for Lists 2 or 5

#### Features

- ◆ Provides components needed to convert one [List 2](#) or [List 5](#) bay from “power and distribution” to “distribution only”.

#### Restrictions

A Module Mounting Assembly cannot be mounted in a bay when List 4 is installed.

#### Ordering Notes

- 1) Order one List 4 for each [List 2](#) or [List 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 inter-bay communications cabling.
- ◆ Accepts one (1) Distribution Cabinet (options are 1-Row, 2-Row, 3-Row, or 4-Row cabinet).
- ◆ Accepts one (1) Module Mounting Assembly. The Module Mounting Assembly can consist of one (1), two (2), three (3), or four (4) factory interconnected 8-position Module Mounting Shelves. Each Module Mounting Shelf in a Module Mounting Assembly provides eight (8) mounting positions for Rectifier Modules (PCUs).  
or  
Can be configured for “distribution only” (no Module Mounting Assembly).

#### 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.

Supplemental Bays DO NOT accept Converter Modules. DO NOT order List [60](#) for Supplemental Bays.

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

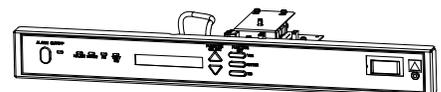
#### Ordering Notes

- 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 P/N 543156 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 Panels as required per '[Distribution Bus Arrangements](#)' and the capacity of the Distribution Cabinet ordered.
- 4) Order one (1) List [30](#) (interface components for one (1) Module Mounting Assembly). Order a Module Mounting Assembly per PD588705101/PD588705102/PD588705103/PD58805104. List 30 is factory connected to the Module Mounting Assembly ordered.  
or  
Order Supplemental Bay 'Distribution Only' option per List [4](#).
- 5) Order Rectifier Modules (PCUs) per P/N [1R242500](#) or by [P/N 1R243000](#) as required.
- 6) Order one (1) Module Mounting Position Blank Cover Panel, [Part No. 540959](#), for each empty 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 as required additional options per Lists [29](#), [92](#) and [93](#).
- 10) Order as required any additional accessories 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



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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](#).

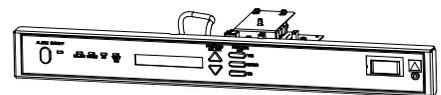
#### **Ordering Notes**

- 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.



# NetSure™ 700NVBA DC Power System

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### **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](#).

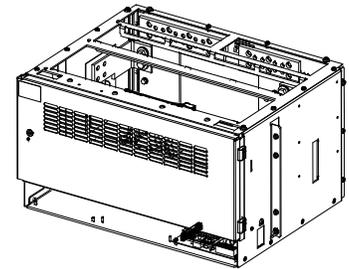
### **Ordering Notes**

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 Panel.
- ◆ 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 inter-bay 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 Panel for each List 21 per '[Distribution Bus Arrangements](#)'.
- 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 Panels.
- ◆ Rated for up to 1000 amperes of distribution.
- ◆ Available for use in [List 1](#) 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.

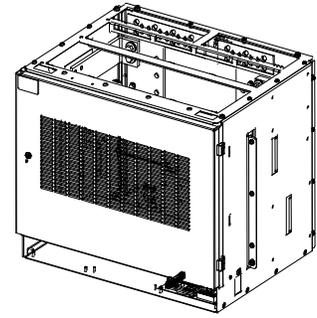
**Restrictions**

Not available for [List 2](#) bays (no inter-bay busbar landings available).

Cannot be ordered with [List 1](#) if it is to be used with a [List 2](#).

**Ordering Notes**

- 1) Order up to two (2) Distribution Bus Panels for each List 22 per '[Distribution Bus Arrangements](#)'.
- 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.



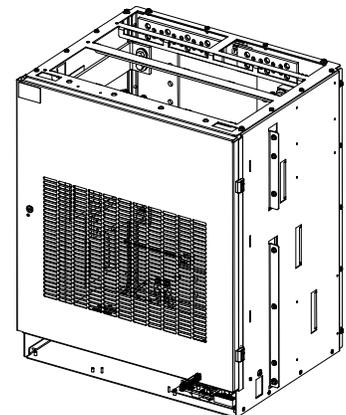
**List 23: Three-Row Distribution Cabinet**

**Features**

- ◆ Accepts up to three (3) Distribution Bus Panels.
- ◆ 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 Panels for each List 23 per '[Distribution Bus Arrangements](#)'.
- 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.



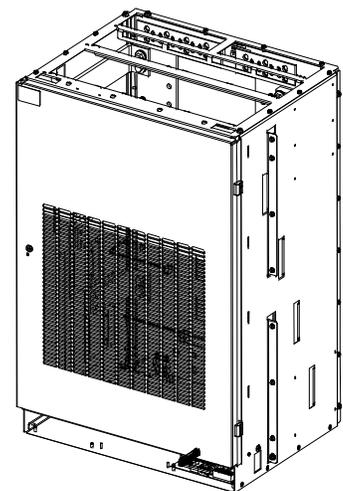
**List 24: Four-Row Distribution Cabinet**

**Features**

- ◆ Accepts up to four (4) Distribution Bus Panels.
- ◆ 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 Panels for each List 24 per '[Distribution Bus Arrangements](#)'.
- 2) Order fuses and/or circuit breakers, as required, per '[Distribution Devices](#)' under ACCESSORY DESCRIPTIONS.



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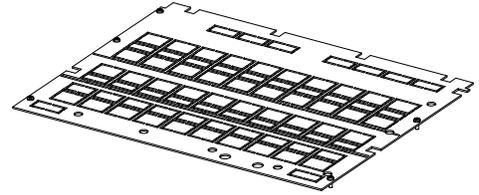
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- 3) Order input and load distribution lugs, as required, per ['Wiring Components'](#) under ACCESSORY DESCRIPTIONS.

### 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.



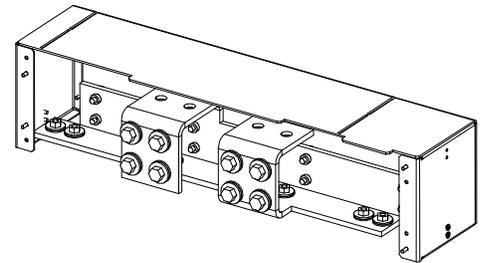
#### Ordering Notes

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

### List 30: Module Mounting Assembly Interface Components

#### Features

- ◆ Provides components to add one (1) Module Mounting Assembly (Spec. No. 588705101, 588705102, 588705103, or 588705104) to a Main or Supplemental Bay.
- ◆ The separately ordered Module Mounting Assembly can consist of one (1), two (2), three (3), or four (4) factory interconnected 8-position Module Mounting Shelves. Each Module Mounting Shelf in a Module Mounting Assembly provides eight (8) mounting positions for Rectifier Modules (PCUs). When the Module Mounting Shelf is equipped with a DC-DC Converter Option Kit, the four (4) middle positions will accept either Rectifier Modules (PCUs) or +24V/-48V DC-DC Converter Modules. Note that Supplemental Bays CANNOT have Converter Modules.
- ◆ Refer to Power Data Sheet PD588705100/PD588705101/PD588705102/PD588705103/PD588705104 for Module Mounting Assembly information.



#### Restrictions

Factory installed only on the Distribution Cabinet.

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

The Module Mounting Assembly must be ordered separately.

Each bay can be equipped with a maximum of one (1) Module Mounting Assembly.

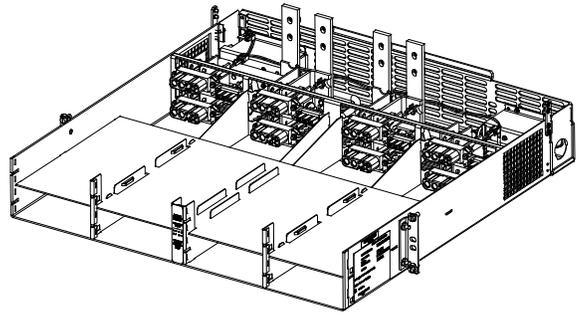
#### Ordering Notes

- 1) Order one (1) List 30 per bay, regardless of the number of module mounting positions required (32 positions maximum per bay).
- 2) Order a Module Mounting Assembly per Power Data Sheet PD588705101/PD588705102/PD588705103/PD588705104 as required.
- 3) Order one (1) List [60](#) (DC-DC Converter Option Kit) for each 8-position Module Mounting Shelf in which DC-DC Converters are required. Note that some Module Mounting Assemblies consist of multiple 8-position Module Mounting Shelves. The kit permits the middle four (4) positions in an 8-position Module Mounting Shelf to accept DC-DC Converter Modules or Rectifier Modules (PCUs). List 60 is factory installed within the 8-position Module Mounting Shelf. List 60 kits will be installed starting with bottom 8-position Module Mounting Shelf in the Module Mounting Assembly and working up. Note that Supplemental Bays CANNOT have Converter Modules.
- 4) Order Rectifier Modules (PCUs) per [1R242500](#) or by P/N [1R243000](#) as required.
- 5) Order DC-DC Converter Modules per [1C24481500](#) as required. Note that Supplemental Bays CANNOT have Converter Modules.
- 6) Order a Module Mounting Position Blank Cover Panel, [Part No. 540959](#), for each empty module mounting position in the system.

**List 31: Field Expansion Kit: One (1) 8-Position Module Mounting Assembly**

**Features**

- ◆ Provides one (1) Spec No. 588705100 Module Mounting Assembly and components required for field installation in an existing Power System that has eight (8) to twenty-four (24) positions.
- ◆ Included are busbars for connecting rectifier output to the main system bus, and cables for connecting DC-DC Converter output to the appropriate dual voltage bus distribution panel assembly (if using converters).
- ◆ The Module Mounting Shelf provides eight (8) mounting positions. Rectifier Modules (PCUs) can be installed in any of the eight (8) mounting positions. Also provided is DC-DC Converter Option Kit (List 60). This allows the four (4) middle mounting positions to accept either Rectifier Modules (PCUs) or DC-DC Converter Modules. Note that Supplemental Bays CANNOT have Converter Modules.
- ◆ Refer to Power Data Sheet PD588705100 for more information.



**Restrictions**

For field installation only.

Maximum number of List 31 that can be installed in a power bay is one (1).

Original system must have a Module Mounting Assembly (up to twenty-four [24] positions).

Cannot be used in a power bay equipped with a Spec No. 588705104 Module Mounting Assembly.

Converter Modules must be used in conjunction with a dual voltage bus distribution panel assembly (List [JA](#), [JB](#), [JC](#), [JD](#), [KA](#), [LB](#), or [LC](#)). Note that Supplemental Bays CANNOT have Converter Modules.

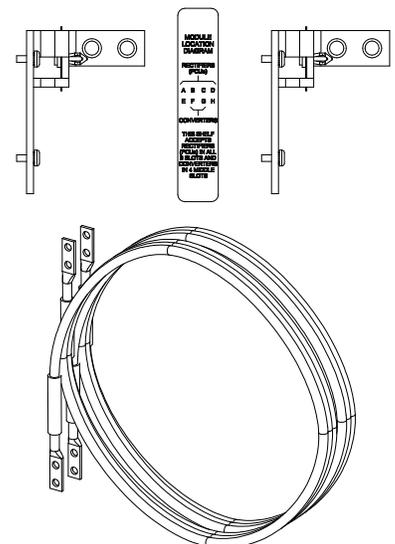
**Ordering Notes**

- 1) For a bay equipped with Spec. No. 588705101 List 1, Spec. No. 588705102 List 1, or Spec. No. 588705103 List 1, order one (1) List 31.
- 2) Order Rectifier Modules (PCUs) per [1R242500](#) or by P/N [1R243000](#) as required.
- 3) Order DC-DC Converter Modules per [1C24481500](#) as required.  
Note that Supplemental Bays CANNOT have Converter Modules.
- 4) Order a Module Mounting Position Blank Cover Panel, [Part No. 540959](#), for each empty module mounting position in the assembly.

**List 60: DC-DC Converter Option Interface Component Kit**

**Features**

- ◆ Provides components to add DC-DC Converter capability to one (1) 8-position Module Mounting Shelf in a Module Mounting Assembly. With one (1) List 60 installed, the four middle mounting positions in an 8-position Module Mounting Shelf in the Module Mounting Assembly will accept DC-DC Converters or Rectifier Modules (PCUs).
- ◆ Includes cables for connection of converter output to a dual voltage bus distribution panel assembly.
- ◆ Note that this option is furnished in 581126000 List 31.



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### **Restrictions**

MUST be factory installed only.

CANNOT be used in Supplemental Bays.

Must be used in conjunction with a dual voltage bus distribution panel assembly (List [JA](#), [JB](#), [JC](#), [JD](#), [KA](#), [LB](#), or [LC](#)). Up to two (2) converter kits can be used with a List JA, JB, JC, JD, LB, or LC. Up to four (4) converter kits can be used with a List KA.

Total rectifier output power available for customer loads is reduced by the input power of each DC-DC Converter Module installed.

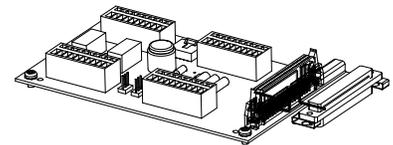
### **Ordering Notes**

- 1) Order one (1) List 60 (DC-DC Converter Option Kit) for each 8-position Module Mounting Shelf in which DC-DC Converters are required (see **restrictions** above). Note that some Module Mounting Assemblies consist of multiple 8-position mounting shelves. The kit permits the middle four (4) positions in an 8-position Module Mounting Shelf to accept DC-DC Converter Modules or Rectifier Modules (PCUs). List 60 is factory installed within the 8-position Module Mounting Shelf. Multiple List 60 kits will be installed starting with bottom 8-position Module Mounting Shelf in the Module Mounting Assembly and working up. Note that Supplemental Bays CANNOT have Converter Modules.
- 2) Order up to four (4) converter modules ([1C24481500](#)) for each List 60 ordered.

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

#### **Features**

- ◆ Provides an Audible Alarm and Alarm Termination circuit card (P/N 509539). This circuit card is interconnected to the MCA and (via relays on the circuit card) to external converter major and minor alarm circuits (if converters are furnished). The circuit card provides spring-clamp type terminals for connection of customer wiring to the MCA 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).

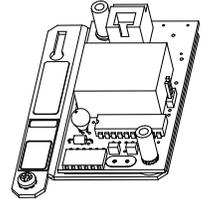
#### **Ordering Notes**

- 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](#), or [78](#)) can be installed.

**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 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](#).

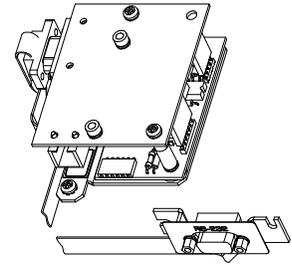
**Ordering Notes**

- 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](#), or [78](#)) can be installed.

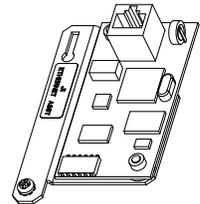
**Ordering Notes**

- 1) Order this option for each Power System (MCA) to be accessed via [WinLink Software \(List 73\)](#) via modem or RS-232.

**List 75: MCA Interface Ethernet Option:  
WinLink Compatible + Web Interface**

**Features**

- ◆ Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- ◆ Ethernet circuit card is **WinLink Compatible** and provides a **Web Interface**.
- ◆ This option plugs into the MCA.
- ◆ Allows MCA interface via an Ethernet 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](#), or [78](#)) can be installed.

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

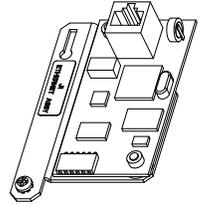
**Ordering Notes**

- 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.
- 3) WinLink Software ([List 73](#)) will operate with [List 75](#) but is not required. Internal WEB Pages are preferred.

**List 76: MCA Interface Ethernet Option:  
WinLink Compatible + Web Interface + SNMP**

**Features**

- ◆ Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- ◆ Ethernet circuit card is **WinLink Compatible**, provides a **Web Interface**, and provides **SNMP**.
- ◆ This option plugs into the MCA.
- ◆ Allows MCA interface via an Ethernet 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](#), or [78](#)) can be installed.  
The Ethernet card requires an MCA with firmware version 5.2.0 or later.

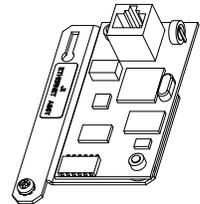
**Ordering Notes**

- 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.
- 3) WinLink Software ([List 73](#)) will operate with [List 76](#) but is not required. Internal WEB Pages are preferred.

**List 77: MCA Interface Ethernet Option:  
WinLink Compatible + Web Interface + Battery Monitoring**

**Features**

- ◆ Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- ◆ Ethernet circuit card is **WinLink Compatible**, provides a **Web Interface**, and provides **Battery Monitoring**.
- ◆ This option plugs into the MCA.
- ◆ Allows MCA interface via an Ethernet 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](#), or [78](#)) can be installed.  
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.
- 3) WinLink Software ([List 73](#)) will operate with [List 77](#) but is not required. Internal WEB Pages are preferred.

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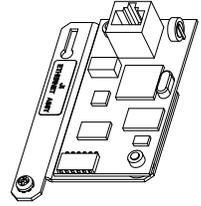
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### **List 78: MCA Interface Ethernet Option: WinLink Compatible + Web Interface + SNMP + Battery Monitoring**

#### **Features**

- ◆ Provides an Ethernet circuit card (P/N 524541) and associated mounting hardware.
- ◆ Ethernet circuit card is **WinLink Compatible**, provides a **Web Interface**, provides **Battery Monitoring**, and provides **SNMP**.
- ◆ This option plugs into the MCA.
- ◆ Allows MCA interface via an Ethernet 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](#), or [78](#)) can be installed.  
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.
- 3) WinLink Software ([List 73](#)) will operate with [List 78](#) but is not required. Internal WEB Pages are preferred.

### **List 92: Battery Stand System**

#### **Features**

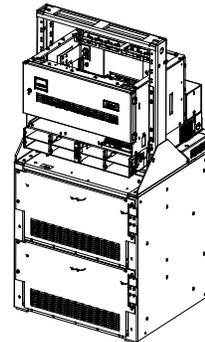
- ◆ Complete battery stand platform, including monitoring options.  
For more information, refer to SAG588810000.

#### **Restrictions**

There must be 1RU of space below the power system.  
[List 92](#) cannot be ordered with [Lists 4](#), [93](#), [RA](#), [RB](#), [RC](#), [RD](#), or [RE](#).

#### **Ordering Notes**

- 1) Order as required. When [List 92](#) is ordered as part of the power system, the power system can be mounted in a relay rack on top of the battery stand.
- 2) The system must be ordered in one of the following relay racks: 543151, 543152, 543153, 543154, 543155, 543156, 543157.
- 3) The system must be equipped with a rectifier shelf.



Generic assembly of parts creating a [List 92](#).  
Battery stand (number of rows), relay rack (height), shelf (number of positions), and distribution cabinet (number of rows) can vary depending on configuration.

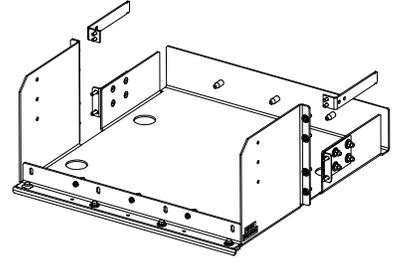
# NetSure™ 700NVBA DC Power System

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### List 93: Battery Tray, Pre-Cabled

#### Features

- ◆ Provides one battery tray that mounts four (4) 12V front terminal VLRA batteries. Batteries are configured as two (2) 24V strings per tray. 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 +24V lead of each battery string (2 circuit breakers per tray).
- ◆ Inter-battery spacer plates included.



#### Restrictions

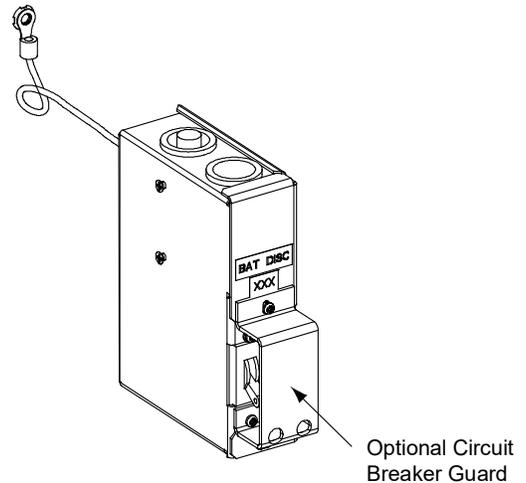
Cannot be used with List RA, RB, RC, RD, RE, or 92.

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

A single List 93 must mount at bottom of bay. Multiples of List 93 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 30.

#### Ordering Notes

- 1) Order multiples of List 93 for more than one (1) battery tray. See **Restrictions**.
- 2) Order batteries separately. The following table lists batteries recommended for use with List 93.
- 3) For double -pole circuit breakers, also order an optional circuit breaker guard (P/N 548014) per circuit breaker if desired.
- 4) If optional front battery covers are desired, order per [Optional Front Battery Covers](#) in the ACCESSORY DESCRIPTIONS section.



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Manufacturer*	Model	Vertiv 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
Energys	12TX105F	--	100	4.90 x 22.10 x 9.30	6U	105.8
Energys	12V100F	--	100	4.9 x 22.00 x 9.00	6U	104.7
Energys	12V155FS	122010	155	4.9 x 22.10 x 11.10	7U	125.6
Energys	12V170F	--	170	4.90 x 22.10 x 12.40	8U	147.7
Energys	12VF105F	--	107	4.90 x 22.10 x 9.30	6U	101.4
Energys	12VX100F	--	100	4.9 x 22.00 x 9.00	6U	104.7
Energys	SBS 170F	--	170	4.90 x 22.10 x 11.10	7U	115.7
Energys	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.

- 5) Specify rack spacing of 7U (12.25") or 8U (14") between trays and above top tray as required for battery clearance. See table above.
- 6) 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 the following table. The table is provided for reference only.

NetSure™ 700NVBA DC Power System  
System Application Guide

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
Energys 12TX105F	528235	528235	528234
Energys 12V100F	528235	528235	528234
Energys 12V155FS	528235	528235	528234
Energys 12V170F	528235	528235	528234
Energys 12VF105F	528235	528235	528234
Energys 12VX100F	528235	528235	528234
Energys SBS 170F	528235	528235	528234
Energys 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

- 7) 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.
- 8) An assembly for connection of all List 93 is automatically added to the order. Part number depends on system configuration.
- 9) If ordering List 93 with circuit breakers, order two (2) circuit breakers per List 93 from the following table.

NetSure™ 700NVBA DC Power System  
System Application Guide

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Ampere Rating	Part Number	
	Electrical/Mechanical Trip <sup>1</sup> (Black Handle)	Electrical Trip <sup>2</sup> (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:

- <sup>1</sup> Provides an alarm during an electrical or manual trip condition.
- <sup>2</sup> Provides an alarm during an electrical trip condition only.

# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AA: Distribution Bus Module (P/N 509840)

#### (24) Fuse/Circuit Breaker System Positions

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

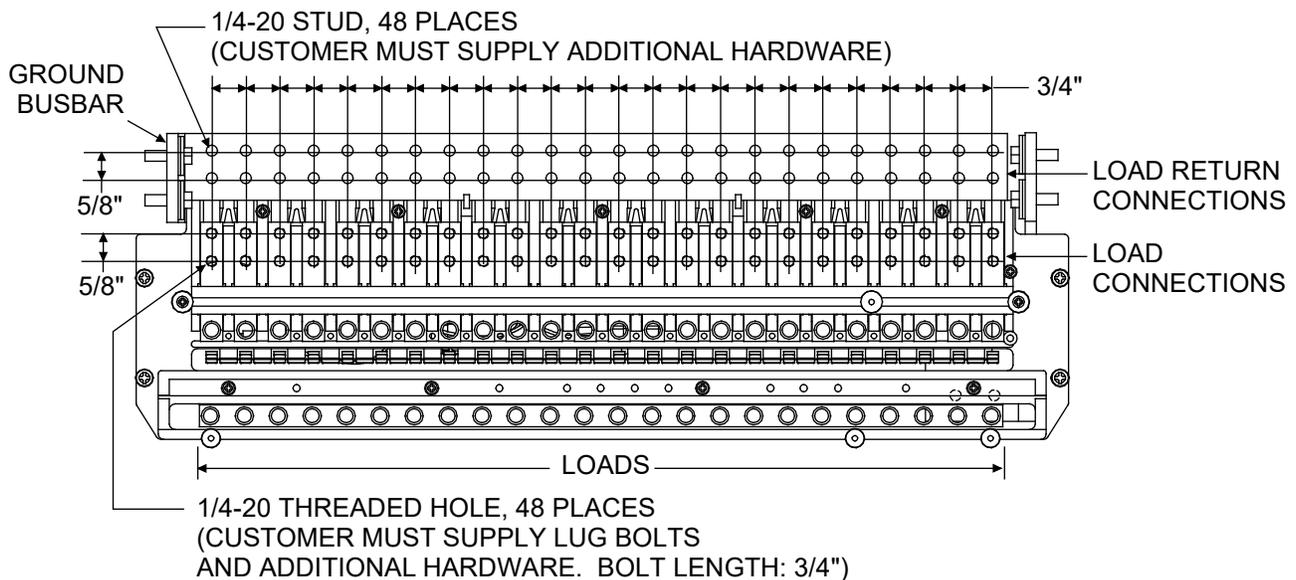
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AB: Distribution Bus Module (P/N 428316100)

#### (3) GJ/218 Circuit Breaker System Positions

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type) **NOTE RESTRICTIONS**

##### Restrictions

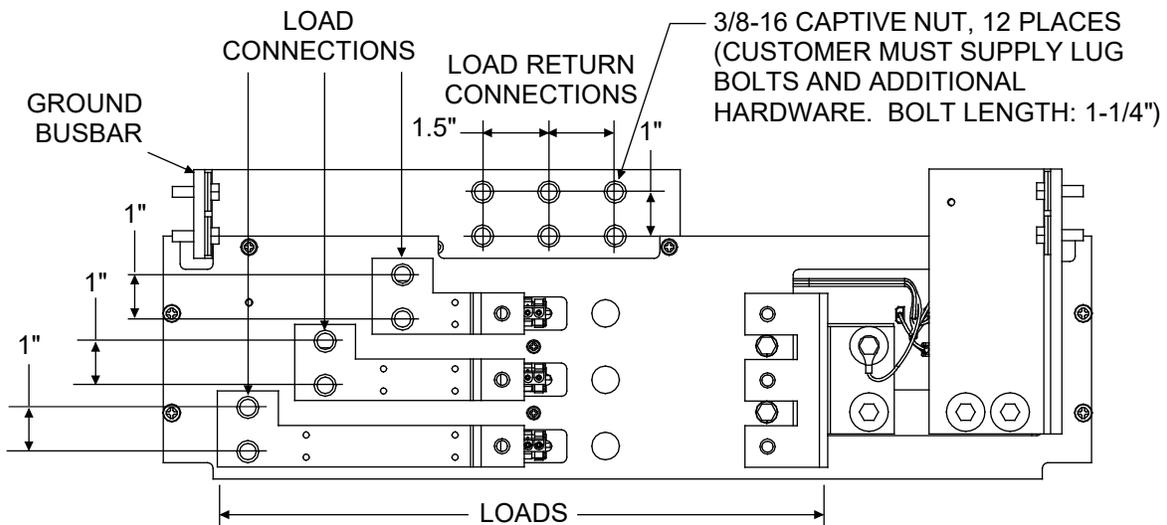
Can be installed in bus positions A-C (row 1-3) of a 1-, 2-, 3-, or 4-bus row cabinet. Cannot be installed in bus position D (row 4) of a 4-bus row cabinet. See also [List AC](#) for similar application in bus position D (row 4).

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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AC: Distribution Bus Module (P/N 507198)

#### (3) GJ/218 Circuit Breaker System Positions

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type) **NOTE RESTRICTIONS**

##### Restrictions

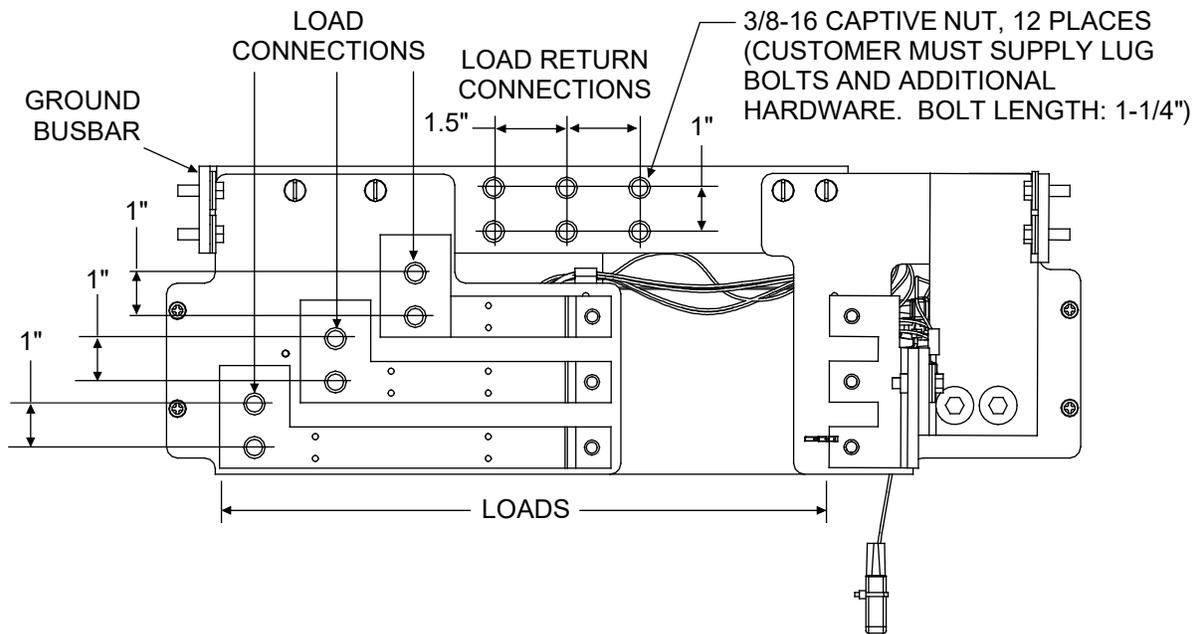
For use in a 4-bus row cabinet only. Must be installed in bus position D (row 4). See also [List AB](#) for similar application in bus positions A-C (rows 1-3).

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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AD: Distribution Bus Module (P/N 509565)

#### (8) GJ/218 Circuit Breaker System Positions (Upper Two Rows)

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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).

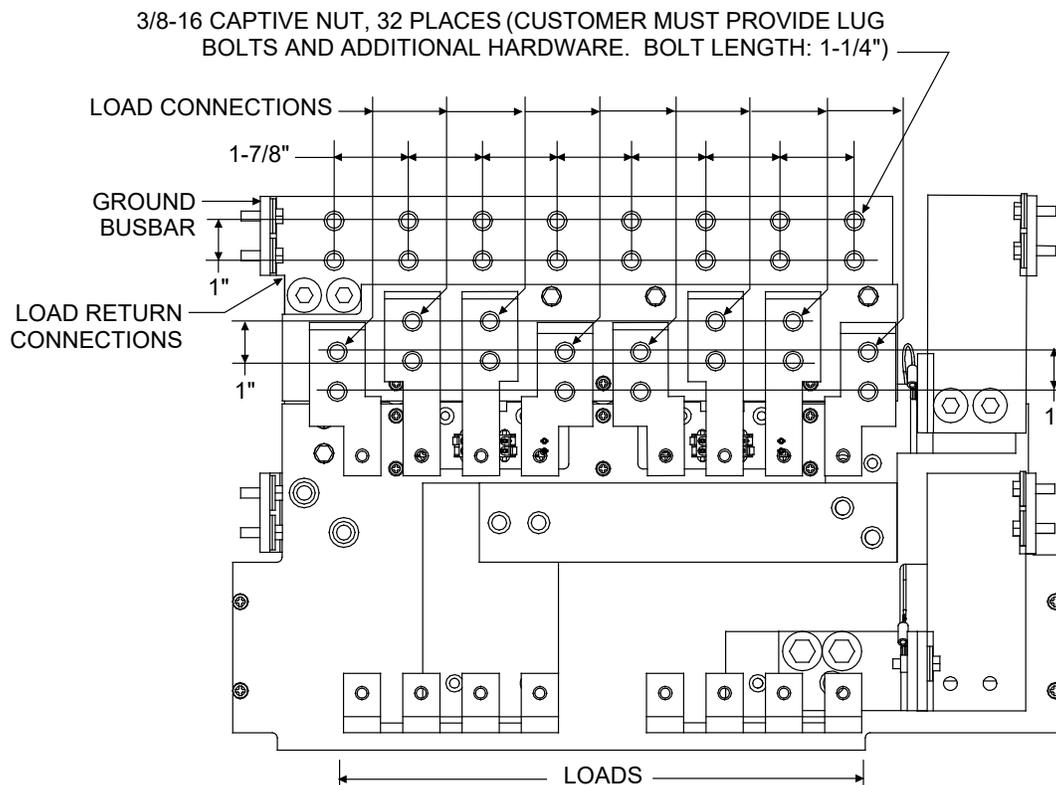
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

- (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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AE: Distribution Bus Module (P/N 509648)

#### (8) GJ/218 Circuit Breaker System Positions (Lower Two Rows)

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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).

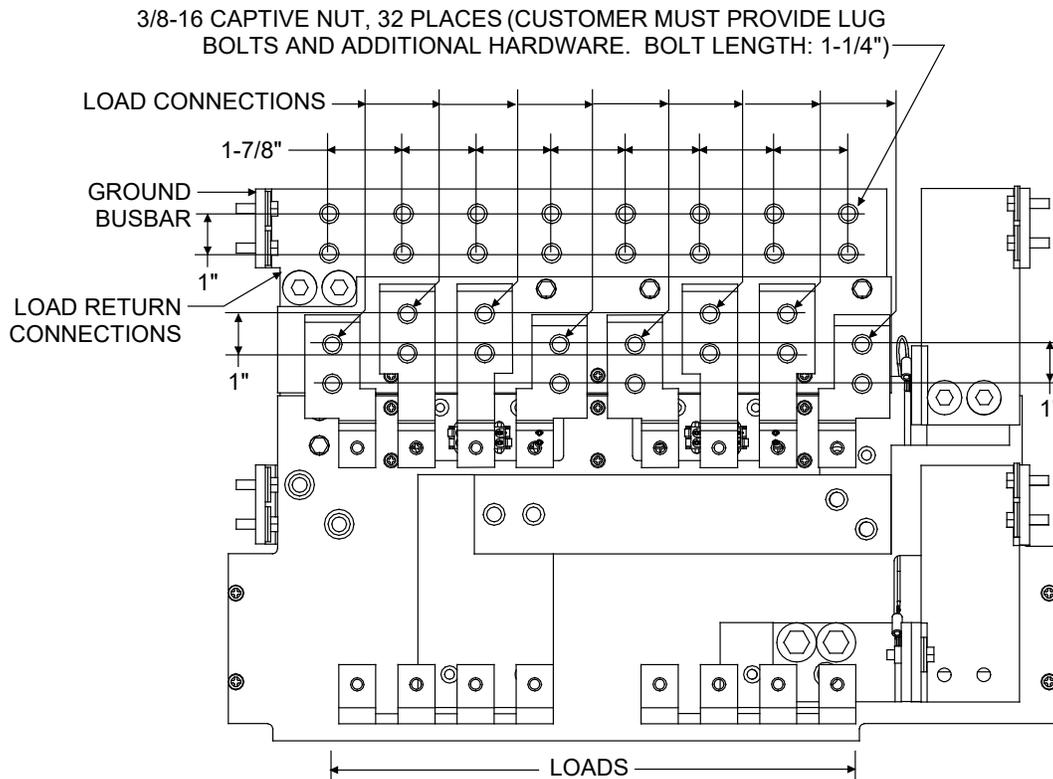
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

- (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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AG: Distribution Bus Module (P/N 514010)

#### (2) TPH Fuse System Positions

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (2) Distribution Fuse Mounting Positions (70 to 600A TPH-Type)

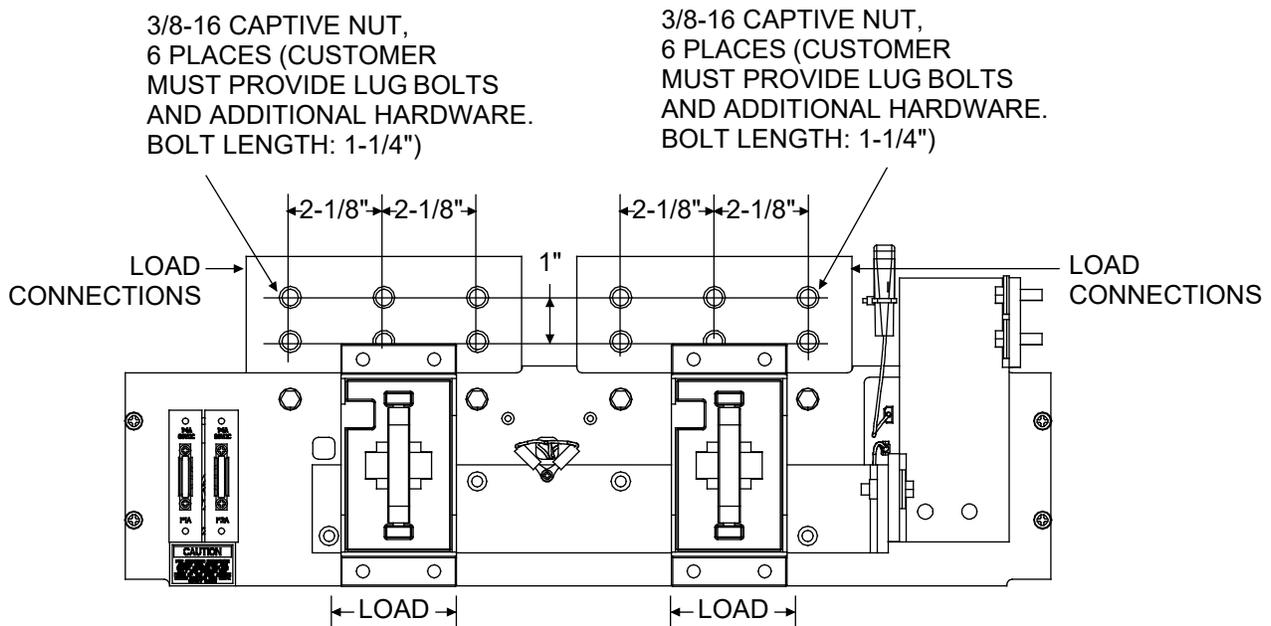
##### Restrictions

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**

**Features**

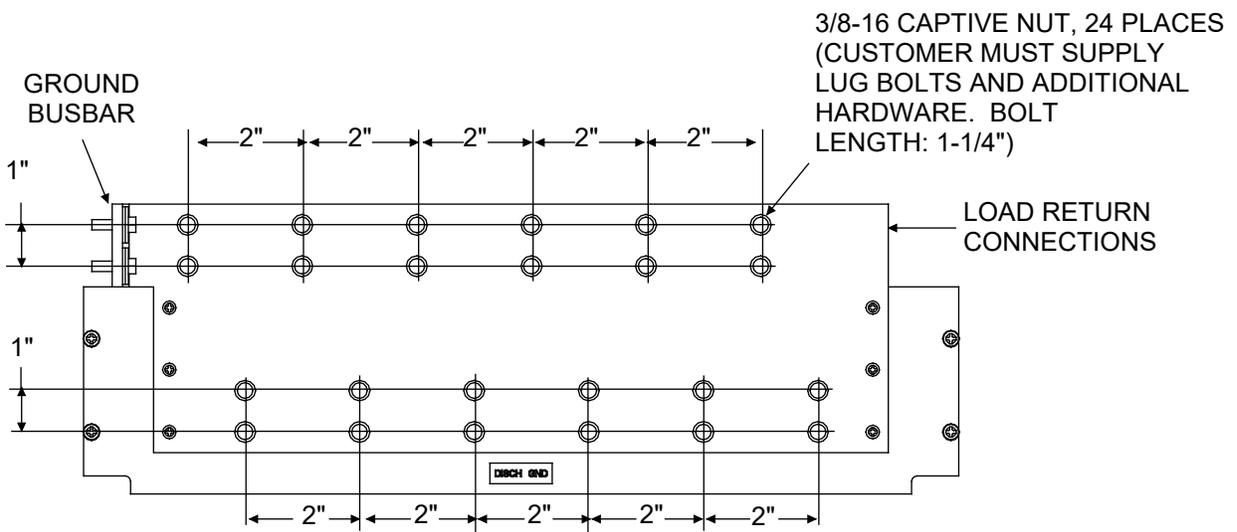
- ◆ Single Voltage Distribution (+24V)
- ◆ 1000A Maximum Capacity
- ◆ Groundbar Assembly for Use with Up to Two (2) List [AG](#), [AJ](#), [CG](#), or [CJ](#) if internal load returns are required

**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](#), [List AJ](#), [List CG](#), or [List CJ](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AJ: Distribution Bus Module (P/N 520819)

#### (2) TPH Fuse System Positions with Load Metering Shunts

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

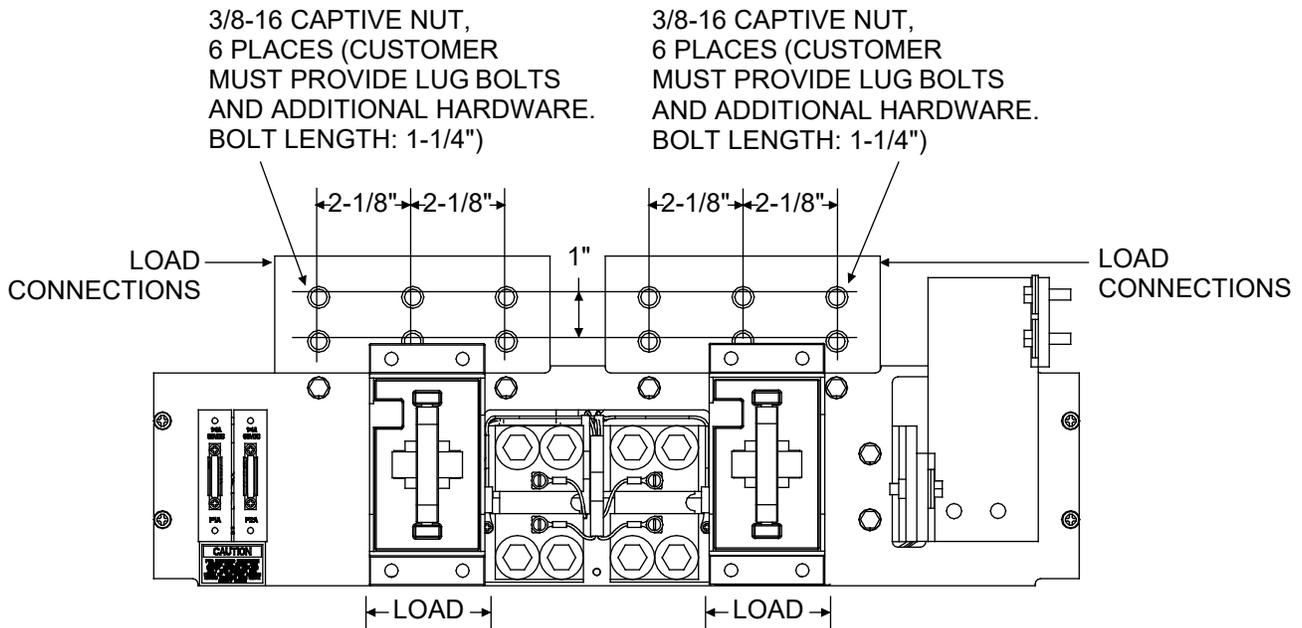
##### Restrictions

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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List AK: Distribution Bus Module (P/N 520805)

#### (24) Fuse/Circuit Breaker System Positions

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

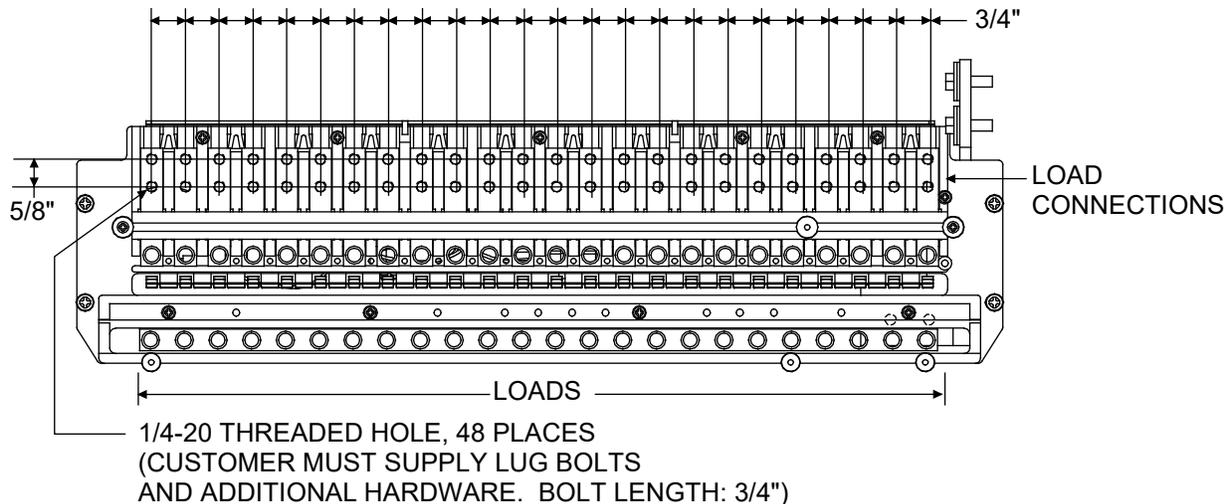
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

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### **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

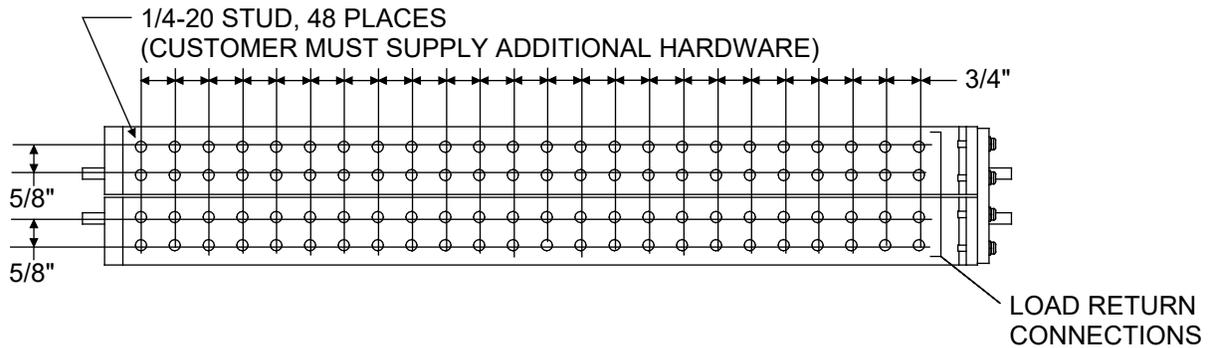
#### **Restrictions**

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 (+24V)
- ◆ 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.

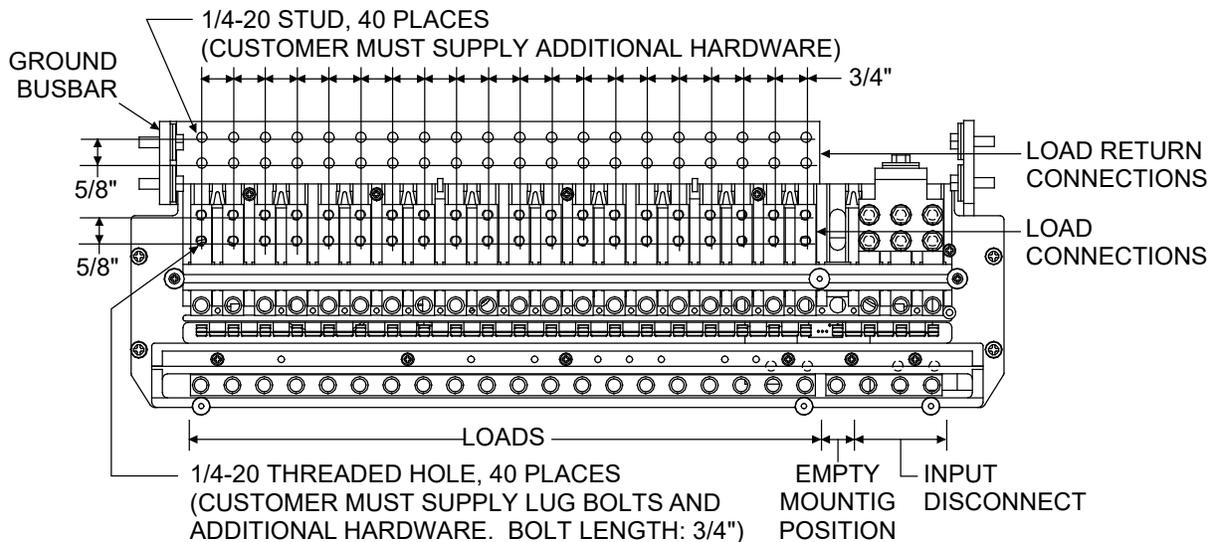
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List BA: Distribution Bus Module (P/N 520534)

#### (12) Fuse/Circuit Breaker System Positions with LVD

#### (8) Fuse/Circuit Breaker System Positions without LVD

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

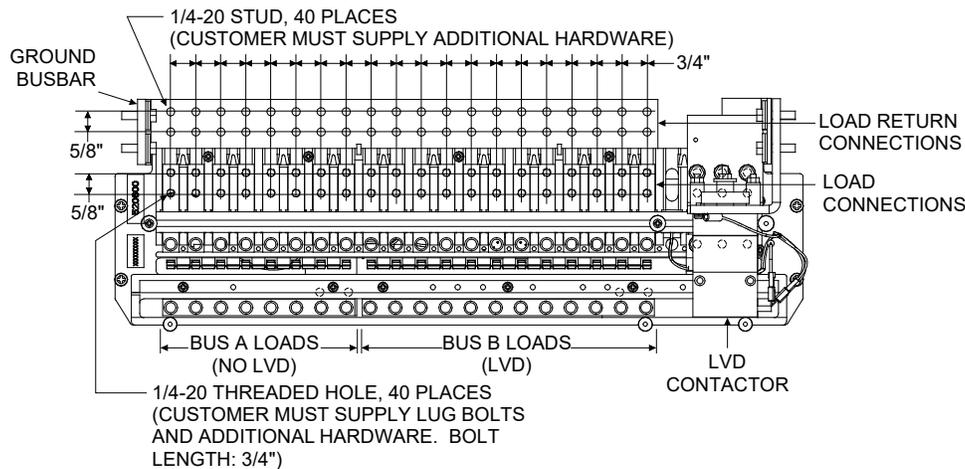
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CA: Distribution Bus Module (P/N 509848) (20) Fuse/Circuit Breaker System Positions w/LVLD

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

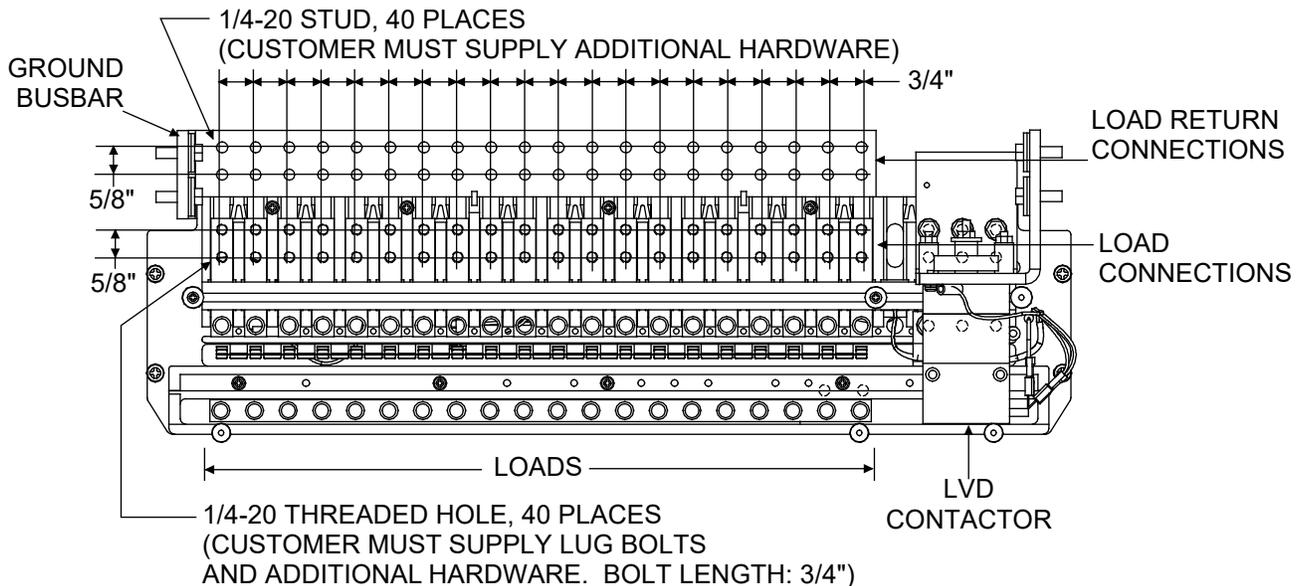
Circuit breakers with greater than 100 ampere rating occupy two mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CB: Distribution Bus Module (P/N 513738)

#### (3) GJ/218 Circuit Breaker System Positions w/LVLD

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type) **NOTE RESTRICTIONS**
- ◆ Low Voltage Load Disconnect Contactor

#### Restrictions

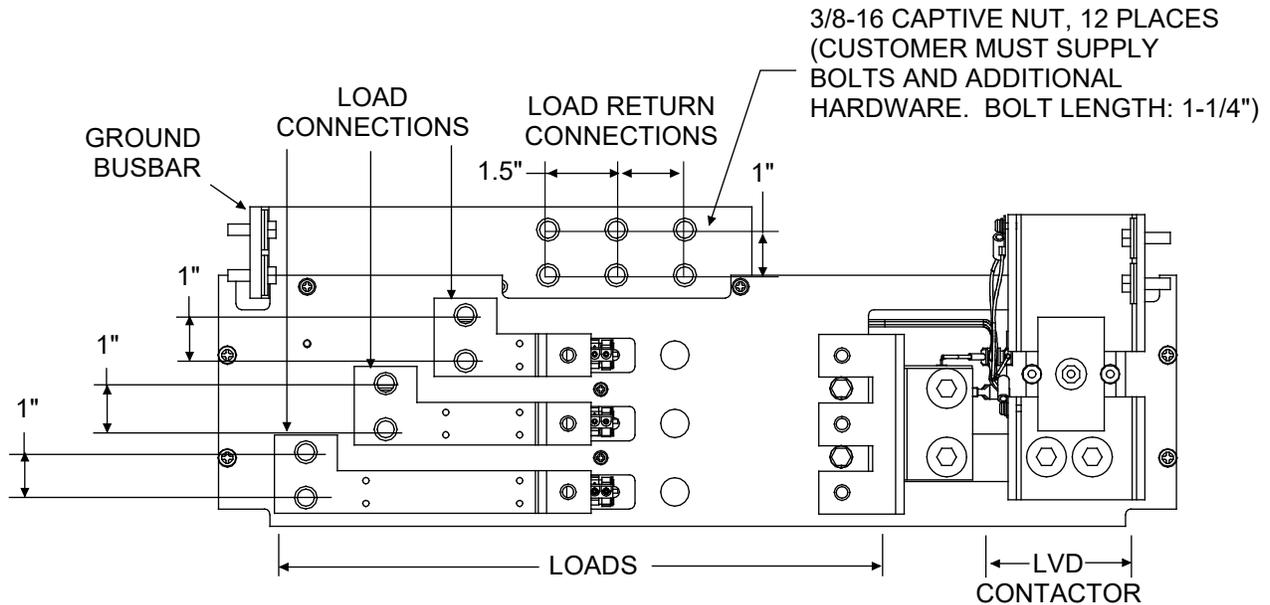
Can be installed in any bus position A-C (row 1-3) of a 1-, 2-, 3-, or 4-bus row cabinet. Cannot be installed in bus position D (row 4) of a four-bus row cabinet. See also [List CD](#) for similar application in bus position D (row 4).

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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CD: Distribution Bus Module (P/N 507200) (3) GJ/218 Circuit Breaker System Positions w/LVLD

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (3) Load Distribution Circuit Breaker Mounting Positions (100 to 600A GJ/218-Type) **NOTE RESTRICTIONS.**
- ◆ Low Voltage Load Disconnect Contactor

#### Restrictions

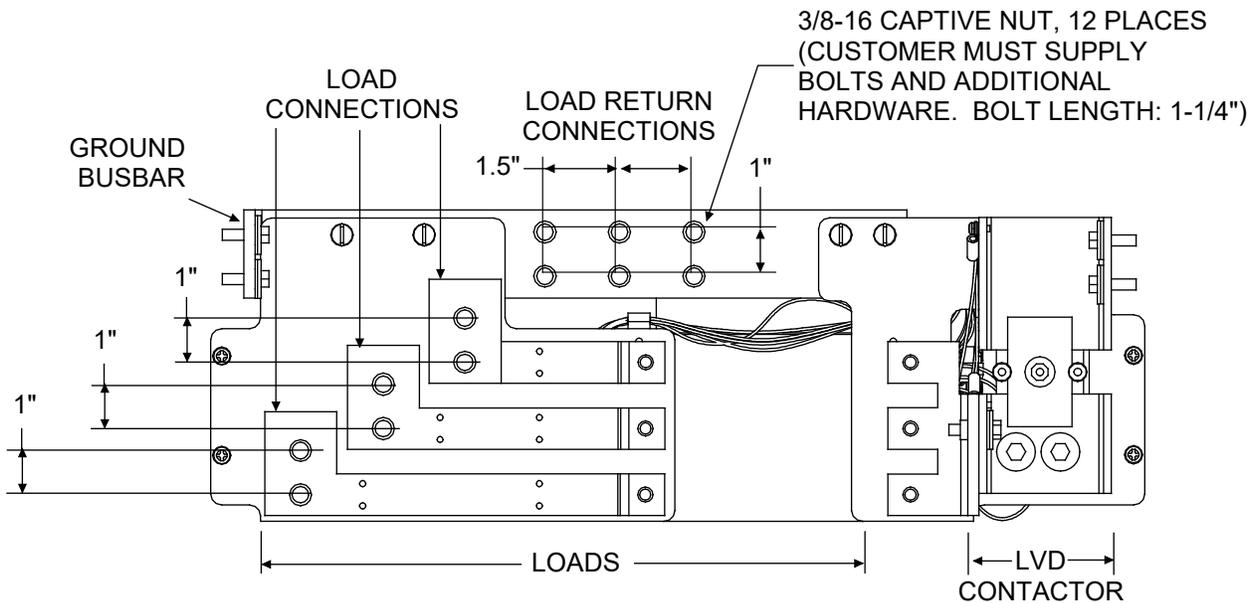
For use in a 4-bus row cabinet only. Must be installed in bus position D (row 4). See also [List CB](#) for similar application in bus positions A-C (rows 1-3).

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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CE: Distribution Bus Module (P/N 509564)

#### (8) GJ/218 Circuit Breaker System Positions w/LVLD (Upper Two Rows)

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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).

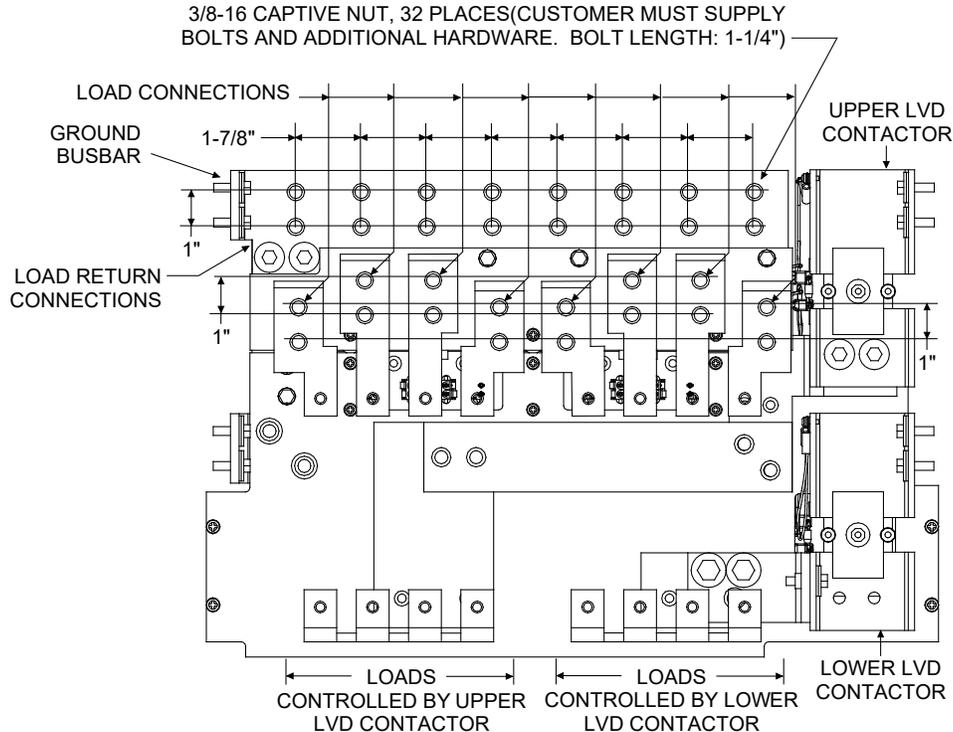
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

- (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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CF: Distribution Bus Module (P/N 509647)

#### (8) GJ/218 Circuit Breaker System Positions w/LVLD (Lower Two Rows)

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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).

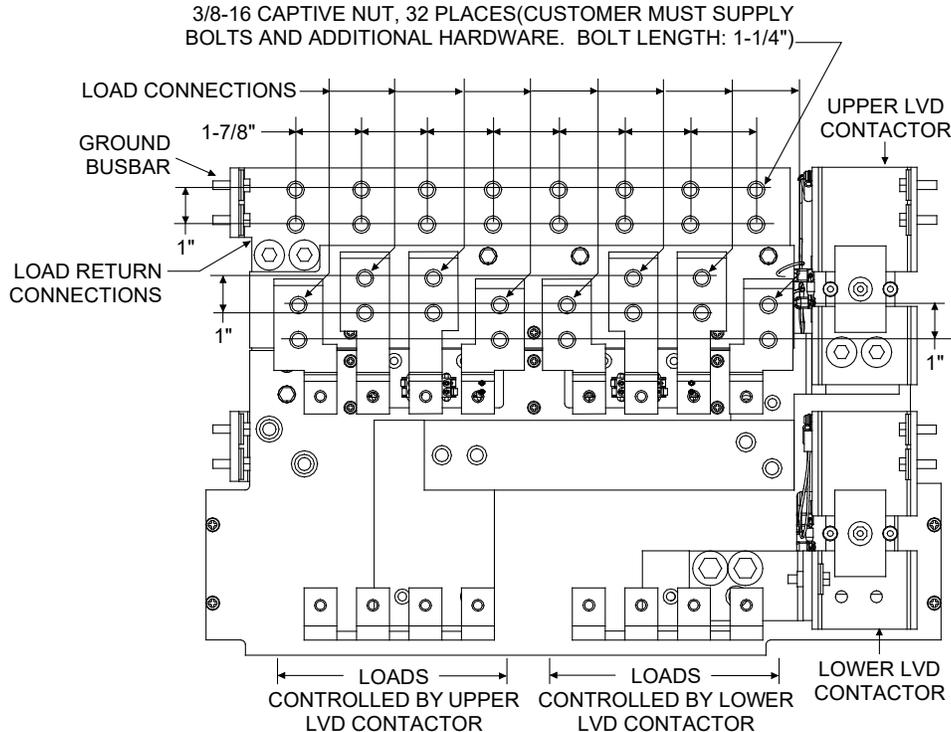
Panel is designed to mount circuit breakers in the following possible combinations **per side**:

- (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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CG: Distribution Bus Module (P/N 514035)

#### (2) TPH Distribution Fuse Positions w/LVLD

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (2) Distribution Fuse Mounting Positions (70 to 600A TPH-Type)
- ◆ Low Voltage Load Disconnect Contactor

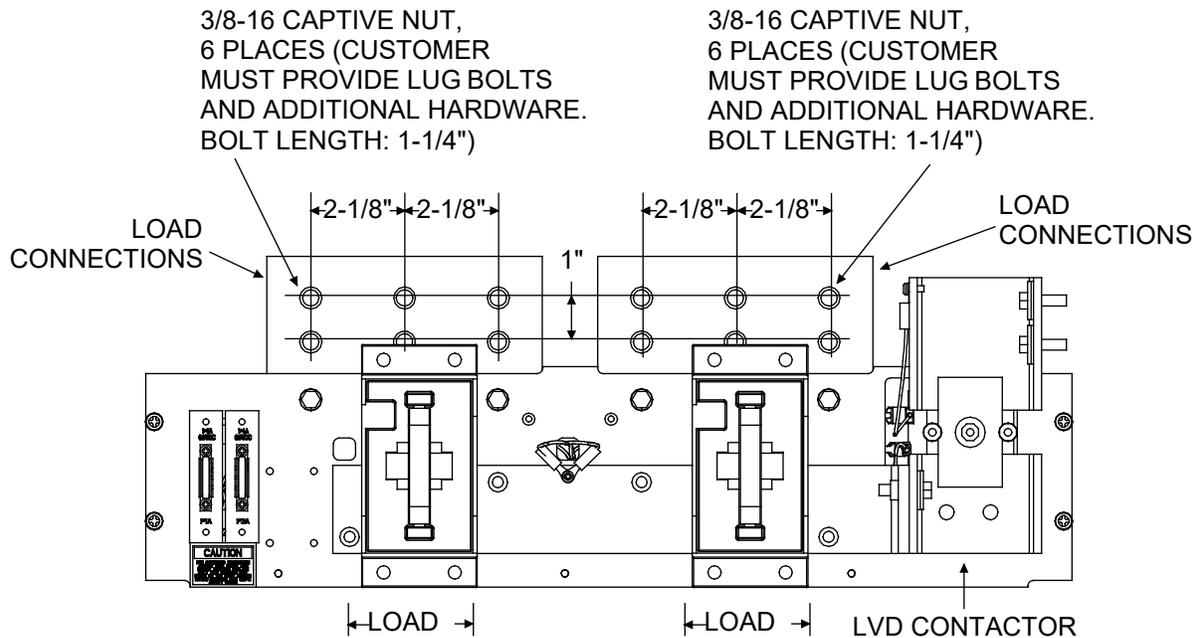
##### Restrictions

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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List CJ: Distribution Bus Module (P/N 520936)

#### (2) TPH Distribution Fuse Positions with Load Metering Shunts and LVL

##### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.
- ◆ Low Voltage Load Disconnect Contactor

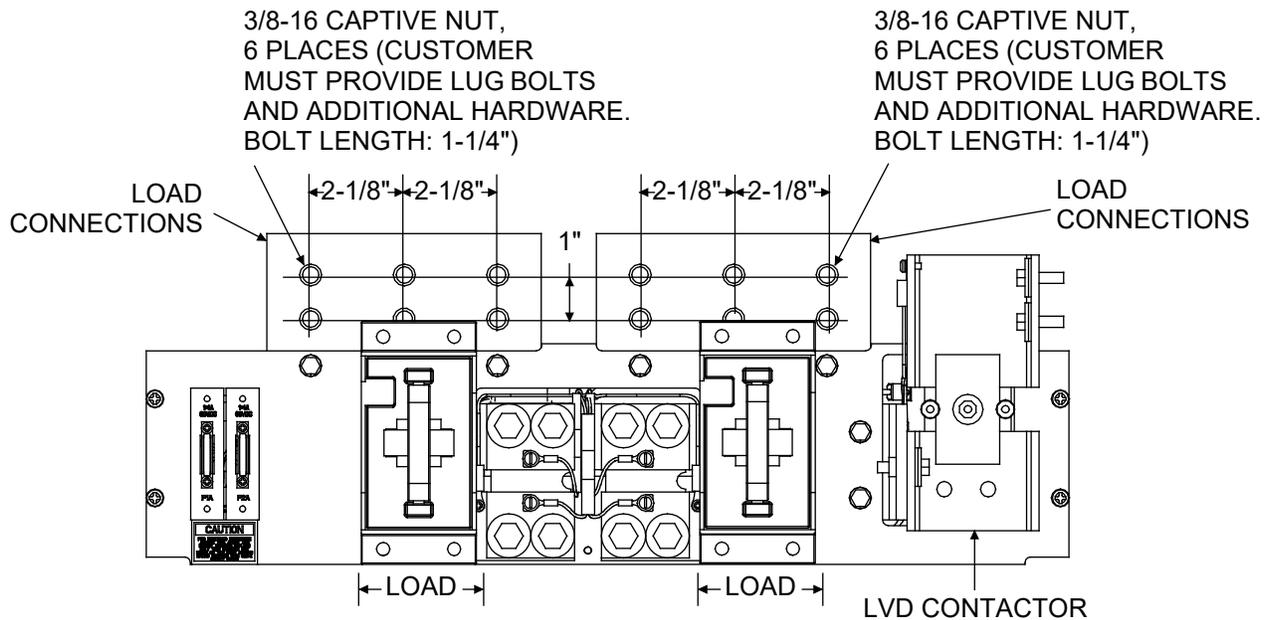
##### Restrictions

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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### 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 (+24V)
- ◆ 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 second row of a 3-bus row cabinet in List 1 if used with List 2.

**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.

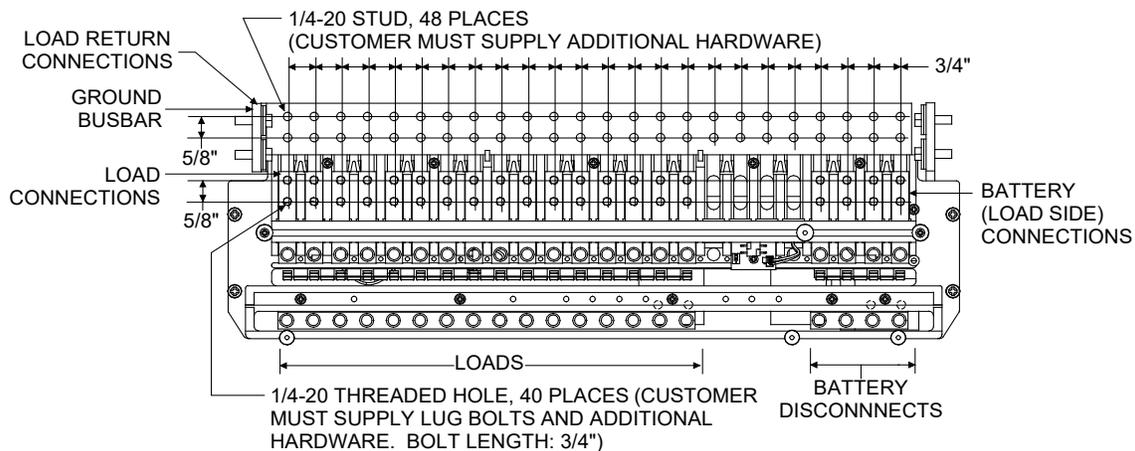
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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 513806)**

**(8) Fuse/Circuit Breaker System Positions w/LVD and (1) TPH Fuse Battery Disconnect Position**

**Features**

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

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.

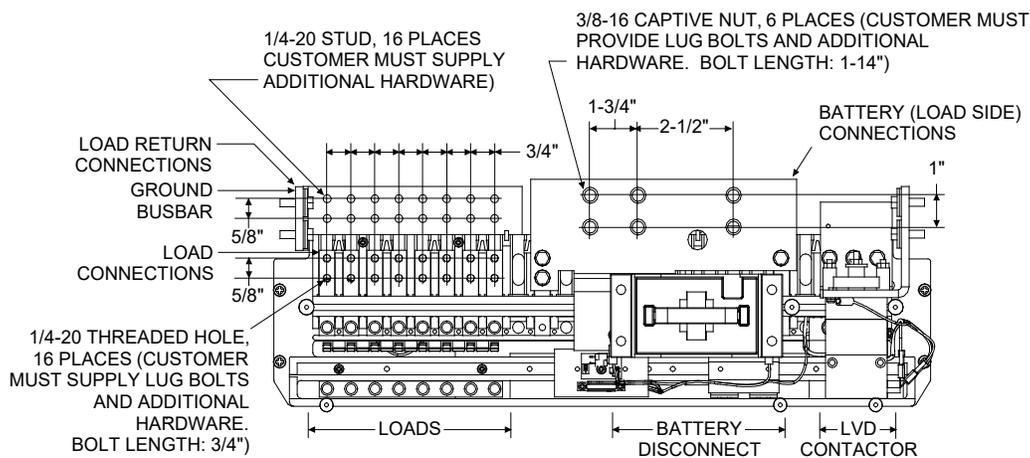
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List JA: Distribution Bus Module (Part No. 509906)

#### (4) +24V Fuse/Circuit Breaker System Positions and

#### (16) -48V Fuse/Circuit Breaker Subsystem Positions

#### Features

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 500A Maximum Total Capacity, 200A Maximum -48V Subsystem Capacity
- ◆ (4) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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](#), [BA](#), [CA](#), [CF](#), [EA](#), [NA](#), [NB](#), [RA](#), or [RB](#). If ordering more than one ([List 60](#), List JA must be installed in bus position A (row 1) of the distribution 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.

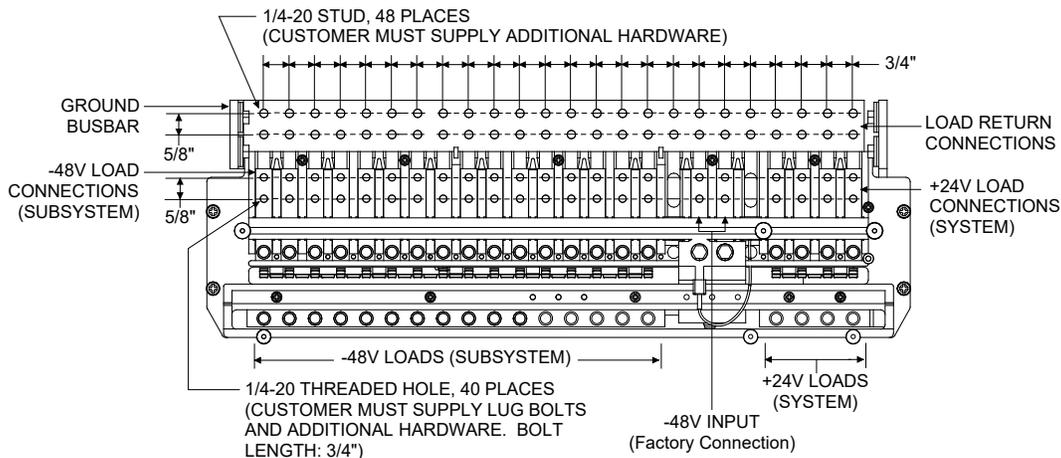
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List JB: Distribution Bus Module (Part No. 513808) (12) +24V Fuse/Circuit Breaker System Positions and (8) -48V Fuse/Circuit Breaker Subsystem Positions

#### Features

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 500A Maximum Total Capacity, 200A Maximum -48V Subsystem Capacity
- ◆ (12) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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](#), [BA](#), [CA](#), [CF](#), [EA](#), [GB](#), [NA](#), [NB](#), [RA](#), or [RB](#). If ordering more than one ([List 60](#), List JB must be installed in bus position A (row 1) of the distribution 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.

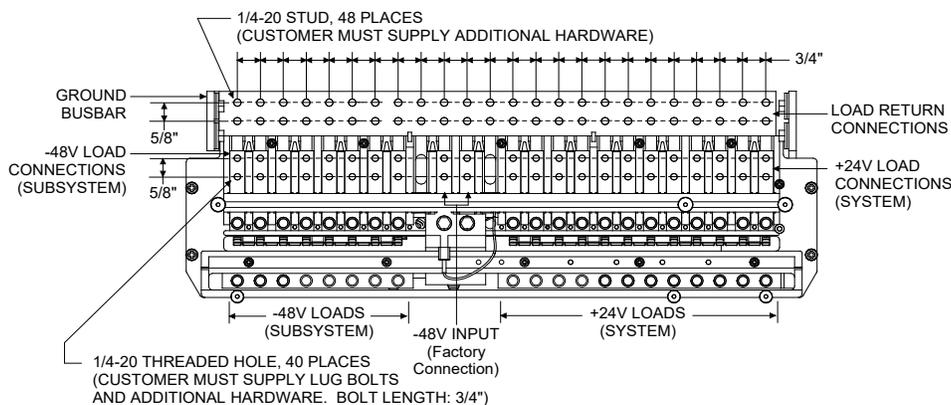
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List JC: Distribution Bus Module (Part No. 524403) (14) +24V Fuse/Circuit Breaker System Positions and (6) -48V Fuse/Circuit Breaker Subsystem Positions

#### Features

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 500A Maximum Total Capacity, 200A Maximum -48V Subsystem Capacity
- ◆ (14) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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](#), [BA](#), [CA](#), [CF](#), [EA](#), [GB](#), [NA](#), [NB](#), [RA](#), or [RB](#). If ordering more than one (1) [List 60](#), List JC must be installed in bus position A (row 1) of the distribution 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.

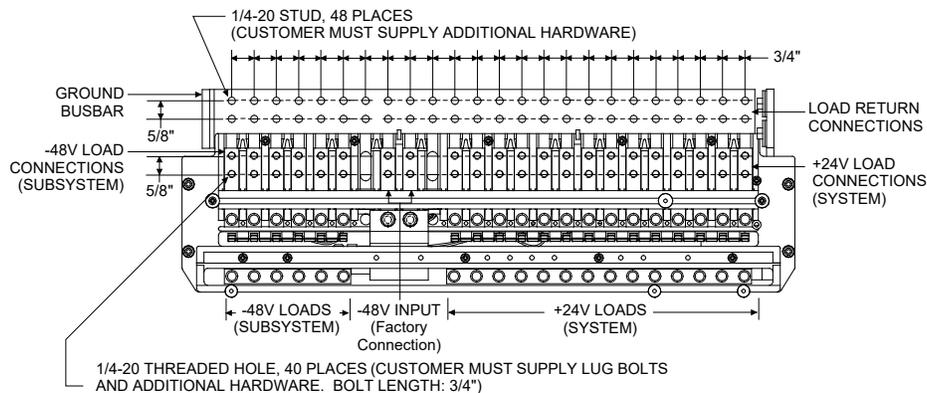
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

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

#### Features

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 500A Maximum Total Capacity, 200A Maximum -48V Subsystem Capacity
- ◆ (14) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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](#), [BA](#), [CA](#), [CF](#), [EA](#), [GB](#), [NA](#), [NB](#), [RA](#), or [RB](#). If ordering more than one (1) [List 60](#), List JD must be installed in bus position A (row 1) of the distribution 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.

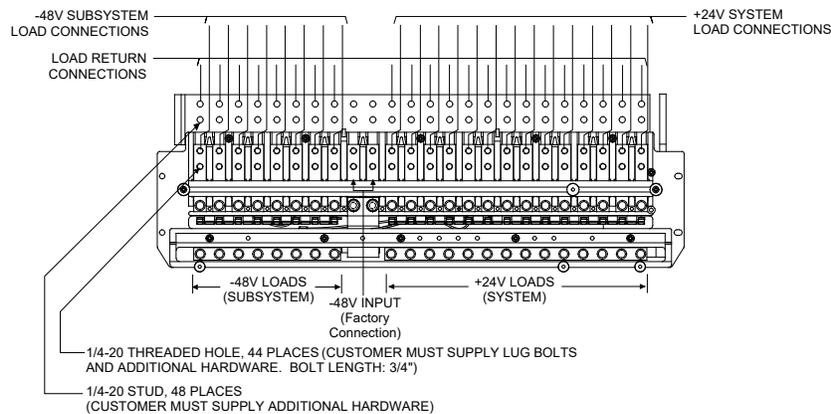
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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. 520507)**  
**(4) +24V Fuse/Circuit Breaker System Positions and**  
**(16) -48V Fuse/Circuit Breaker Subsystem Positions**

**Features**

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 320A Maximum +24V System bus capacity, 480A Maximum -48V Subsystem bus capacity.
- ◆ (4) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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.

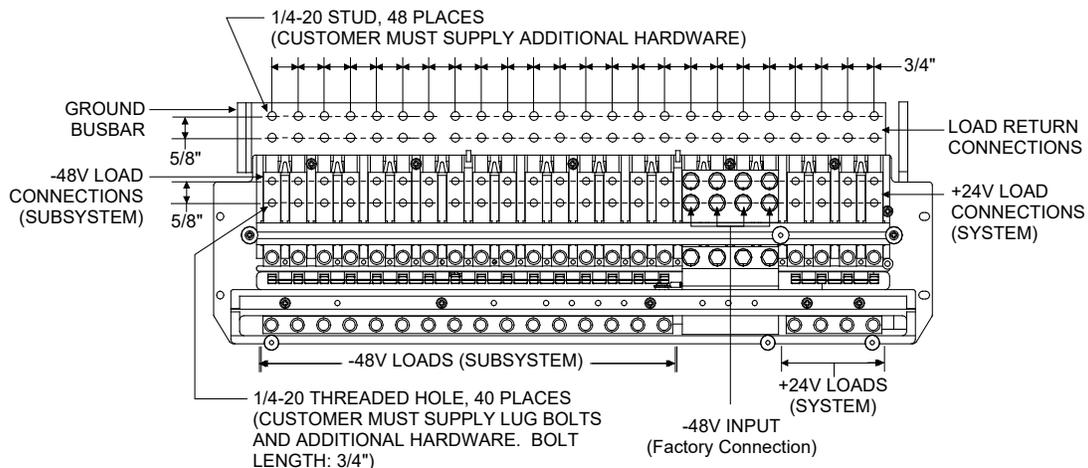
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List LB: Distribution Bus Module (Part No. 513807)

#### (8) +24V Fuse/Circuit Breaker System Positions w/LVD and

#### (8) -48V Fuse/Circuit Breaker Subsystem Positions

#### Features

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 500A Maximum Total Capacity, 200A Maximum -48V Subsystem Capacity
- ◆ (8) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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](#), [BA](#), [CA](#), [CF](#), [EA](#), [GB](#), [NA](#), [NB](#), [RA](#), or [RB](#). If ordering more than one (1) [List 60](#), List LB must be installed in bus position A (row 1) of the distribution 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.

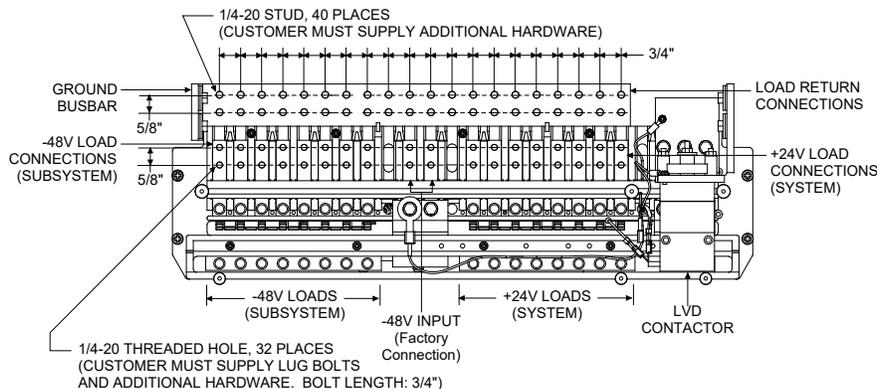
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List LC: Distribution Bus Module (Part No. 514623) (12) +24V Fuse/Circuit Breaker System Positions w/LVD and (4) -48V Fuse/Circuit Breaker Subsystem Positions

#### Features

- ◆ Dual Voltage Distribution (+24V and -48V)
- ◆ 500A Maximum Total Capacity, 200A Maximum -48V Subsystem Capacity
- ◆ (12) Load Distribution Fuse / Circuit Breaker Mounting Positions (+24V 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 (-48V 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 ([List 1](#)) 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](#), [BA](#), [CA](#), [CF](#), [EA](#), [GB](#), [NA](#), [NB](#), [RA](#), or [RB](#). If ordering more than one (1) [List 60](#), List LC must be installed in bus position A (row 1) of the distribution 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.

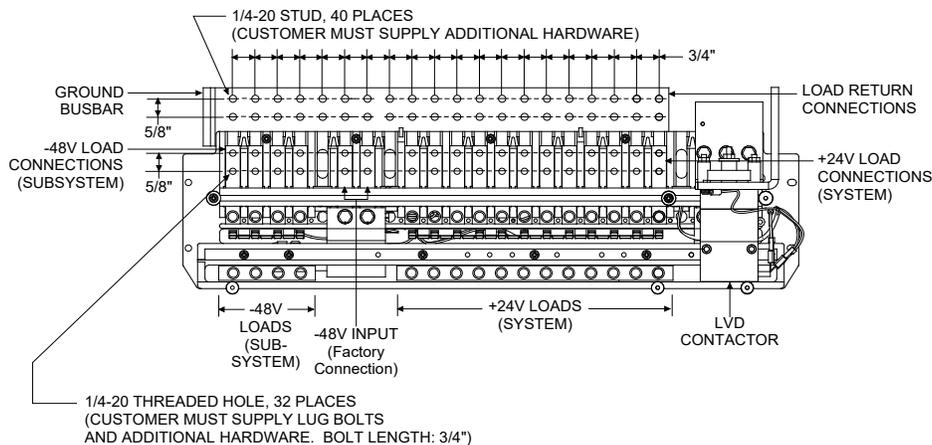
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List NA: Distribution Bus Module (P/N 514336)

#### (20) Fuse/Circuit Breaker Battery Disconnect Positions

#### Features

- ◆ Single Voltage Distribution (+24V)
- ◆ 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.

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.

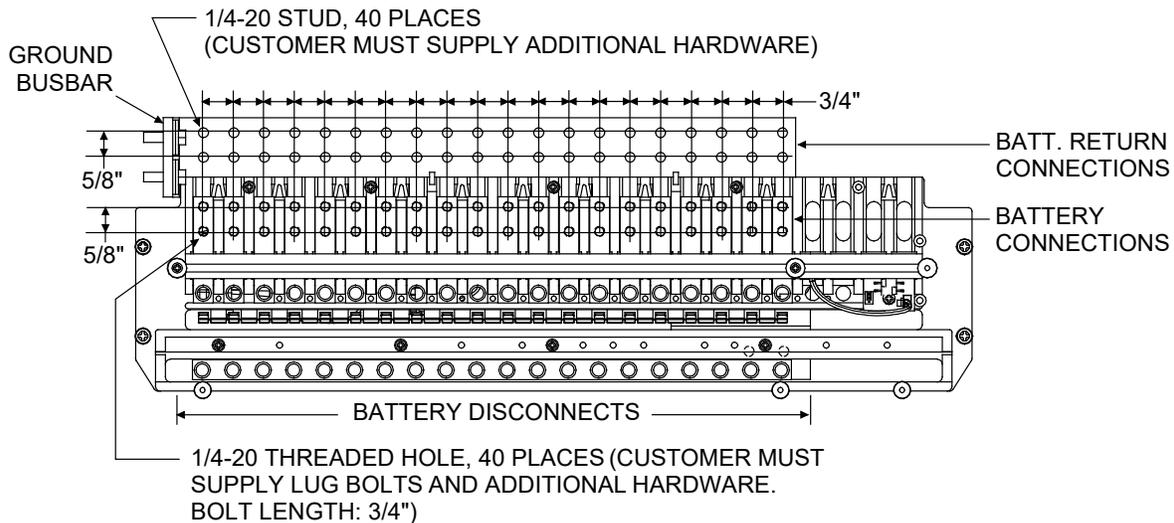
125A, 150A, 175A, and 200A circuit breakers occupy two mounting positions. 225A and 250A circuit breakers occupy three mounting positions.

**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](#) and [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 NC: Distribution Bus Module (P/N 514025)**

**(1) TPH Fuse Battery Disconnect Position**

**Features**

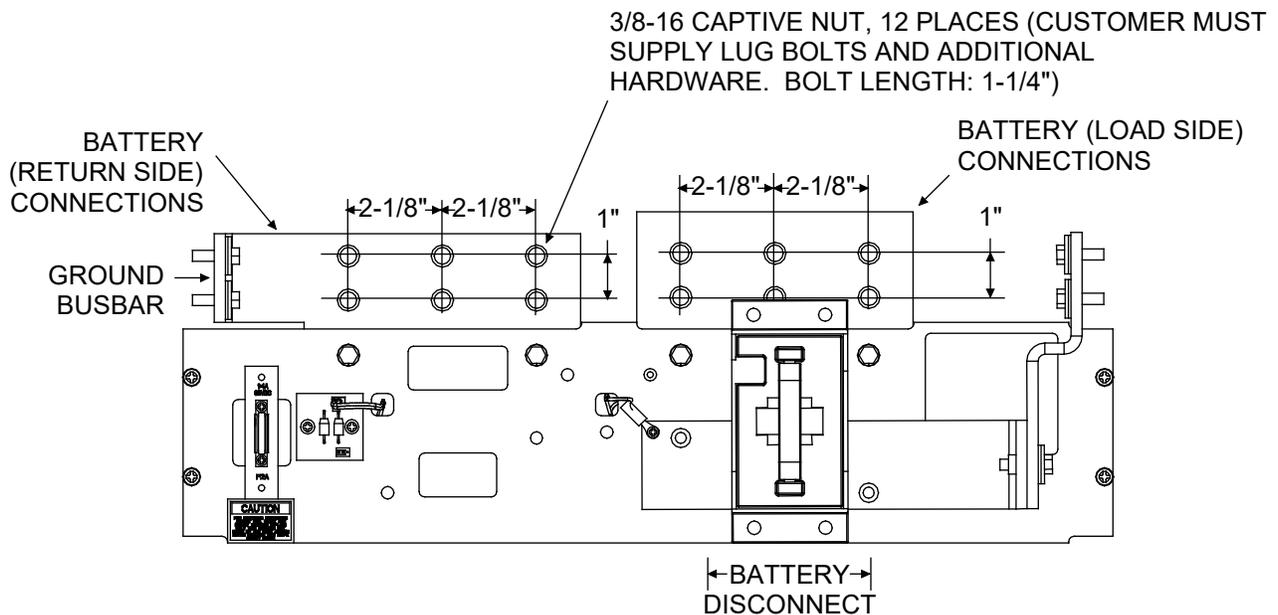
- ◆ Single Voltage Distribution (+24V)
- ◆ 500A Maximum Capacity
- ◆ (1) Battery Disconnect Fuse Mounting Position (70 to 600A TPH-Type)

**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**

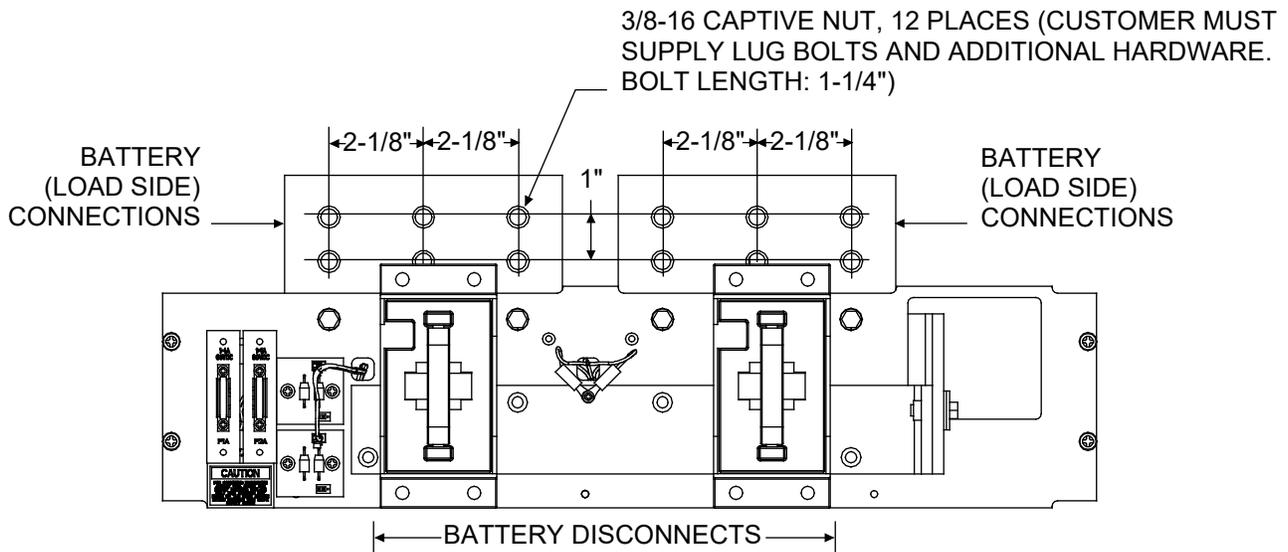
- ◆ Single Voltage Distribution (+24V)
- ◆ 960A Maximum Capacity
- ◆ (2) Battery Disconnect Fuse Mounting Positions (70 to 600A TPH-Type)

**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.

**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](#).



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List RA: 1200A Low Voltage Battery Disconnect (LVBD) Contactor and Control Circuit (P/N 540808)

#### Features

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

#### Restrictions

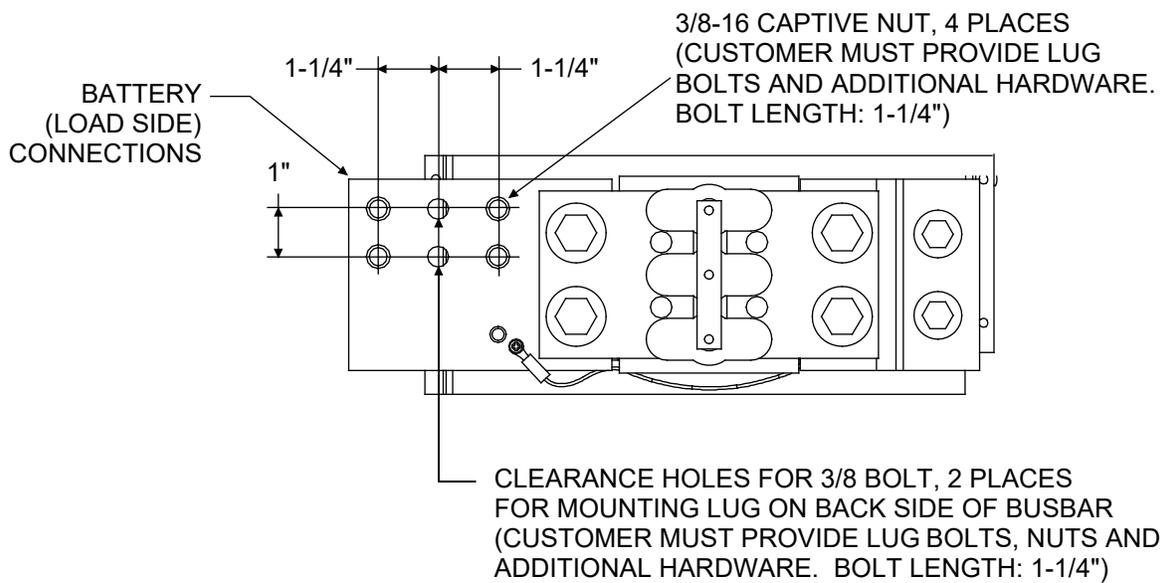
Limit one bus arrangement of this type per System.

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

**Cannot** be used 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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### List RB: 1200A Manual Battery Disconnect Contactor with Local and Remote Alarm (P/N 540809)

#### 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

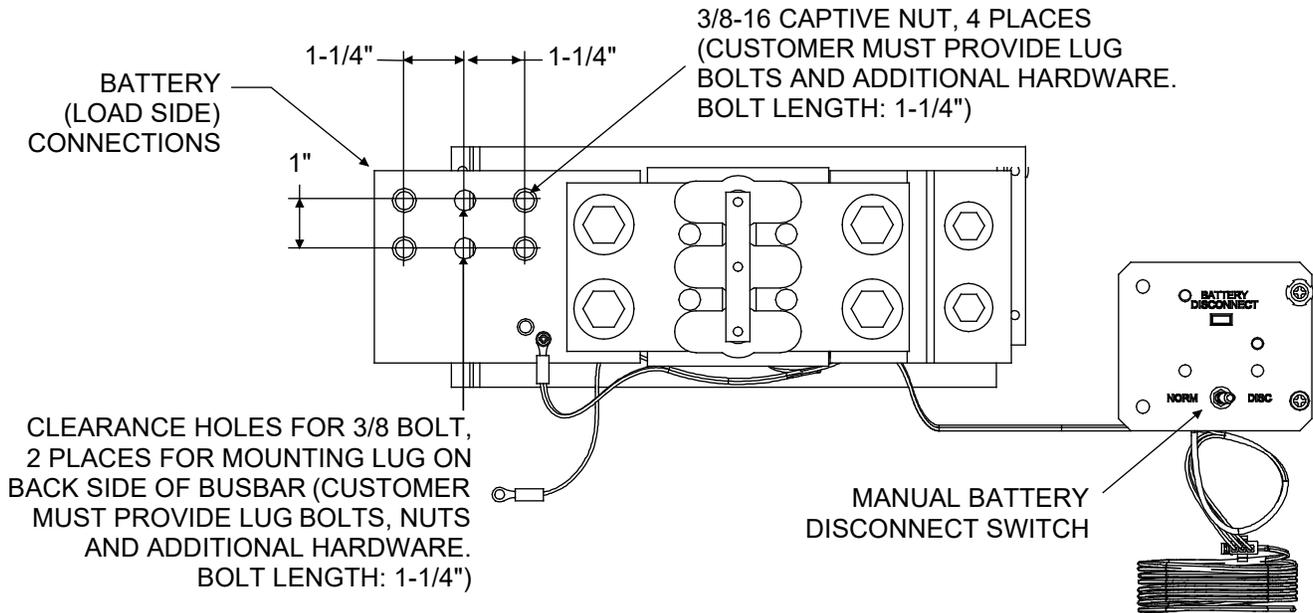
Limit one bus arrangement of this type per System.

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

**Cannot** be used 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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### 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.

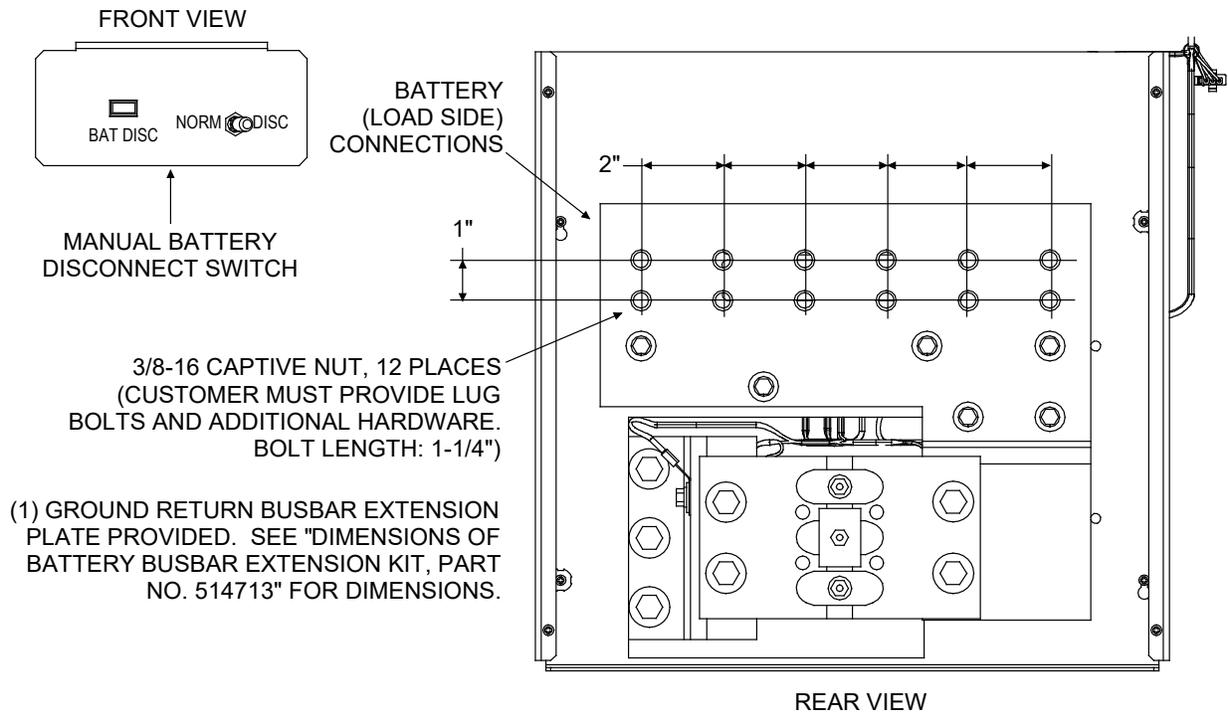
**Cannot** be used if List 1 is used with List 2. (**Can** be used if List 1 is used alone or with List 5.)

**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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### 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.

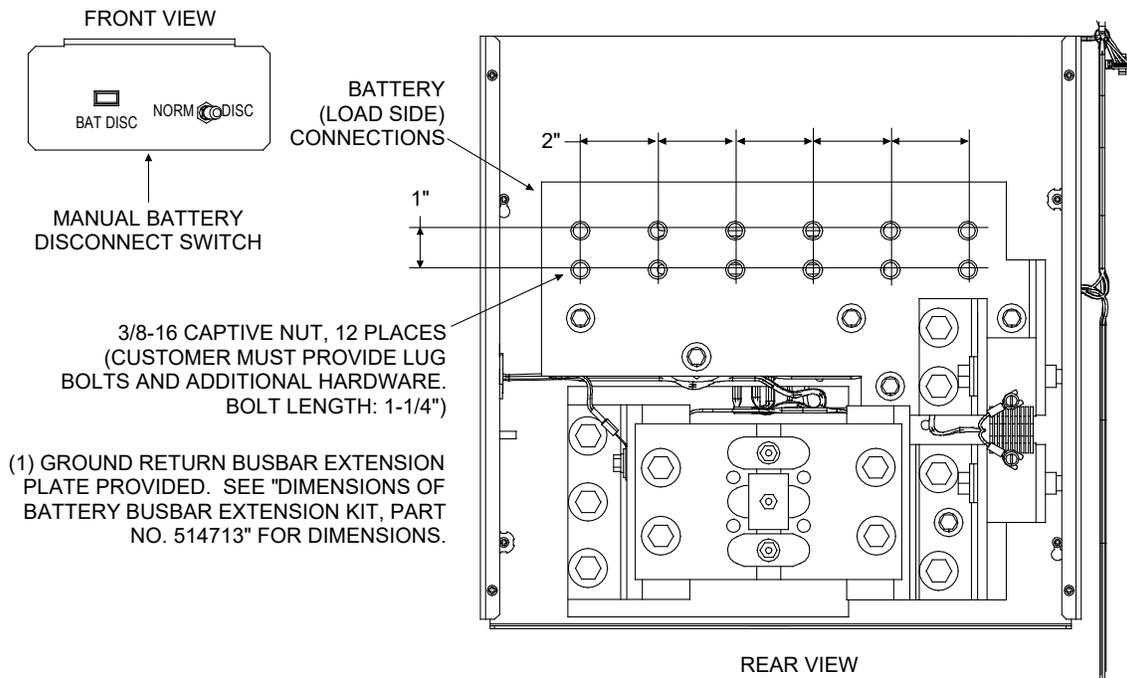
**Cannot** be used if List 1 is used with List 2. (**Can** be used if List 1 is used alone or with List 5.)

**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.



# NetSure™ 700NVBA DC Power System

## System Application Guide

### 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.

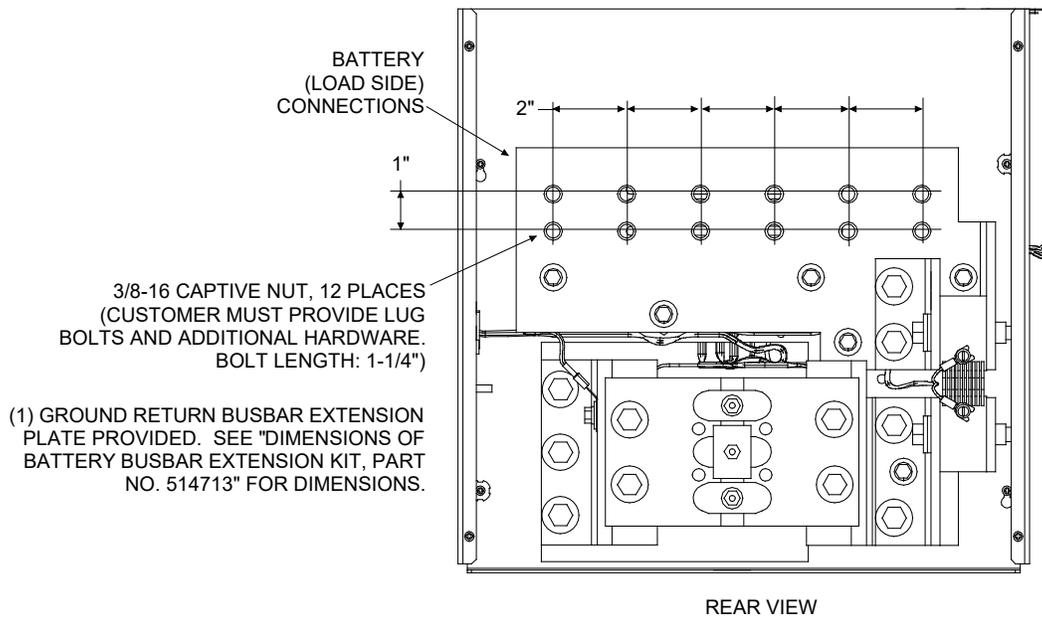
**Cannot** be used if List 1 is used with List 2. (**Can** be used if List 1 is used alone or with List 5.)

**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.

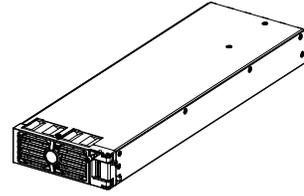


## ACCESSORY DESCRIPTIONS

### **1R242500: Rectifier Module (PCU)**

#### **Features**

- ◆ Provides one (1) Model R24-2500, Spec. No. 1R242500, 2500-watt / 24-volt Rectifier Module (PCU).
- ◆ Refer to UM1R243000 (Rectifier User Instructions) for more information.



#### **Restrictions**

For use in Spec. No. 588705100, 588705101, 588705102, 588705103, or 588705104 Module Mounting Assemblies.

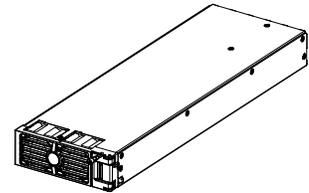
#### **Ordering Notes**

- 1) Order as required.

### **1R243000: High Efficiency Rectifier Module**

#### **Features:**

- ◆ Provides one (1) Model R24-3000, Spec. No. 1R243000, 3000-watt / 24-volt High Efficiency Rectifier Module.
- ◆ Refer to UM1R243000 (Rectifier User Instructions) for more information.



#### **Restrictions**

For use in Spec. No. 588705100, 588705101, 588705102, 588705103, or 588705104 Module Mounting Assemblies.

The 1R243000 Rectifier Module is compatible only in systems that have version 2.1.0 or above software installed on the Rectifier Shelf Interface Circuit Card (P/N 535250). Systems manufactured after 02/09/2010 have version 2.1.0 or greater software installed on the Rectifier Shelf Interface Circuit Card (P/N 535250). Refer to Application Note AN41 for a procedure to determine the version of software installed in your system and what to do if your system does not have version 2.1.0 or greater software.

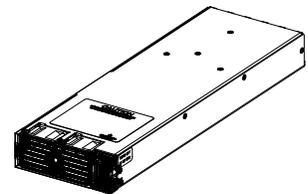
#### **Ordering Notes:**

- 1) Order by P/N (1R243000) as required.

### **1C24481500: DC-DC Converter Module**

#### **Features**

- ◆ Provides one (1) Model C24/48-1500, DC-DC Converter Module.
- ◆ Refer to Power Data Sheet UM1C24481500 (Converter User Instructions) for more information.



#### **Restrictions**

For use in Spec. No. 588705100, 588705101, 588705102, 588705103, or 588705104 Module Mounting Assemblies.

Requires [List 60](#). Note that List 60 is furnished in 581126000 List 31 and does not need to be ordered separately.

Supplemental Bays CANNOT have Converter Modules.

#### **Ordering Notes**

- 1) Order as required. Each 8-position Module Mounting Shelf holds up to four (4) DC-DC Converter Modules when equipped with a DC-DC Converter Option Kit.

# NetSure™ 700NVBA DC Power System

## System Application Guide

### Relay Racks

#### Features

- ◆ The system is factory mounted to the relay rack specified when ordered.
- ◆ Relay racks (except 541340) are 23" standard mounting with 3" deep uprights. 541340 is 23" standard mounting with 6" deep upright.
- ◆ 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.

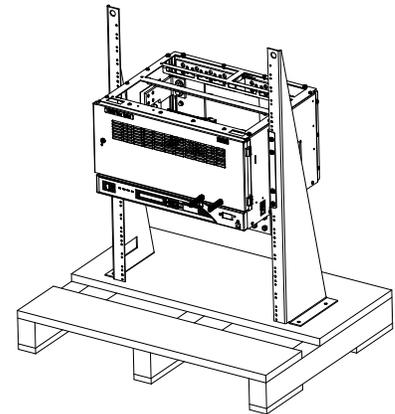
Part Number	Size	Available Mounting Positions (1RU = 1-3/4")	Notes
543151	25.656"H x 24.376"W x 15"D	13RU	Welded (Notes 1, 3)
543152	27.406"H x 24.376"W x 15"D	14RU	Welded (Notes 1, 3)
543153	36.156"H x 24.376"W x 15"D	19RU	Welded (Notes 1, 3)
543154	39.656"H x 24.376"W x 15"D	21RU	Welded (Notes 1, 3)
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
543151	25.656"H x 24.376"W x 15"D	13RU	Welded (Notes 1, 3)
541340	7'0"H x 25.00"W x 18" 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

# NetSure™ 700NVBA DC Power System

## System Application Guide

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

#### **Features**

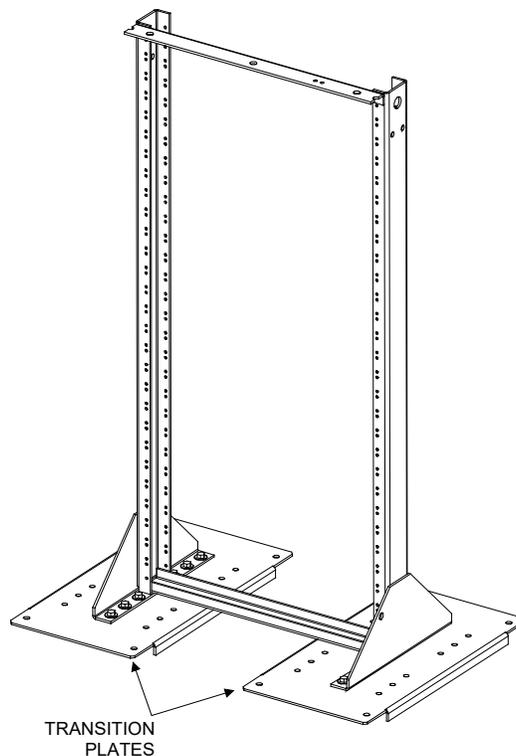
- ◆ Transition Plate Kits can be ordered to mount relay rack P/Ns 543151, 543152, 543153, 543154, 543155, 543156, and 543157 on top of GNB Absolyte IIP Battery Stands.
- ◆ Each kit consists of two transition plates with three hole patterns and hardware (3/8") to mount the plates to the above listed relay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

#### **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 (+24V).
- ◆ 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](#), [BA](#), [CA](#), [EA](#), [GB](#), [JA](#), [JB](#), [JC](#), [JD](#), [KA](#), [LB](#), and [LC](#) Distribution Bus Module only.

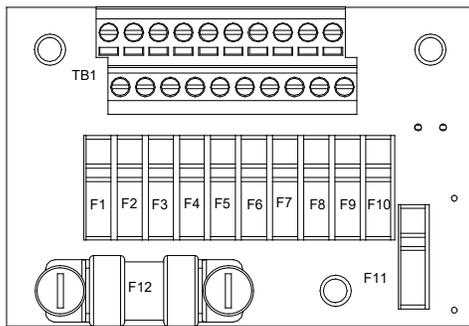
When factory-ordered, installation order of the assembly will be from top to bottom and right to left (see illustration below for 4-row example), unless otherwise specified.

**Ordering Notes**

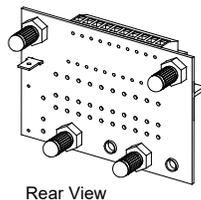
- 1) Order kit P/N 514432 as required. Provides one (1) 10-Position GMT Fuse Distribution Assembly P/N 509128, one (1) Ground Return Link, and hardware.
- 2) Order fuses as required per [Table 2 \(GMT Fuses\)](#).
- 3) Located on the P/N 509128 Assembly is an input fuse. If this fuse opens, an alarm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

Input Fuse F12: P/N 110982 (Bussmann TPS-35LB, 35A)

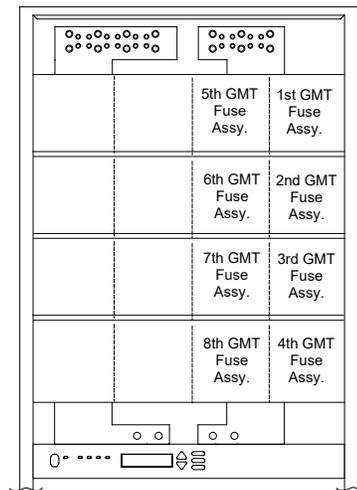
Alarm Fuse F11: P/N 248610200 (Bussmann GMT-1/4, 1/4A)



Part No. 509128



Rear View



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

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### **GMT-Type Load Distribution Fuses**

#### **Features**

- ◆ An optional “[GMT Load Distribution Fuse Block Assembly Kit](#)” (see previous section) is available for additional load distribution.

#### **Restrictions**

When used for power distribution, load should not exceed 80% of device rating, except 10 and 15 amp fuses, for which load should not exceed 70% of device rating.

#### **Ordering Notes**

- 1) Order fuses as required per [Table 2 \(GMT Fuses\)](#).

<b>Ampere Rating</b>	<b>Part Number</b>	<b>Fuse Color</b>
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

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**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	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)	1-1/3	Bussmann GMT	248610700
	F7	Not Used	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 " <a href="#">GMT Load Distribution Fuse Block Assembly Kit</a> " under ACCESSORY DESCRIPTIONS for replaceable fuses part numbers.				

Table 3  
Replaceable Alarm, Reference, and Control Fuses

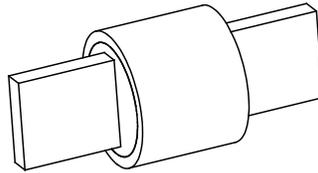
**TPH-Type Fuses**

**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	<a href="#">Table 14</a>
80	119438	
100	119440	
150	119581	
200	119582	
225	119583	
250	119584	
300	119585	
400	119586	
500	119587	
600	119588	

Table 4  
 TPH Fuses

# NetSure™ 700NVBA DC Power System

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### GJ/218-Type Circuit Breakers

#### Restrictions

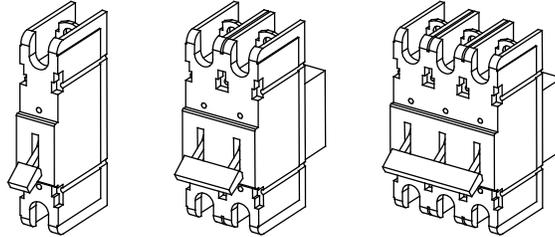
A bus arrangement must be specified that contains GJ/218-type circuit breaker positions.

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 <sup>1</sup> without Internal Shunt	P/N Electrical Trip <sup>2</sup> without Internal Shunt	P/N Electrical Trip <sup>2</sup> with Internal Shunt (25mV @ full rated load) <sup>3</sup>	P/N Electrical/Mechanical Trip <sup>1</sup> with Internal Shunt (25mV @ full rated load) <sup>3</sup>	for wire size and lug selection, refer to the following table
100	1	256621700	256621300	516184	123580	<a href="#">Table 14</a>
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	--	--	

<sup>1,2</sup> Circuit Breaker Alarm Operation:

<sup>1</sup> Provides an alarm during an electrical or manual trip condition.

<sup>2</sup> Provides an alarm during an electrical trip condition only.

<sup>3</sup> 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.

Table 5  
GJ/218 Circuit Breakers

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<b>Breaker Ampere Rating</b>	<b>Distribution Bus Module List No.</b>	<b>Breaker Jumper Kit P/N (Order 1 of the following kits for each circuit breaker W/O an internal shunt.)</b>	<b>Breaker Jumper Kit P/N (Order 1 of the following kits for each circuit breaker WITH an internal shunt.)</b>
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**

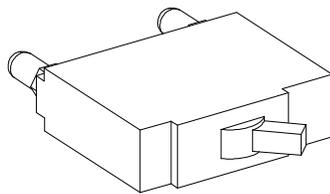
Load should not exceed 80% of device rating.

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

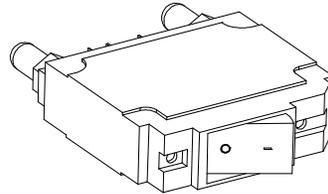
**Caution:** *A circuit breaker with a rating greater than 150 amperes SHALL HAVE an empty mounting position between it and any other overcurrent protective device.*

**Ordering Notes**

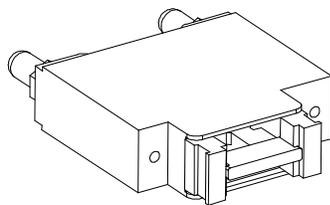
- 1) Order circuit breakers as required per [Table 7 \(Bullet Nose-Type Circuit Breakers\)](#) and [Table 8 \(Rocker Handle Bullet Nose Circuit Breakers\)](#).
- 2) Order fuses as required per [Table 9 \(Bullet Nose-Type Fuseholders and TPS/TLS Fuses\)](#). For each fuse ordered, also order one (1) P/N 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 \(Special Application Crimp Lug / Strap Combination\)](#).



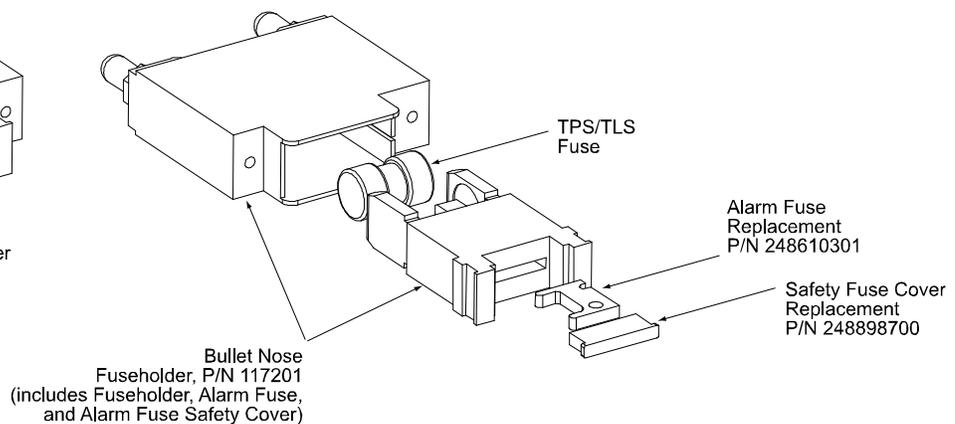
Toggle Handle Bullet Nose Circuit Breaker



Rocker Handle Bullet Nose Circuit Breaker



Bullet Nose Fuseholder



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Ampere Rating	Number of Poles (and Mounting Positions)	Part Number		for wire size and lug selection, refer to the following table
		Electrical Trip <sup>1</sup> (White Handle)	Electrical/Mechanical Trip <sup>2</sup> (Black Handle)	
1	1	102272	101596	<a href="#">Table 13</a>
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) <a href="#">P/N 514717</a> adapter kit per 225A or 250A Bullet Nose Type circuit breaker ordered. Order lugs per <a href="#">Table 12</a> .
250	3	121835	121836	

Circuit Breaker Alarm Operation:

- <sup>1</sup> Provides an alarm during an electrical trip condition only.
- <sup>2</sup> 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, 534449, 514714.

Table 7  
Toggle Handle Bullet Nose-Type 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 <sup>1</sup> (White Handle)	Electrical/ Mechanical Trip <sup>2</sup> (Black Handle)	
1	1	142856	142878	<a href="#">Table 13</a>
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) <a href="#">P/N 514717</a> adapter kit per 250A Bullet Nose Type circuit breaker ordered. Order lugs per <a href="#">Table 12</a> .

Circuit Breaker Alarm Operation:

- <sup>1</sup> Provides an alarm during an electrical trip condition only.
- <sup>2</sup> 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, 534449, 514714.

Table 8  
Rocker Handle Bullet Nose Circuit Breakers

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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	<a href="#">Table 13</a>
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

## **Wiring Components**

### **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 for installation of customer-provided two-hole lugs that have 5/8 inch centers and 1/4 inch bolt clearance holes. Customer must provide lug mounting bolts and 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](#) 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.

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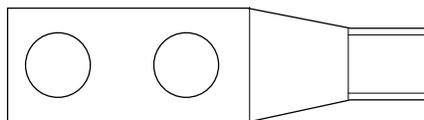
- 2) **When Distribution Bus Modules with Battery Disconnect Fuse/Circuit Breaker Positions are NOT Provided:** Battery wire size and lug requirements are determined by site requirements. For wire size and lug selection; refer to the following.

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.

- 3) 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**

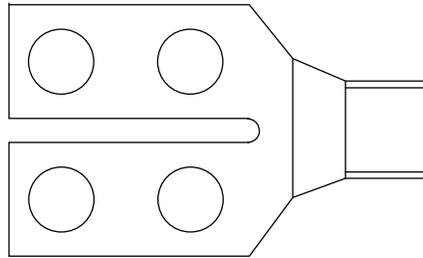
- ◆ Straps two fuseholder/circuit breaker wiring positions together, and provides a crimp-type lug which allows distribution wiring up to 350 kcmil size (maximum size of wire to be connected to a single position is 2 AWG). Designed for use with 125 ampere and larger bullet nose-type circuit breakers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

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

- <sup>1</sup> 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.
- <sup>2</sup> 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.
- <sup>3</sup> Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.
- <sup>4</sup> Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.
- <sup>5</sup> Two-hole lug, 1/4" bolt clearance hole, 5/8" centers. Refer to drawing 031110100 for lug crimping information.
- <sup>6</sup> 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

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

- <sup>1</sup> 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.
- <sup>2</sup> 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.
- <sup>3</sup> Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.
- <sup>4</sup> Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.
- <sup>5</sup> Two-hole lug, 1/4" bolt clearance hole, 5/8" centers. Refer to drawing 031110100 for lug crimping information.
- <sup>6</sup> Special application crimp lug / strap combination.
- <sup>7</sup> **MUST USE** P/N 514717 Lug Adapter Busbar for lugs having 1/4" bolt clearance hole, 5/8" centers.
- <sup>8</sup> Two-hole lug, 3/8" bolt clearance hole, 1" centers. Refer to drawing 031110100 for lug crimping information.
- <sup>9</sup> **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

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**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 <sup>(1)</sup>							
	6 AWG	4 AWG	2 AWG	1/0 AWG	2/0 AWG	3/0 AWG	4/0 AWG	250 kcmil
	Loop Length (feet) <sup>(2)</sup>							
70A	33 <sup>(3)</sup>	53 <sup>(3,4)</sup>	85 <sup>(3,4)</sup>	135 <sup>(4)</sup>	--	--	--	--
80A	--	47 <sup>(3,4)</sup>	74 <sup>(3,4)</sup>	118 <sup>(3,4)</sup>	--	--	--	--
100A	--	--	59 <sup>(3,4)</sup>	95 <sup>(3,4)</sup>	119 <sup>(3,4)</sup>	--	--	--
125A	--	--	47 <sup>(3)</sup>	76 <sup>(3,4)</sup>	95 <sup>(3,4)</sup>	120 <sup>(4)</sup>	--	--
150A	--	--	--	63 <sup>(3,4)</sup>	79 <sup>(3,4)</sup>	100 <sup>(3,4)</sup>	--	--
175A	--	--	--	--	68 <sup>(3,4)</sup>	86 <sup>(3,4)</sup>	108 <sup>(3,4)</sup>	--
200A	--	--	--	--	--	75 <sup>(3,4)</sup>	95 <sup>(3,4)</sup>	112 <sup>(3,4)</sup>
Recommended Crimp Lug <sup>(5)</sup>								
Lug	245349900	245350000	245348200	245347100	245347200	245347300	245347400	245347500

- <sup>1</sup> 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.
- <sup>2</sup> 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.
- <sup>3</sup> Wire Size / Loop Length Combination Calculated using 30°C Ambient Operating Temperature.
- <sup>4</sup> Wire Size / Loop Length Combination Calculated using 40°C Ambient Operating Temperature.
- <sup>5</sup> 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**

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Fuse/ Circuit Breaker Amperage	Recm 90°C Wire Size <sup>(1)</sup>							
	2/0 AWG	3/0 AWG	4/0 AWG	250 kcmil	300 kcmil	350 kcmil	400 kcmil	500 kcmil
	Loop Length (feet) <sup>(2)</sup>							
225A	--	67 <sup>(3)</sup>	84 <sup>(3, 4)</sup>	100 <sup>(3, 4)</sup>	120 <sup>(4)</sup>	--	--	--
250A	--	--	76 <sup>(3)</sup>	90 <sup>(3, 4)</sup>	108 <sup>(3, 4)</sup>	126 <sup>(4)</sup>	--	--
300A	159 <sup>(4)</sup> (2) Wires	--	--	--	90 <sup>(3)</sup>	105 <sup>(3, 4)</sup>	120 <sup>(3, 4)</sup>	--
400A	--	75 <sup>(3, 4)</sup> (2) Wires	95 <sup>(3, 4)</sup> (2) Wires	112 <sup>(3, 4)</sup> (2) Wires	--	--	--	--
500A	--	--	76 <sup>(3)</sup> (2) Wires	90 <sup>(3, 4)</sup> (2) Wires	108 <sup>(3, 4)</sup> (2) Wires	126 <sup>(4)</sup> (2) Wires	--	--
600A	--	--	--	--	90 <sup>(3)</sup> (2) Wires	105 <sup>(3, 4)</sup> (2) Wires 157 <sup>(4)</sup> (3) Wires	120 <sup>(3, 4)</sup> (2) Wires	--
Recommended Crimp Lug <sup>(5)</sup>								
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

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### AC Input Branch Circuit Protection and Wire Size Selection

Refer to PD588705100/PD588705101/PD588705102/PD588705103/PD588705104.

### Relay Rack Frame Grounding Requirements

#### Ordering Notes

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

A customer's grounding network lead can be attached to the top of 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 9 for lug selection.

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

#### Features

- External alarm, reference, and control connection points are located on...
  - J1-J4 on the optional [List 71](#) Audible Alarm and Alarm Termination Circuit Card P/N 509539,
  - 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](#)" under PHYSICAL SIZE INFORMATION for illustration.

J1-J4 on Optional List 71 Audible Alarm and Alarm Termination Circuit Card P/N 509539		
Terminals		Recm Wire Size
Capacity	Type	
26 to 16 AWG	Spring-Clamp	22 AWG for Loop Lengths Up to 200 ft. 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. 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. 18-20 AWG for Loop Lengths Over 200 ft.

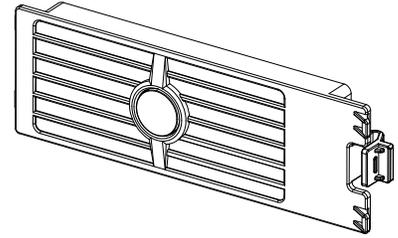
**Module Mounting Position Blank Cover Panel (P/N 540959)**

**Features**

- ◆ Covers one (1) unused module mounting position.

**Ordering Notes**

- 1) Order a Module Mounting Position Blank Cover Panel, P/N 540959, for each empty 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. Refer to PD588705100/PD588705101/PD588705102/PD588705103/PD588705104 for complete specifications.

**Ordering Notes**

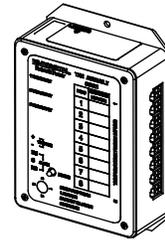
- 1) Order one Battery Charge Temperature Compensation Probe per power system, as required.

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

**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 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.



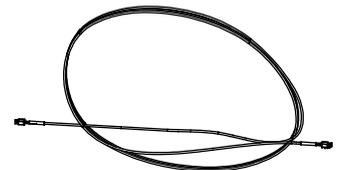
521211

**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.

# NetSure™ 700NVBA DC Power System

## System Application Guide

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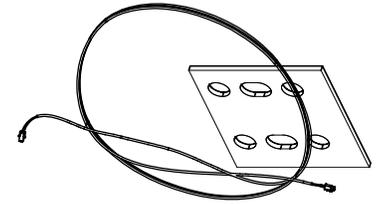
### **TXM Extension Cable (P/N 514153)**

#### **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.

#### **Ordering Notes**

- 1) See above Ordering Notes.

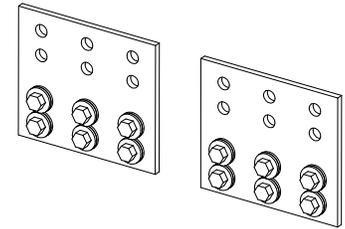


514153

### **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 for a dimensional drawing.



#### **Restrictions**

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

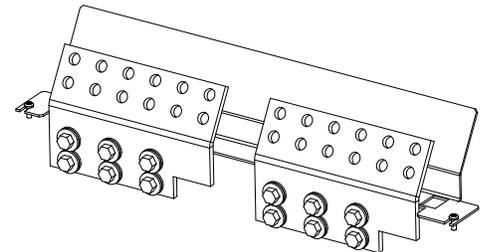
#### **Ordering Notes**

- 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 for a dimensional drawing.



#### **Restrictions**

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

#### **Ordering Notes**

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

### **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.

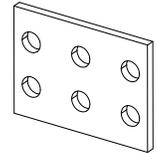
#### **Ordering Notes**

- 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.



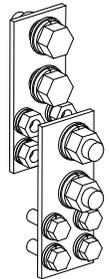
**Ordering Notes**

- 2) Order one (1) P/N 514717 per 225-250A 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.



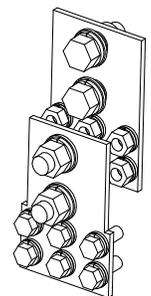
**Ordering Notes**

- 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.

**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. 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.

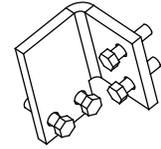
**Ordering Notes**

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

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

**Features**

- ◆ Designed for field installation in a bullet nose type distribution bus assembly 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, GB, LB, or LC.



Kit P/N 514910

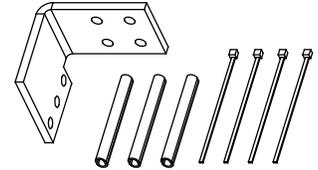
**Restrictions**

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

**Optional Front Battery Cover Kits**

**Features**

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

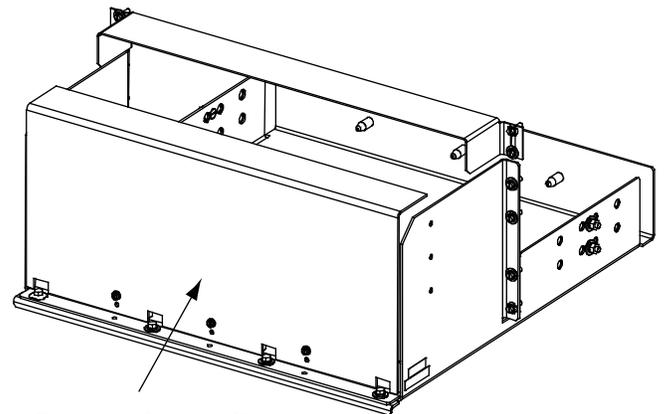
**Restrictions**

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 Battery Cover

**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.

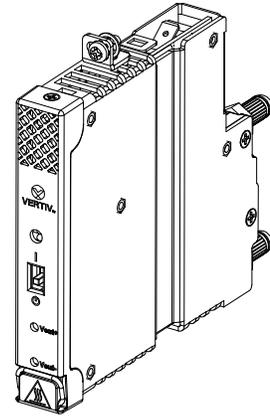
**Restrictions**

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 581126000 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>



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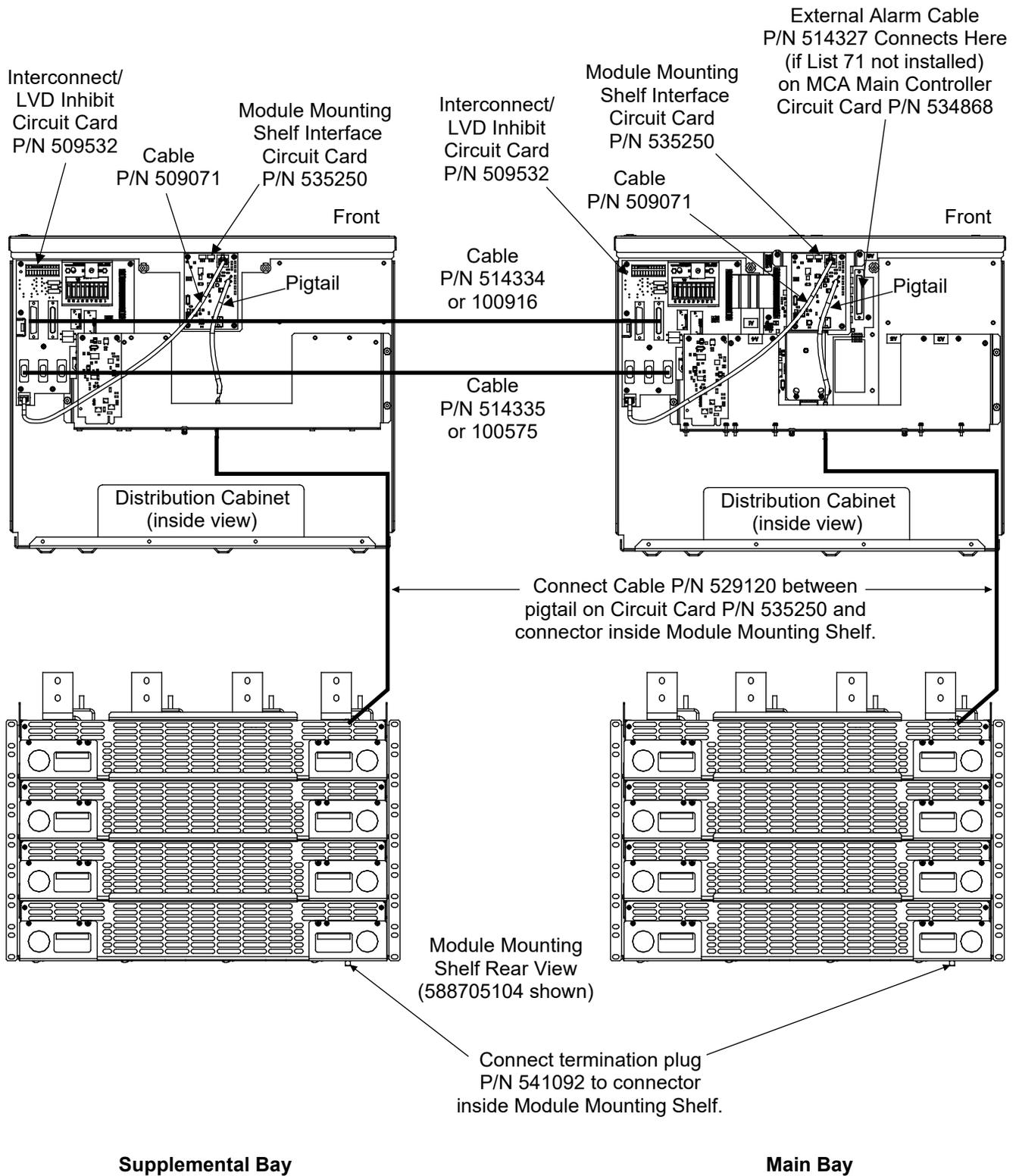
## System Application Guide

### 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):	<p>One 15 ft. cable is provided with List 1. For a replacement cable, order <b>P/N 514327</b>. Also available is <b>P/N 514380</b> (60 ft. cable).</p> <p>Provides pre-assembled cable and mating connector for connecting the MCA external alarm connector to customer circuits.</p> <p>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.</p>
Bay Module Mounting Shelf Interface Circuit Card to MCA Interconnect Cable:	<p>P/N 509071</p> <p>Provides pre-assembled cable and mating connectors for connecting the Bay Module Mounting Shelf Interface circuit card to the MCA (via the "Interconnect/Inhibit" circuit card).</p> <p>Connects between the Module Mounting Shelf Interface circuit card P/N 535250 located in the Bay Distribution Cabinet and the "Interconnect/Inhibit" circuit card located in the same Distribution Cabinet.</p>
Bay Internal 'Rectifier Module Control' Interconnect Cable:	<p>P/N 529120</p> <p>Provides pre-assembled cable and mating connectors for connecting the Bay Module Mounting Shelf Interface circuit card to the top most Module Mounting Shelf.</p> <p>Connects between the pigtail located on Module Mounting Shelf Interface circuit card P/N 535250 located in the Bay Distribution Cabinet and the connector exiting the top of the topmost Module Mounting Shelf.</p> <p>Note that subsequent Module Mounting Shelves located within the same bay are interconnected via the shelf internal wiring harness. Connect the mating connector of the cable exiting the bottom of one Module Mounting Shelf with the connector exiting the top of the shelf installed below it.</p>
Bay-to-Bay 'Distribution Control' Interconnect Cable:	<p>A 6 ft. cable is provided with List 2. For a replacement cable, order <b>P/N 514334</b>. A 25 ft. cable is provided with List 5. For a replacement cable, order <b>P/N 100916</b>.</p> <p>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).</p> <p>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.</p>
Bay-to-Bay 'Rectifier Module Control' Interconnect Cable:	<p>A 7-1/2 ft. cable is provided with List 2. For a replacement cable, order <b>P/N 514335</b>. A 25 ft. cable is provided with List 5. For a replacement cable, order <b>P/N 100575</b>.</p> <p>Provides pre-assembled cable and mating connectors for Rectifier Module control signal interconnection between the MCA (in the Main Bay) and Module Mounting Shelves located in the Supplemental Bay.</p> <p>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.</p>
MCA Control Bus Termination Plug	<p>Provided with each Module Mounting Shelf (List 30). For a replacement termination plug, order <b>P/N 541092</b>.</p>



Replacement Cable Diagram

# NetSure™ 700NVBA DC Power System

## System Application Guide

### Replacement Components

#### Ordering Notes

- 1) Refer to the following table. Refer also to "Replacement Components" in PD588705100/PD588705101/PD588705102/PD588705103/PD588705104.

Item	Part Number
2500W Rectifier Module (PCU):	Order via <a href="#">1R242500</a> .
3000W High Efficiency Rectifier Module	Order via P/N <a href="#">1R243000</a>
DC-DC Converter Module	Order via <a href="#">1C24481500</a> .
MCA MCA Main Controller Circuit Card:	534868 with 534876 Configuration ( <a href="#">List 10</a> Standard Configuration)  534868 with 534877 Configuration ( <a href="#">List 11</a> Special Application Configuration)  534868 with 534878 Configuration ( <a href="#">List 12</a> Special Application Configuration)  534868 with 534879 Configuration ( <a href="#">List 13</a> Special Application Configuration.)
MCA Keypad/Display Circuit Card: MCA Power Supply Circuit Card:	288710900 514361
Rectifier Shelf Interface Circuit Card:	535250
MCA Interface Circuit Cards:	Order via Lists <a href="#">72, 74, 75, 76, 77, 78</a>
Audible Alarm and Alarm Termination Circuit Card	Order via <a href="#">List 71</a>
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

## SPECIFICATIONS

**Note:** For Module Mounting Shelf specifications; refer to PD588705100/PD588705101/PD588705102/PD588705103/PD588705104.

For Rectifier specifications; refer to UM1R243000 (Rectifier User Instructions).

For Converter specifications; refer to UM1C24481500 (Converter User Instructions).

For List 92 Battery Stand System specifications, refer to System Application Guide 588810000, furnished with the Battery Stand.

### 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 PD588705100/PD588705101/PD588705102/PD588705103/PD588705104.

**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. Nos. 588705100, 588705101, 588705102, 588705103, and 588705104 Module Mounting Assemblies.
4. Addition of a Module Mounting Assembly in the field.

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

### 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 for NEBS compliance reports.

In order to remain compliant during a fan failure condition, the backup battery connection must be utilized to provide sufficient power to the loads for up to eight (8) hours when the system is operated at greater than 50% output power. If no backup battery connection is used, the system must operate with a redundant module installed.

### 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 or WEB Pages. The following Interface Options are available for use with WinLink: Modem, RS-232/Modem, and Ethernet. The following Interface Options are available for use with WEB Pages: Ethernet.

**Note:** Only one interface (Modem, Combination Modem/RS-232, or Ethernet) 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 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 and output power does not exceed 2500W or 3000W (depending on rectifier module installed in system). 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. If the demand by the load exceeds 2500W or 3000W (depending on rectifier module installed in system) per rectifier (PCU), the battery is required to furnish the difference 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 (PCUs) 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 (PCUs) can be inhibited (TR) via 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 (PCU) current, subsystem load voltage and current (if subsystem installed), 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 PCU communications to conserve power when system voltage falls below 20 volts. Full operation is restored when system voltage recovers to 23.5 volts. The display and communications can be temporarily reactivated by the user.

**1.3.7 MCA Meter Accuracy:**  $\pm 0.01\text{ V}$ ,  $\pm 0.005\%$  /  $^{\circ}\text{C}$

**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 100% of full load rating.*

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 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 23.50 to 28.50 volts DC. Test/equalize voltage is adjustable from 23.00 to 28.50 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)	27.24	27.00	27.24	27.24

- (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)	27.24	27.00	27.24	27.24

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 PD588705100/PD588705101/PD588705102/PD588705103/PD588705104.

- a) The temperature compensation slope in volts/°C. Adjustable from zero to 100 millivolts/°C. Factory set at 0V/°C (DIGITAL TC OFF).
- b) The maximum voltage limit in volts DC. Adjustable from float up to 29.25 volts DC, but automatically limited to 0.5 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)	28.25	28.25	28.25	28.25

- c) The minimum voltage limit in volts DC. Adjustable from float down to 23 volts DC, but automatically limited to 0.5 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)	25.00	25.50	25.00	25.00

- (B) **Rectifier Module Current Limit:** Adjustable from 10% to 120% of total system capacity at maximum rated output voltage. Factory set at 100% of rated full load, unless otherwise specified.

- (C) **Rectifier Module High Voltage Shutdown:** Adjustable from 24.00 to 29.75 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)	28.75	28.50	28.75	28.75

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## System Application Guide

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**(D) High Voltage Alarm 1:** Adjustable from 24.00 to 29.50 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)	27.75	28.10	27.75	27.75

**(E) High Voltage Alarm 2:** Adjustable from 24.00 to 29.50 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)	28.25	28.50	28.25	28.25

**(F) Battery On Discharge Alarm:** Adjustable from 20.00 to 28.00 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)	24.00	23.50	24.00	24.00

**(G) 50% Battery On Discharge (Very Low Voltage) Alarm:** Adjustable from 20.00 to 28.00 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)	23.00	22.00	23.00	23.00

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

**(I) Subsystem High Voltage Alarm (if subsystem installed):** Adjustable from 0.00 to 60.00 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)	50.00	53.00	50.00	50.00

**(J) Subsystem Low Voltage Alarm (if subsystem installed):** Adjustable from 0.00 to 60.00 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)	46.00	44.50	46.00	46.00

**(K) Subsystem Load Current Alarm (if subsystem installed):** Adjustable from 0 to 60000 ampere. Factory set at 2000 amperes, unless otherwise specified.

**(L) 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.)

**(M) 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.)

**(N) Low Voltage Disconnect (if LVD installed):** Low voltage disconnect is adjustable from 20.0 to 25.0 volts DC. Reconnect is adjustable from 23.5 to 28.5 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)	21.0	21.7	21.0	21.0
Factory Reconnect Setting (Volts)	24.5	25.2	24.5	24.5

**(O) 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.

**(P) 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.

**(Q) 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.

**(R) 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 Local Controls:** Refer to the "System Operating Procedures" chapter in the Power System User Instructions (Section 6013) for a complete description.

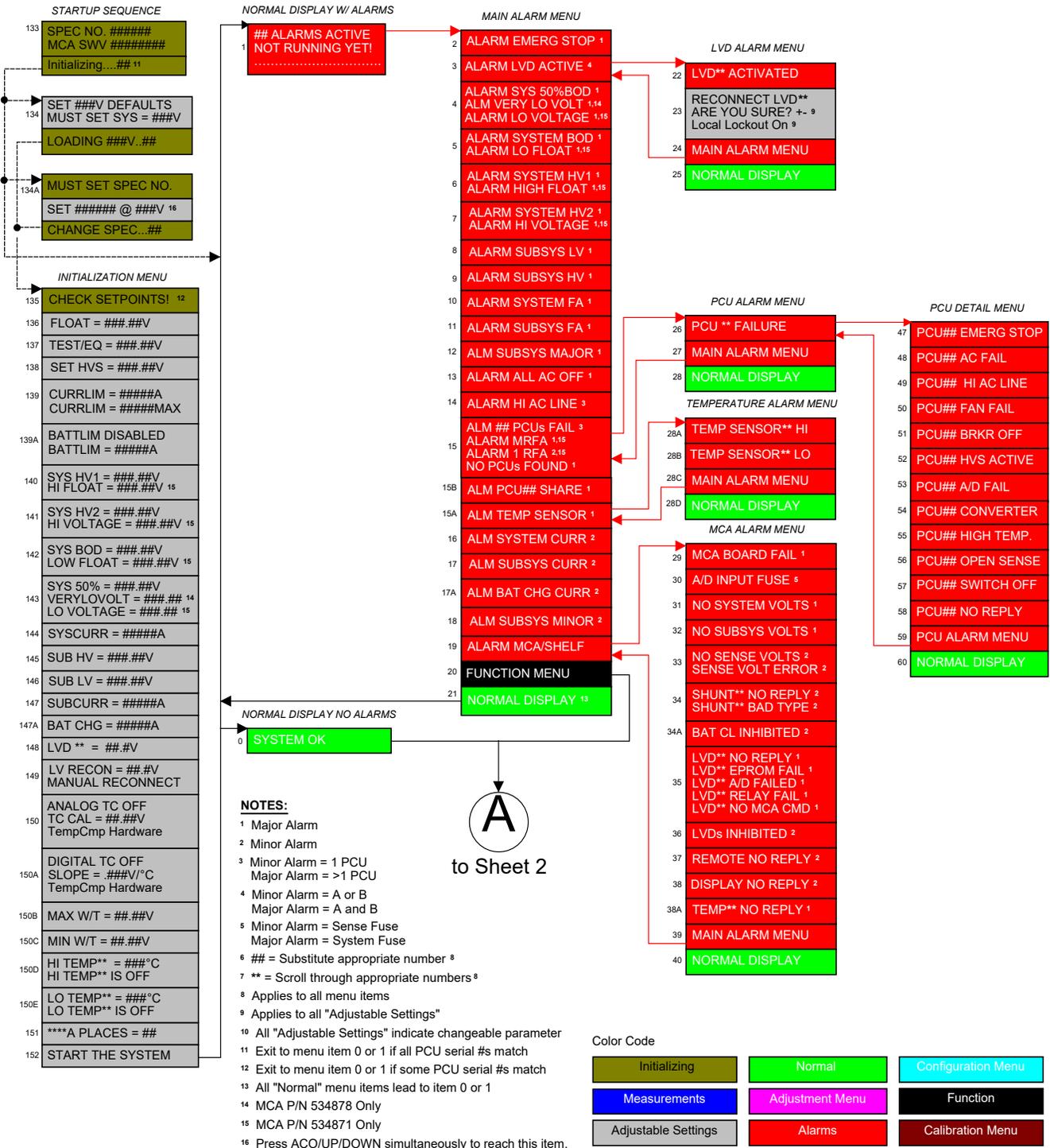
Location	NAME / Description	Type
MCA	FUNCTION SELECT UP and DOWN	Pushbutton Switches
	FUNCTION SET ENTER	Pushbutton Switch
	FUNCTION SET YES (+) and NO (-)	Pushbutton Switches
	ALARM CUTOFF	Pushbutton Switch

- 1.3.12 Local Status and Alarm Indicators:** Refer to the "System Operating Procedures" chapter in the Power System User Instructions (Section 6013) for a complete description.

Location	NAME / Description	Type
Rectifier Module	See PD588705100/PD588705101/PD588705102/PD588705103/PD588705104.	
MCA	Message Display, Shows... <ul style="list-style-type: none"> <li>• Active Alarms or "SYSTEM OK"</li> <li>• Various Measurement Items and Values</li> <li>• Various Adjustment Items and Values</li> <li>• Various Configuration Items and Settings</li> <li>• Various Calibration Items and Settings</li> </ul> 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

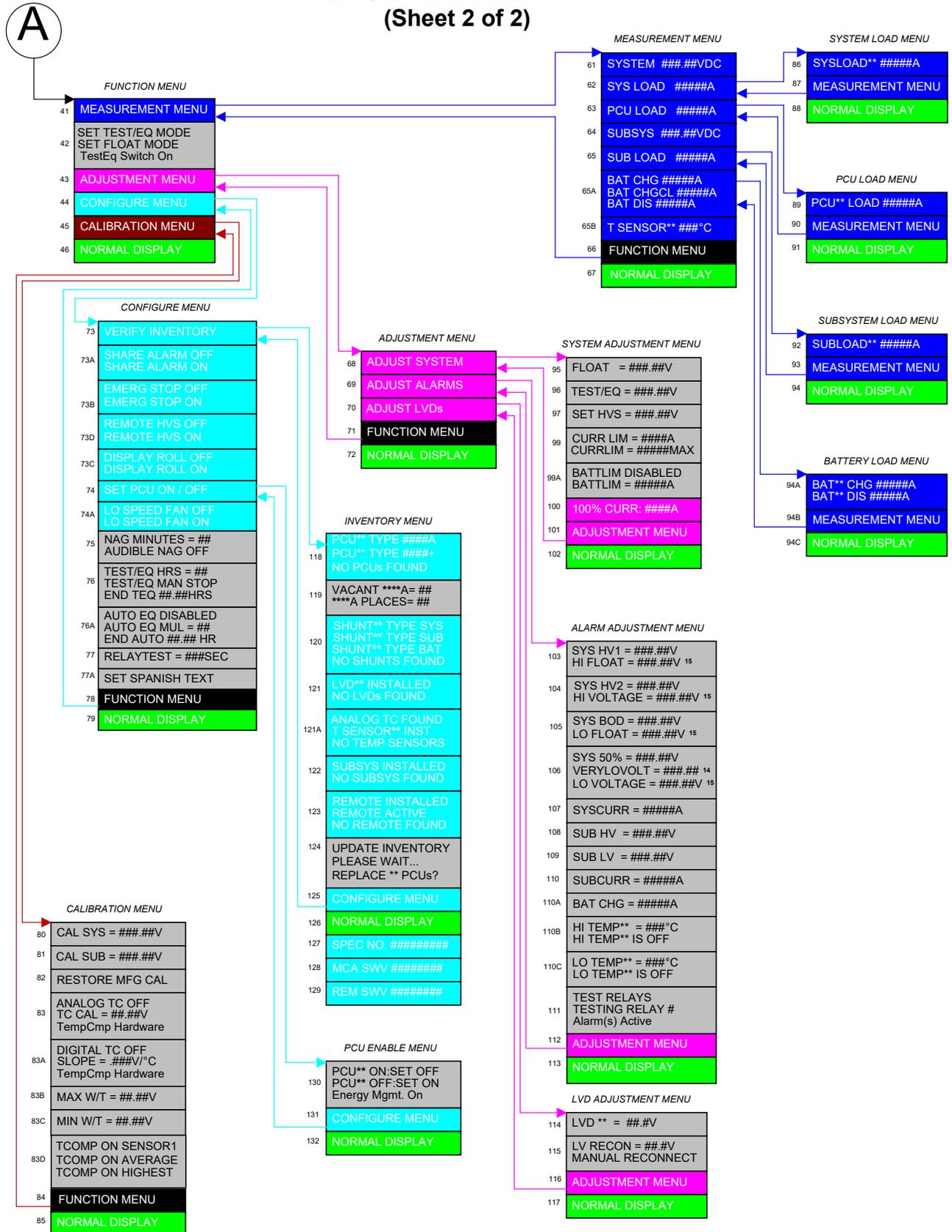
- 1.3.13 MCA Display:** The following are illustrations from the MCA Menu Tree (Section 6022). Refer to the latest version of Section 6022 for the most recent MCA Menu Tree. Refer to the "Navigating the MCA" and "System Operating Procedures" chapters of the Power System User Instructions (Section 6013) for complete descriptions of menu items.

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



from Sheet 1

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



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**1.3.14 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 6012) for connection details.
- Refer to the "Navigating the MCA" and "System Operating Procedures" chapters of the Power System User Instructions (Section 6013) 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
<b>MCA Configuration No.</b>	<b>534876</b>	<b>534877</b>	<b>534878</b>	<b>534879</b>
<b>Relay K1</b>	Major Alarm	Major Alarm	Major Alarm	Major Alarm
<b>Relay K2</b>	Minor Alarm	Minor Alarm	Minor Alarm	Minor Alarm
<b>Relay K3</b>	High Voltage 1 Alarm	High Voltage 1 Alarm	High Voltage 1 Alarm	Test/EQ Mode Indication 2
<b>Relay K4</b>	High Voltage 2 Alarm	Rectifier Module Fail Major Alarm	MCA Fail Alarm	Fuse Alarm
<b>Relay K5</b>	Battery On Discharge Alarm	Battery On Discharge Alarm	Battery On Discharge Alarm	Battery On Discharge Alarm
<b>Relay K6</b>	50% Battery On Discharge Alarm	Rectifier Module Fail Minor Alarm	Very Low Voltage Alarm	AC Major Alarm
<b>Relay K7</b>	AC Fail Alarm	AC Fail Alarm	AC Fail Alarm	AC Fail Alarm
<b>Relay K8</b>	Audible Alarm	Audible Alarm	Fuse Alarm	LVD Alarm
<b>Relay K9</b>	Test/EQ Mode Indication	Fuse Alarm	Rectifier Module Fail Alarm	Test/EQ Mode Indication

**1.3.15 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  $\pm 18$  to 60 volts DC signal is applied this terminal.

**PHYSICAL SIZE INFORMATION**

**Overall Dimensions**

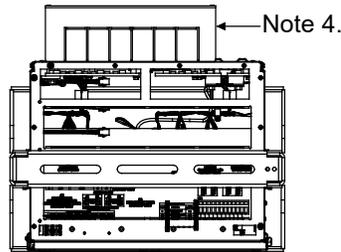
Refer to PD588705100, PD588705101, PD588705102, PD588705103, PD588705104 for Module Mounting Assembly dimensions.

Refer to Table 1, page 71, for relay rack dimensions.

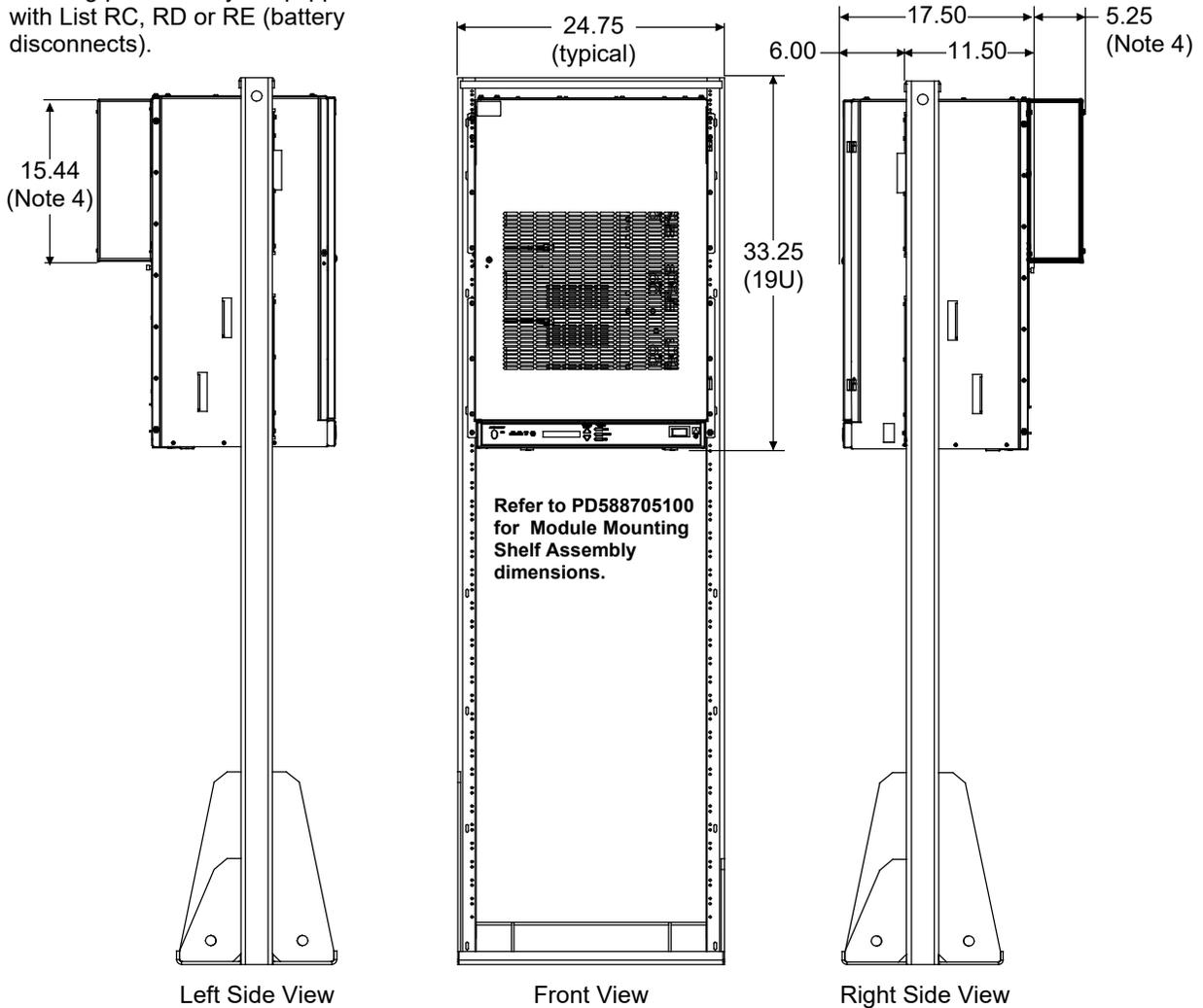
**List 24 (Four Bus Row Cabinet)**

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)
4. Housing present only if equipped with List RC, RD or RE (battery disconnects).



Top View



Left Side View

Front View

Right Side View

# NetSure™ 700NVBA DC Power System

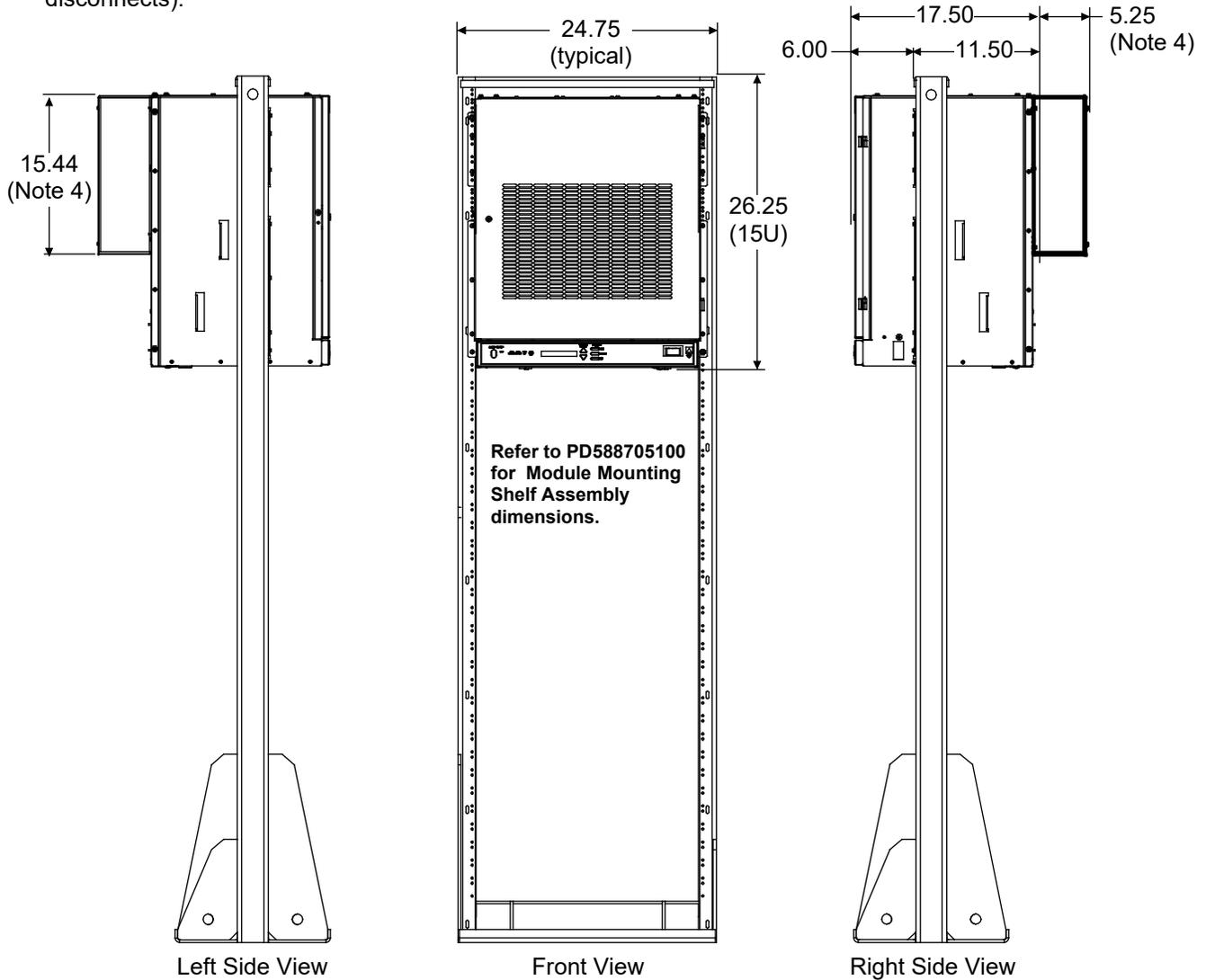
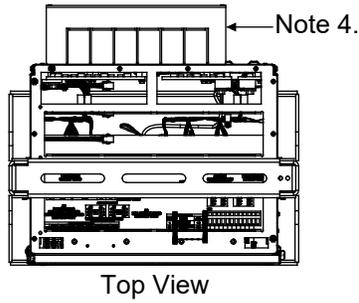
## System Application Guide

### List 23 (Three Bus Row Cabinet)

Refer to Table 1, page 71, for relay rack dimensions.

**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)
4. Housing present only if equipped with List RC, RD or RE (battery disconnects).



# NetSure™ 700NVBA DC Power System

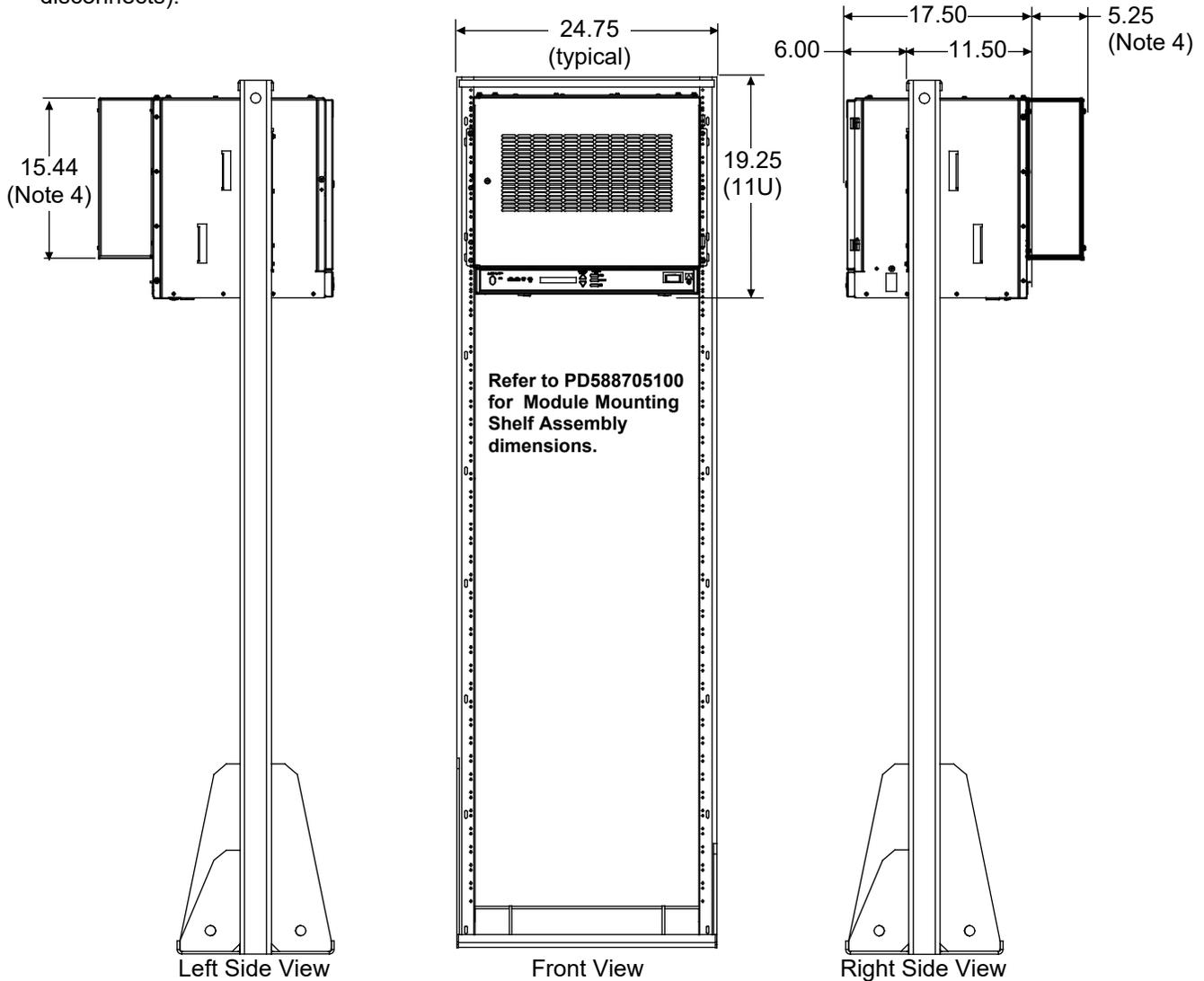
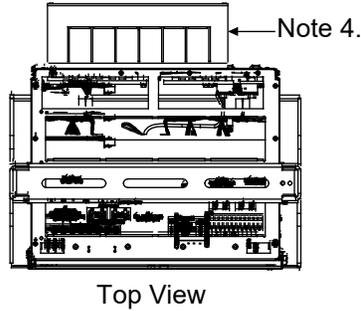
## System Application Guide

### List 22 (Two Bus Row Cabinet)

Refer to Table 1, page 71, for relay rack dimensions.

**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)
4. Housing present only if equipped with List RC, RD or RE (battery disconnects).



# NetSure™ 700NVBA DC Power System

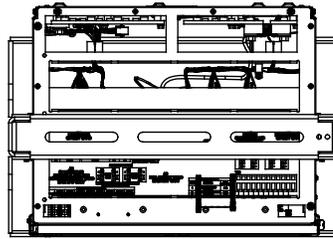
## System Application Guide

### List 21 (One Bus Row Cabinet)

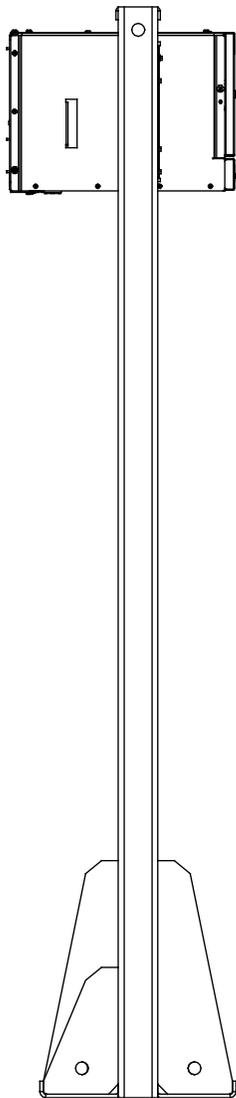
Refer to Table 1, page 71, for relay rack dimensions.

Notes:

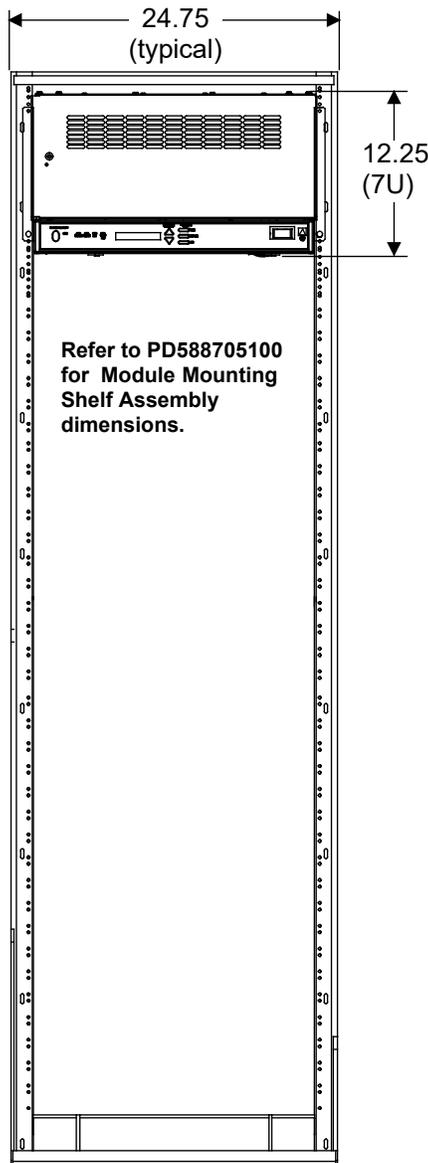
1. All dimensions are in inches, unless otherwise specified.
2. Weight in LBS.  
(minus relay rack)  
One Bus Row Cabinet  
Net:  
Shipping:
3. Finish: Textured Gray (M500-147)



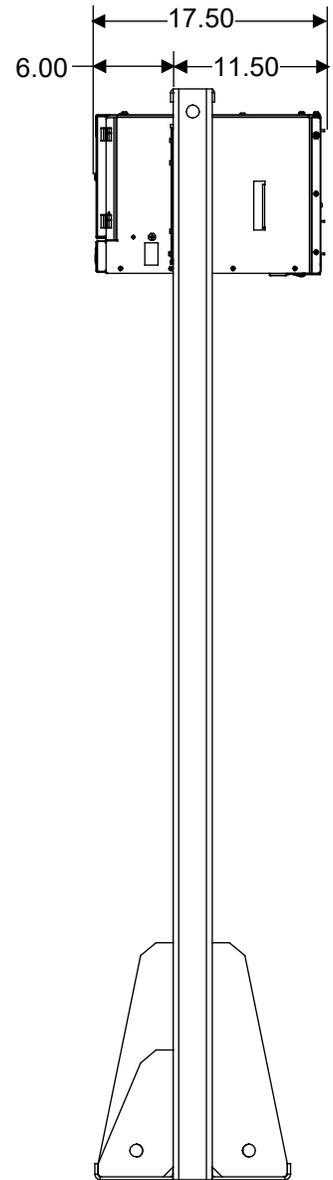
Top View



Left Side View



Front View



Right Side View

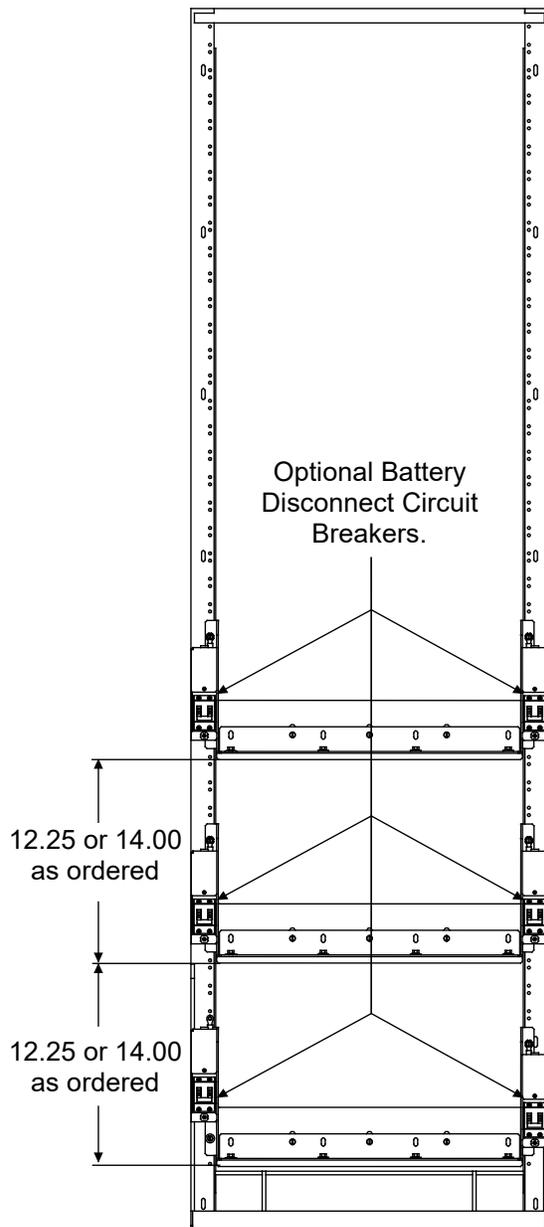
# NetSure™ 700NVBA DC Power System

## System Application Guide

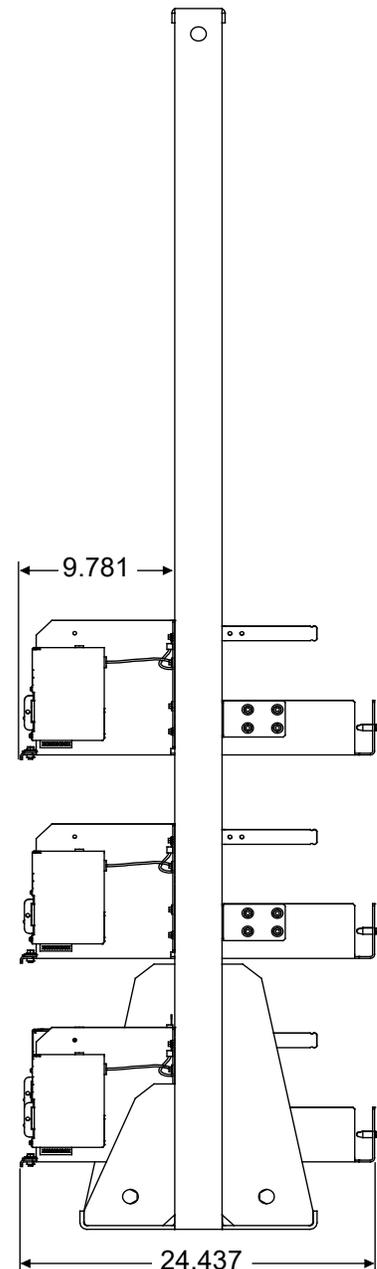
### List 93 (Battery Tray)

#### Notes:

1. Three trays shown as example.  
Max. available per rack: four.
2. Dimensions are in inches.
3. Net Weight Per Tray, Less Batteries:  
With Circuit Breaker Option: 35 lbs.  
Without Circuit Breaker Option: 29 lbs.

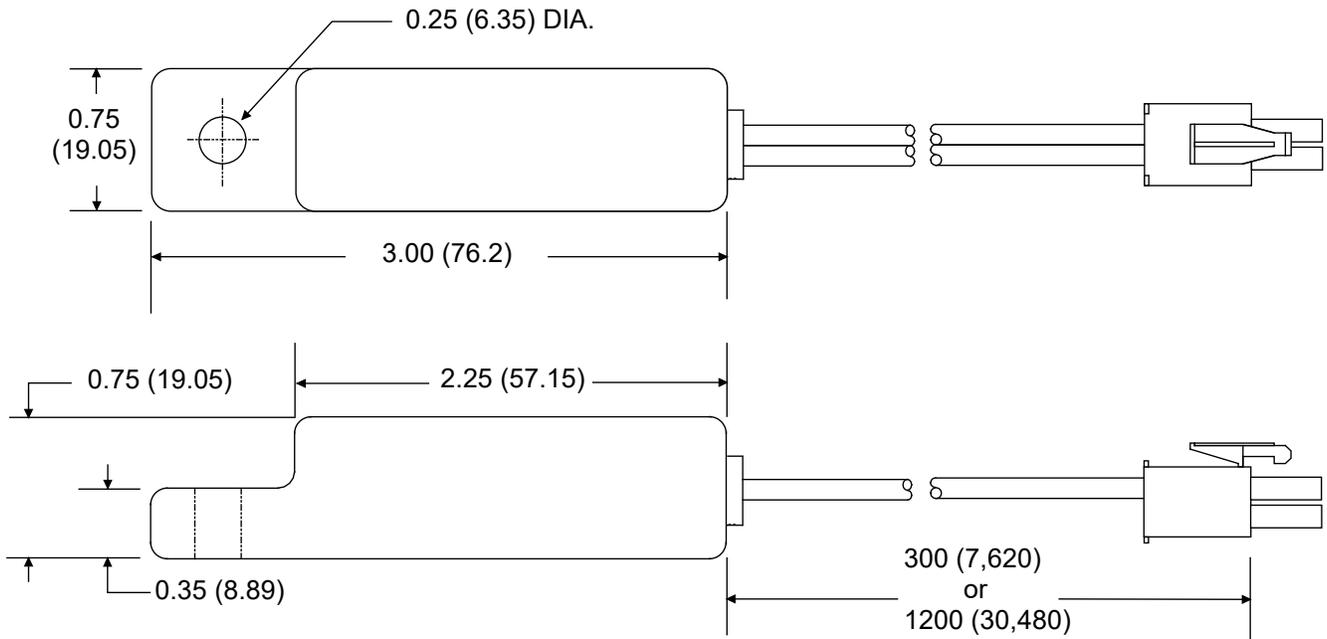


**FRONT VIEW**



**RIGHT SIDE VIEW**

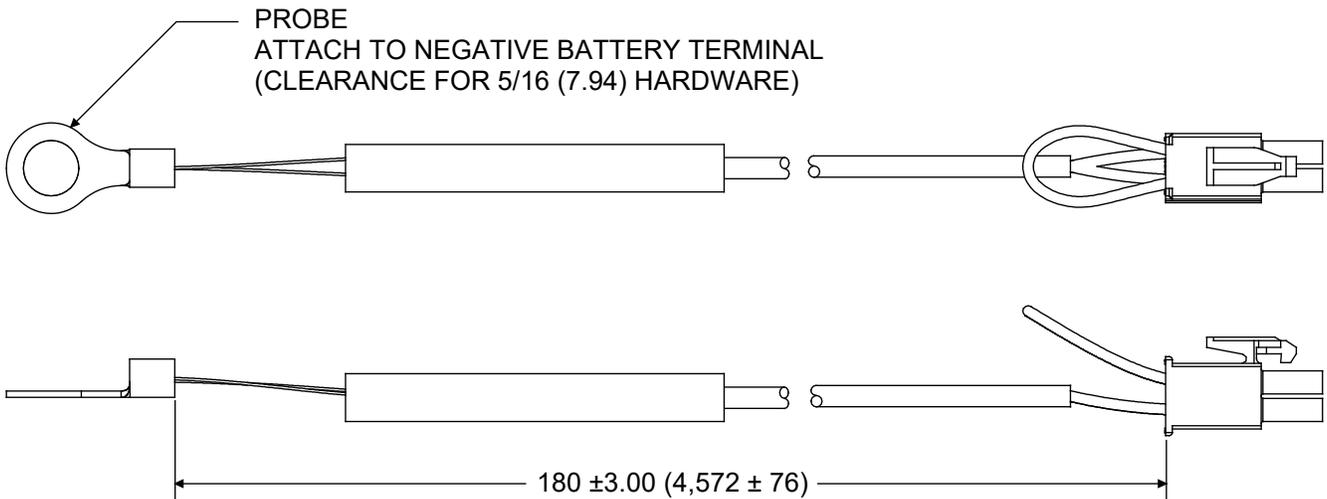
**Optional Digital Battery Charge Temperature Compensation Probe (P/N 107021 and 106824)**



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)**



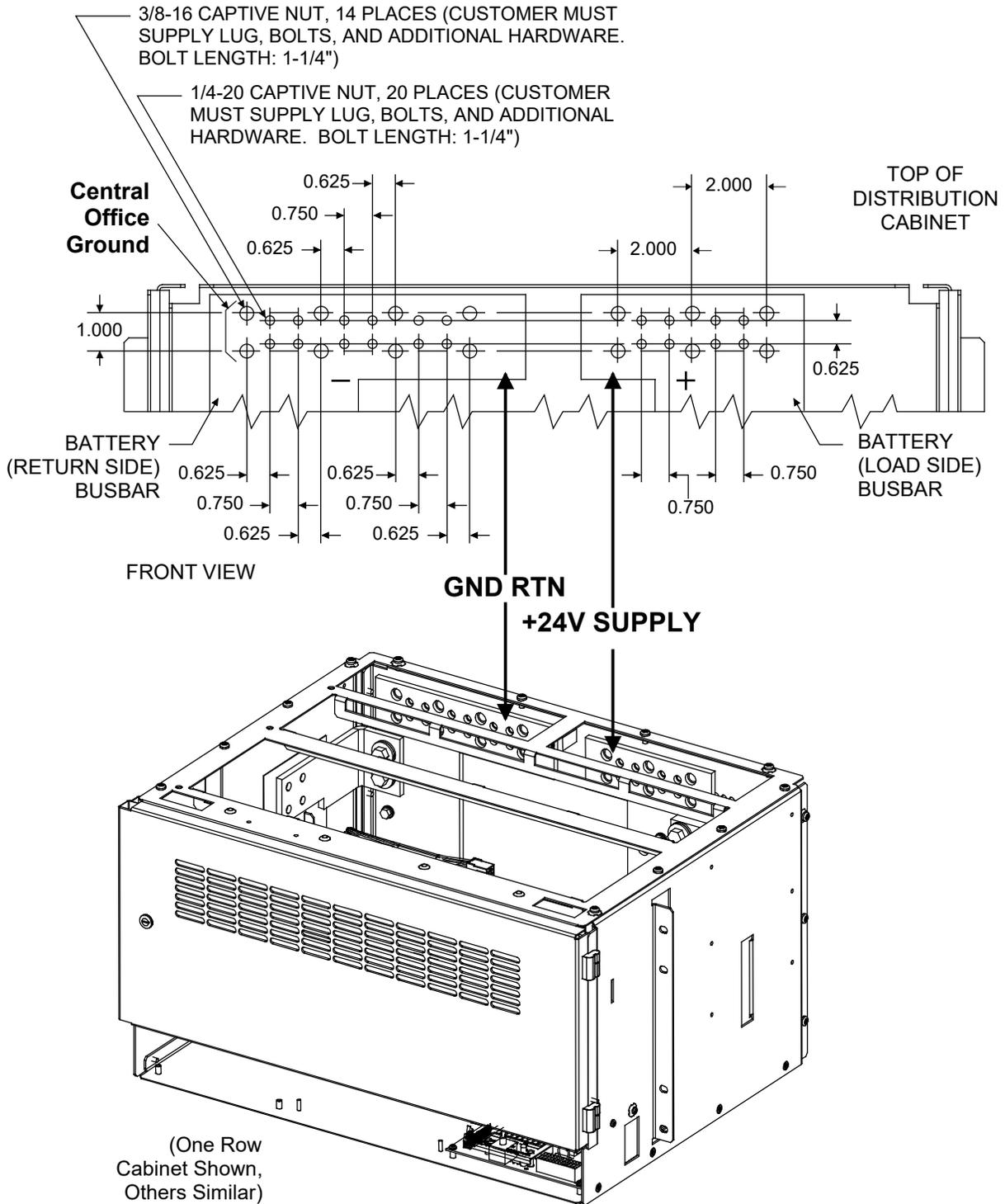
**NOTE:** All dimensions are in inches and (millimeters).

**Electrical Connection Locations and Dimensions**

**Input Battery**

**Connections to Lists 21 through 24 Distribution Cabinets**

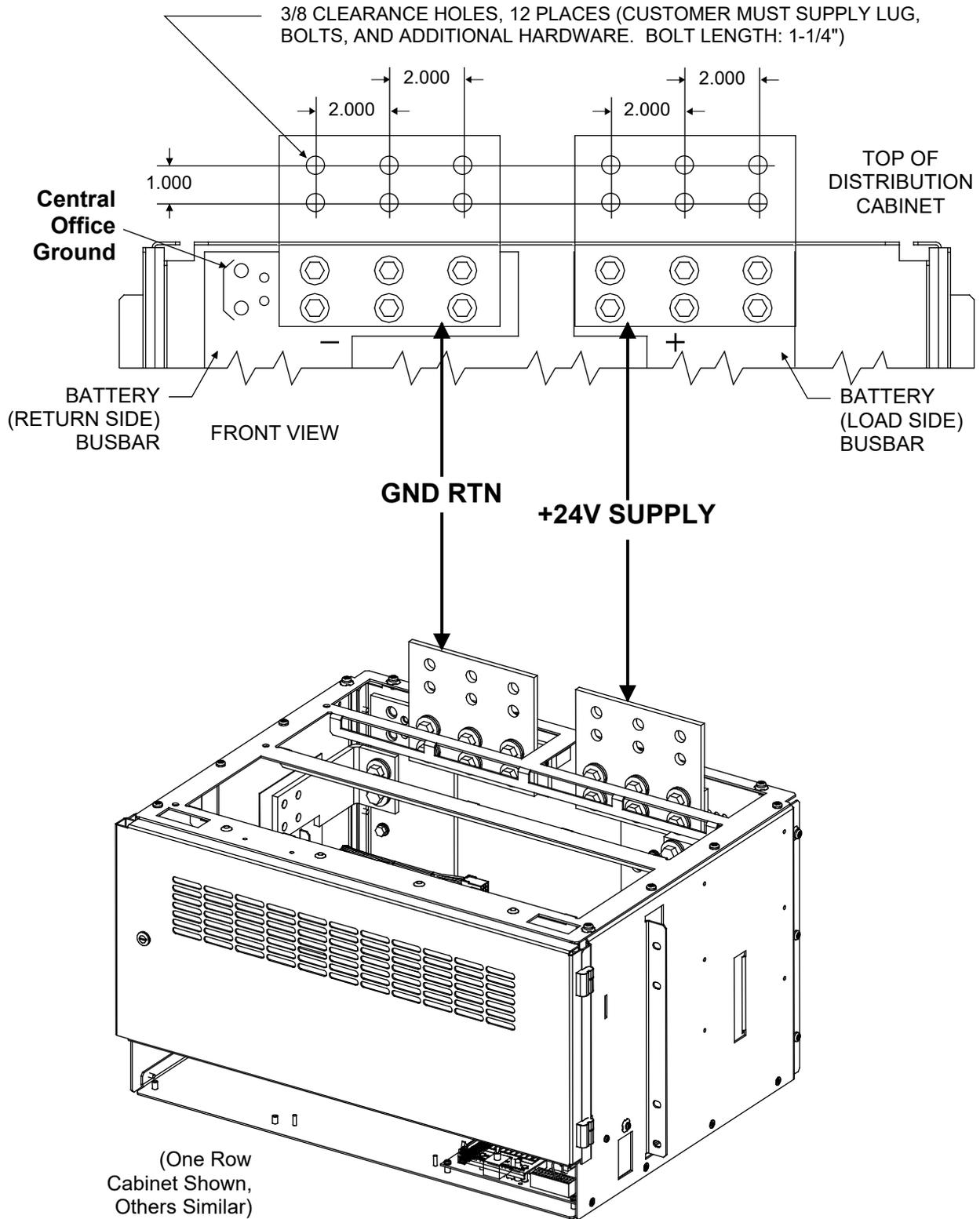
**Note:** Battery busbars within distribution cabinets are rated for 2000A max.  
For 2000A-4000A in List 2, make additional battery connections to inter-bay busbars.



NetSure™ 700NVBA DC Power System  
System Application Guide

**Connections to Optional Battery Busbar Extension Kit P/N 514713  
Installed in Lists 21 through 24 Distribution Cabinets**

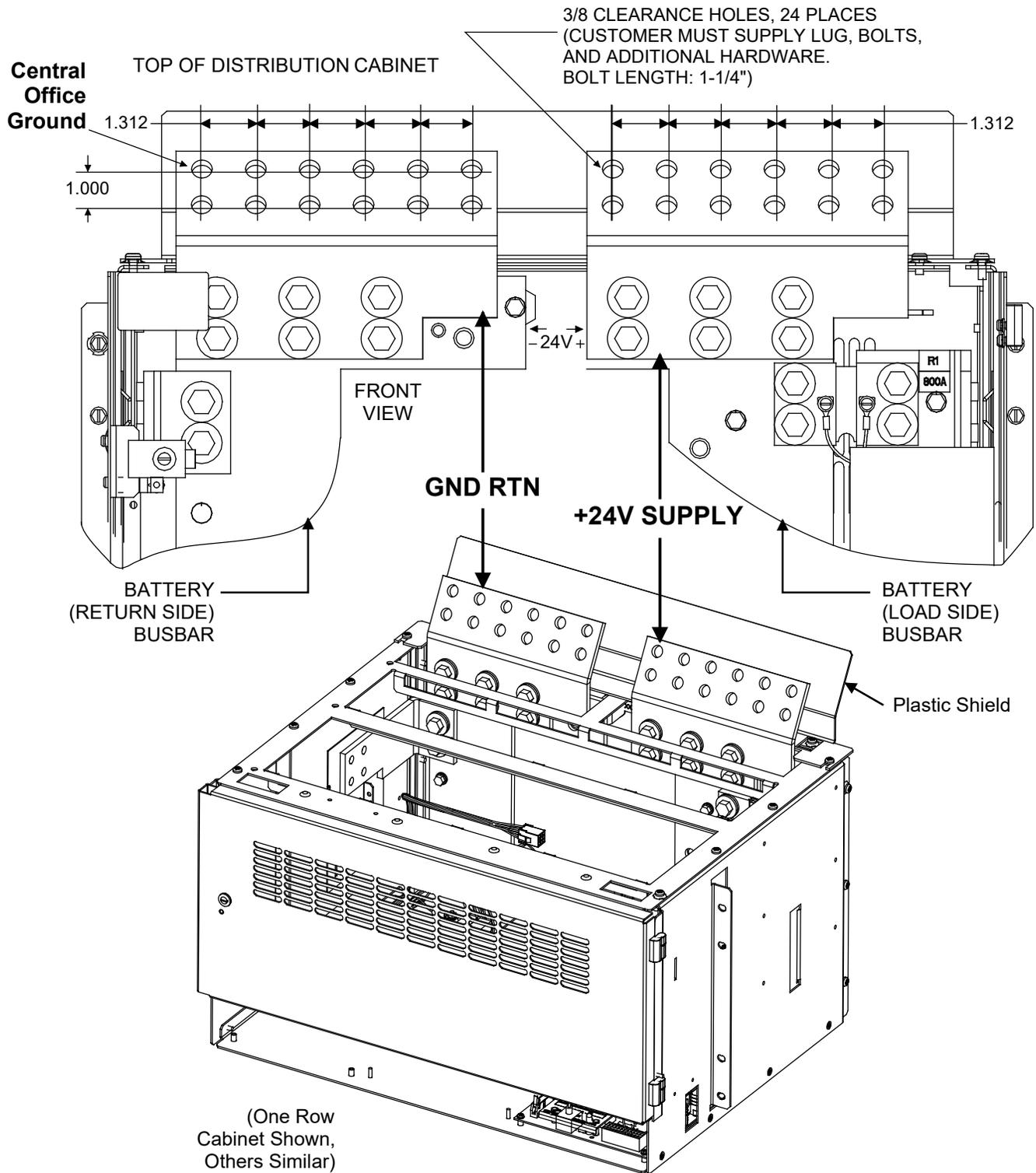
**Note:** See Battery Busbar Extension Kit (P/N 514713) under ACCESSORY DESCRIPTIONS for description.



NetSure™ 700NVBA DC Power System  
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**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.

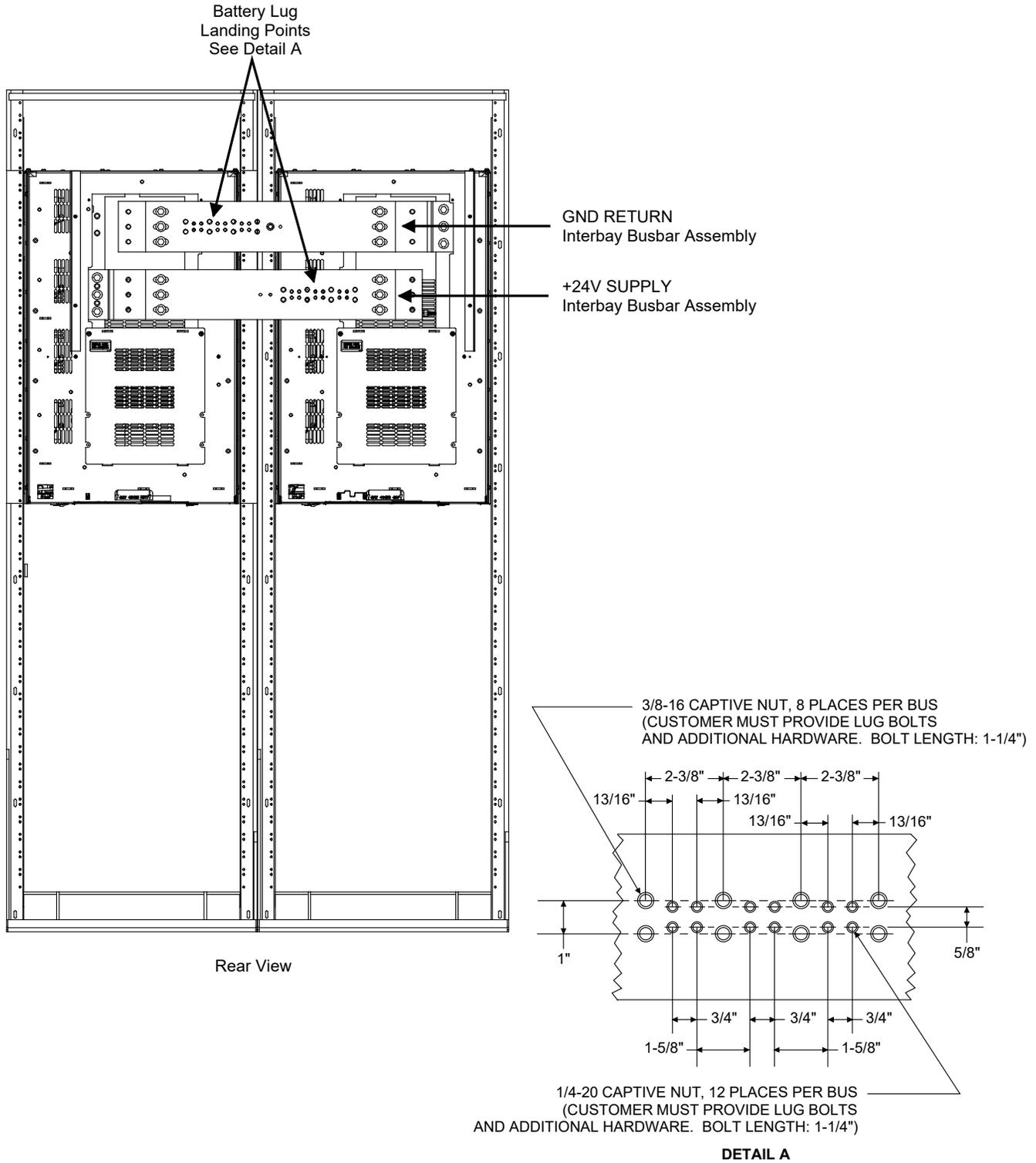


# NetSure™ 700NVBA DC Power System

## System Application Guide

### Connections to Inter-bay 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 inter-bay busbars, shown here.



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**Connections to Battery Disconnect Circuit Breakers  
and Low Battery Voltage Disconnect Options**

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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**

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**Connections to 588705100, 588705101, 588705102, 588705103, 588705104 Module Mounting Assembly(s)**

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Refer to the documentation package furnished with the Module Mounting Assembly.

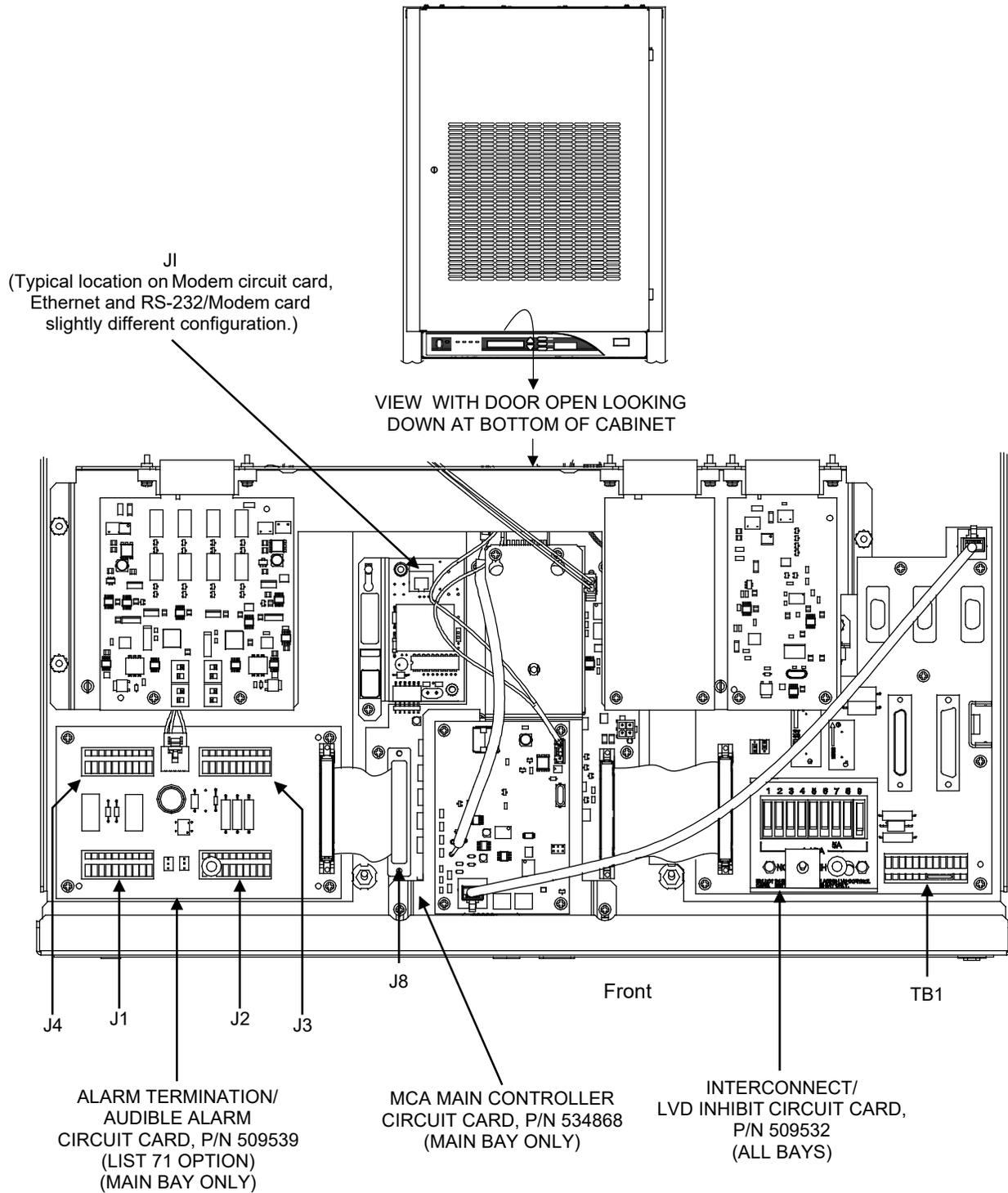
# NetSure™ 700NVBA DC Power System

## System Application Guide

### External Alarm, Reference, and Control

External alarm, reference, and control connection points are located on...

- J1-J4 on the optional [List 71](#) Audible Alarm and Alarm Termination Circuit Card P/N 509539,
- TB1 on circuit card P/N 509532, and
- J8 on circuit card P/N 534868 (if List 71 not installed).



## RELATED DOCUMENTATION

<b>Power Data Sheets:</b>	PD588705100/PD588705101/PD588705102/PD588705103/PD588705104 (Module Mounting Assemblies)
<b>Schematic Diagrams:</b>	SD581126000 (NetSure™ Power System) SD588705100/SD588705101/SD588705102/SD588705103/SD588705104 (Module Mounting Assemblies) SD540827 (1-Row Distribution Cabinet) SD540828 (2-Row Distribution Cabinet) SD540829 (3-Row Distribution Cabinet) SD540830 (4-Row Distribution Cabinet)
<b>Wiring Diagrams:</b>	T581126000 (NetSure™ Power System) T588705100/T588705101/T588705102/T588705103/T588705104 (Module Mounting Assemblies) T540827 (1-Row Distribution Cabinet) T540828 (2-Row Distribution Cabinet) T540829 (3-Row Distribution Cabinet) T540830 (4-Row Distribution Cabinet)
<b>Color MCA Menu Tree:</b>	Section 6022
<b>Instructions:</b>	Section 6012, System Installation Instructions (NetSure™ Power System, Spec. No. 581126000) Section 6013, System User Instructions (NetSure™ Power System, Spec. No. 581126000) 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) UM1R243000, Rectifier Instructions UM1C24481500, Converter Instructions
<b>Load and Battery Lug Detail Drawings:</b>	031110100 031110200 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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