NetSure™
-48 VDC Bulk Output Power System

Installation and User Manual

Specification Number: 582127100
Model Number: 722NBBB

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions. Refer to other local practices or building codes as applicable for the correct methods, tools, and materials to be used in performing procedures not specifically described in this document.

Names of companies and products are trademarks or registered trademarks of the respective companies. Any questions regarding usage of trademark names should be directed to the original manufacturer.

Technical Support Site

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

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

TABLE OF CONTENTS

Admonishments Used in this Document

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

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

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

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

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

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

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

Important Safety Instructions

Safety Admonishments Definitions

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

Safety and Regulatory Statements

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

Déclarations de Sécurité et de Réglementation

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

1 System Overview

1.1 Customer Documentation Package

This document (UM582127100) provides Installation and User Instructions for Vertiv™ NetSure™ -48 VDC Bulk Output Power System Model 722NBBB, Spec. No. 582127100.

The complete Customer Documentation Package consists of…

-48 VDC Bulk Output Power System Installation and User Manual

- Power System Installation and User Instructions: UM582127100

NCU Controller User Manual

- NCU Controller User Instructions: UM1M830BNA

USB Drive with All Customer Documentation

- Power System Installation and User Instructions: UM582127100
- Power System "System Application Guide": SAG582127100
- Rectifier Module Mounting Shelf Power Data Sheet: PD588705000
- Rectifier Instructions: UM1R483500E
- NCU Controller User Instructions: UM1M830BNA
- Engineering Drawings
- Also provided on the USB drive is a controller configuration drawing and the controller configuration files loaded into the controller as shipped.

1.2 System Description

-48V DC @ up to 2000 Amperes Bulk Output Power System

The Vertiv™ NetSure™ 722NBBB Bulk Output Power System is intended for use to expand or replace legacy -48V DC rectifiers while retaining the distribution power board. It can be used with any -48V DC power system, regardless of vendor or plant type.

The Vertiv™ NetSure™ 722NBBB is an integrated power system containing rectifiers, intelligent control, metering, and monitoring.

This power system is designed to power a load while charging a positive 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 positive output grounded.

This system consists of the following components.

Main Rectifier Module Mounting Shelf

The system contains a main rectifier module mounting shelf. This shelf houses up to five (5) rectifier modules, the controller, a controller interface board, and a system interface board. Refer to Power Data Sheet PD588705000 for more information.

NCU (NetSure Control Unit): The controller provides power system control (including optional low voltage battery disconnect (LVBD) and low voltage load disconnect (LVLD) control), rectifier control (including a charge control function), metering functions, monitoring functions, and local/remote alarm functions. The controller also supports rectifier temperature compensation if the system is equipped with a temperature probe(s). Temperature probe(s) may also be designated to monitor ambient temperature and/or battery temperature. The controller also provides data acquisition, system alarm management, and advanced battery and energy

management. The controller contains a color LCD display and keypad for local access. The controller provides an Ethernet port and comes with comprehensive webpages for remote access. The controller has SNMP v3 capability for remote system management. The controller supports software upgrade via its USB port. Refer to the NCU Controller Instructions (UM1M830BNA) for more information.

Expansion Rectifier Module Mounting Shelf

The system contains one or more expansion rectifier module mounting shelves, each of which houses up to six (6) rectifier modules. Refer to Power Data Sheet PD588705000 for more information.

Rectifier Modules

The system contains rectifier modules, which provide load power, battery float current, and battery recharge current during normal operating conditions. Refer to the Rectifier Instructions (UM1R483500E) for more information.

2 Installation Acceptance Checklist

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

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

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

Installing the System

- ❑ Relay Rack Secured to Floor
- ❑ System Components Mounted in Relay Rack and Interconnected (if required)

Setting Switch Options

- ❑ Factory Switch Setting on IB2 Interface Board Verified
- ❑ Making Electrical Connections
- ❑ Relay Rack Grounding Connection (Frame Ground) Made
- ❑ AC Input and AC Input Equipment Grounding Connections Made
- ❑ External Alarm, Reference, Monitoring, and Control Connections Made
- ❑ Controller Ethernet Connection Made (if required)
- ❑ -48V DC Output Connections Made

Installing the Rectifier Modules and Initially Starting the System

- ❑ Rectifier Modules Installed
- ❑ System Started, Configured, and Checked

3 Installing the System

3.1 General Requirements

- This product is intended only for installation in a restricted access location on or above a non-combustible surface.
- This product must be located in a controlled environment with access to crafts persons only.
- This product is intended for installation in network telecommunication facilities (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- This product is intended for connection to the common bonding network in a network telecommunication facility (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- The DC return connection to this system can remain isolated from system frame and chassis (DC-I).
- This system is suitable for installation as part of the Common Bonding Network (CBN).
- The installer should be familiar with the installation requirements and techniques to be used in securing the relay rack to the floor.
- Rectifier and rectifier module mounting shelf ventilating openings must not be blocked and temperature of air entering rectifiers must not exceed rated operating ambient temperature range found in SAG582127100.
- Clearance requirements are:

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

  b) Minimum spacing from the rear of the bay to a wall or other solid surface is that which is specified for proper rectifier module mounting shelf ventilation. Refer to the rectifier module mounting shelf Power Data Sheet for ventilation spacing requirements.

  NOTE! *Minimum rear spacing specified for ventilation may not permit installation and maintenance of the system.*

  Recommended minimum aisle space clearance for the rear of each bay is 2’ 0” to allow for installation and maintenance.

3.2 Securing the Relay Rack to the Floor

Secure the relay rack to the floor per site requirements. Refer to “General Requirements” on page 3.

Ventilation Requirements

Refer to “General Requirements” on page 3.

Relay Rack Floor Mounting Dimensions

Refer to Figure 3.1 for relay rack floor mounting dimensions.

Optional Relay Rack Isolation Kit

Refer to Figure 3.2 when using the Optional Relay Rack Isolation Kit.

3.3 Mounting System Components in a Relay Rack

NOTE! *If the power system was ordered in a relay rack, these procedures have been performed at the factory.*

This power system is designed to mount in a standard 23” relay rack having 1” or 1-3/4” multiple drillings. Refer to System Application Guide SAG582127100 for overall dimensions and a list of available relay racks.

Mounting the Rectifier Module Mounting Shelf(s) to a Relay Rack

DANGER! The relay rack must be securely anchored to the floor before the rectifier module mounting shelf(s) is installed.

NOTE! *If the system was shipped on shipping rails, rectifier module mounting shelves are installed in groups of two or less. Space has been provided for pallet forks to fit between the sets of rectifier module mounting shelves. Simply rest the pallet forks on the bottom-most rectifier module mounting shelf, unbolt the shelves from the shipping rails, transfer the shelves to the relay rack, and re-secure the shelves to the relay rack.*

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

Procedure

1. If multiple shelves are in the system, remove the rear center shield from each. Save hardware for later re-installation.
2. If multiple shelves are in the system, remove and discard the bottom section of the rear center shield from all shelves except the bottom shelf.

NOTE! *In multiple shelf systems, apply electrical anti-oxidizing compound to busbar mating surfaces before performing the next step.*

3. Position the rectifier module mounting shelf in the relay rack. In multiple shelf systems, align the holes in the mating busbars before securing the shelves to the relay rack.

NOTE! *Install the ground washers in the next step so the teeth dig into the paint on the mounting angles.*

4. Secure the rectifier module mounting shelf to the relay rack. Torque all screws to 65 in-lbs.

   Hardware build-up is:
   12-24 x 3/4" screw and flat washer,
   (1) set per side.
   12-24 x 3/4" screw and ground washer,
   (1) set per side.

5. Repeat for any additional rectifier module mounting shelf. Rectifier module mounting shelves are install directly below each other with no space between them. The main shelf (the one with the NCU Controller) should be the top-most shelf.

Interconnecting the Rectifier Module Mounting Shelves Output Busbars in Multiple Shelf Systems

NOTE! *Refer to Figure 3.4 as this procedure is performed.*

Procedure

1. The mating busbars are factory installed on the expansion rectifier module mounting shelf. Secure these busbars to the output busbars on the shelf above it. Hardware is provided with the expansion rectifier module mounting shelf.

   Hardware build-up for these connections is:
   1/4-20 x 7/8" Bolt,
   1/4" Belleville Lock Washer,
   1/4" Flat Washer.

   Install the Belleville lock washer so the concave side is towards the busbar. Torque all connections to 60 in-lbs.

NOTE! *Some systems may come with two shelves connected together with a common relay rack mounting bracket and an output busbar spanning both shelves. Connect these shelves to other shelves in the same manner as described here.*

2. Repeat this procedure for each expansion rectifier module mounting shelf.

Changing the Direction of the DC Output Cables

DC output cables can either enter from the right, from the left, or from the rear. To reconfigure the shelf for these options, remove the appropriate shield and position the DC output busbars per the following procedure. The DC output busbars are factory connected for DC output cables entering from the right as viewed from the front.

Procedure

NOTE! *Refer to Figure 3.5 as this procedure is performed.*

1. In Figure 3.5, select the view for your DC output cabling requirements (left, right, or rear).
2. Remove the appropriate shield as required as shown in the selected view.
3. Reposition the DC output lug landing busbars as shown in the selected view.

Figure 3.1 Relay Rack Floor Mounting Dimensions

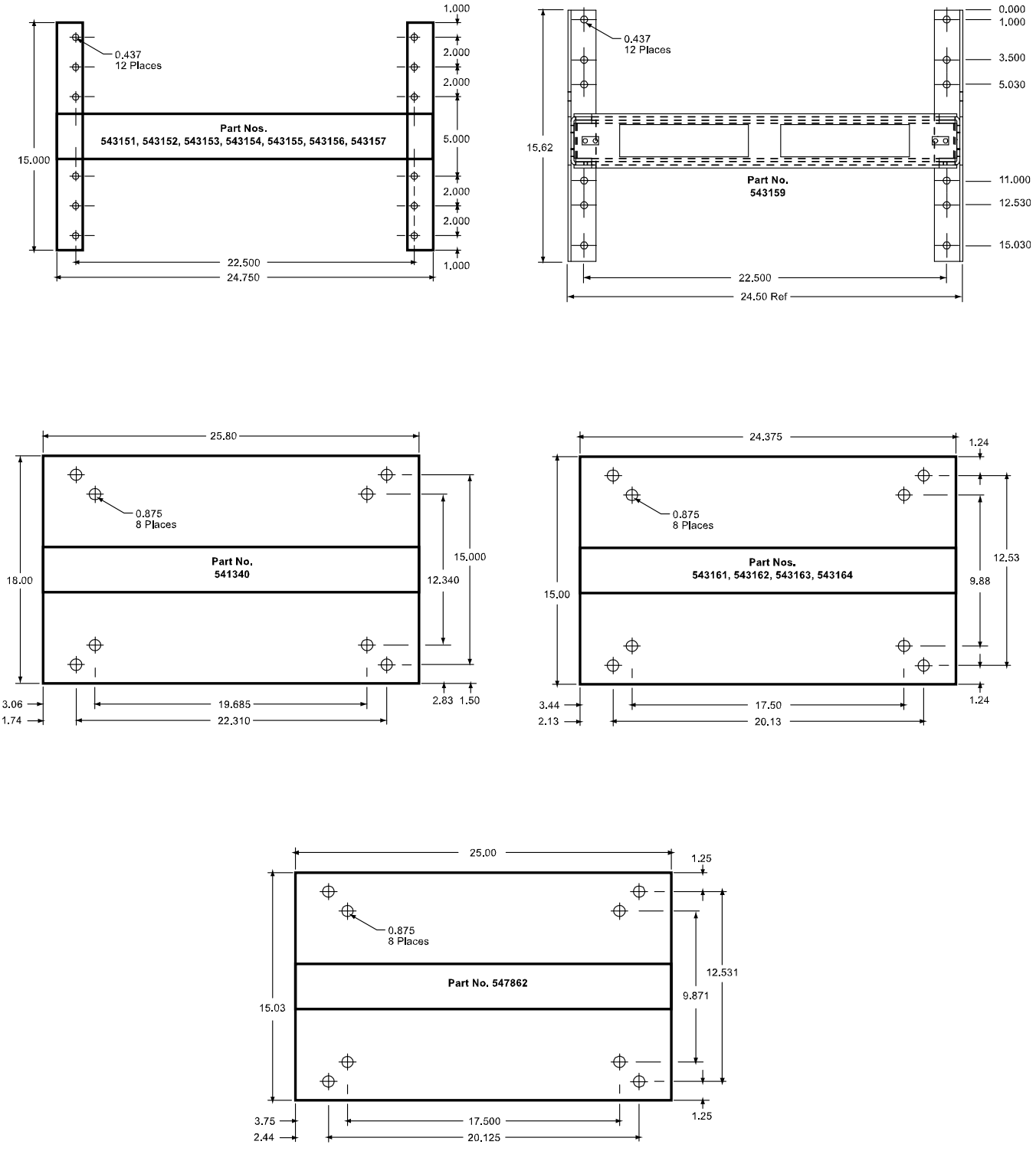


Figure 3.2 Optional Relay Rack Isolation Kit Mounting

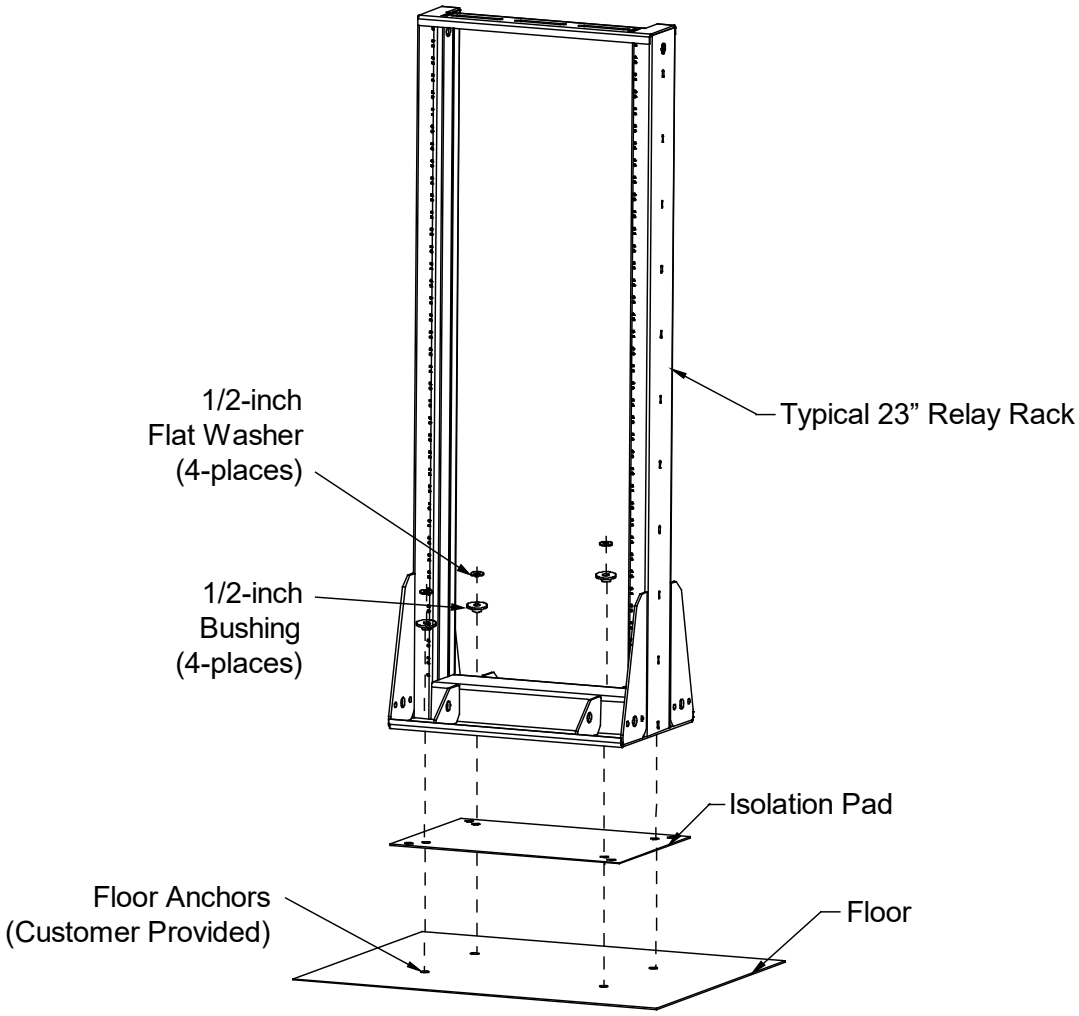
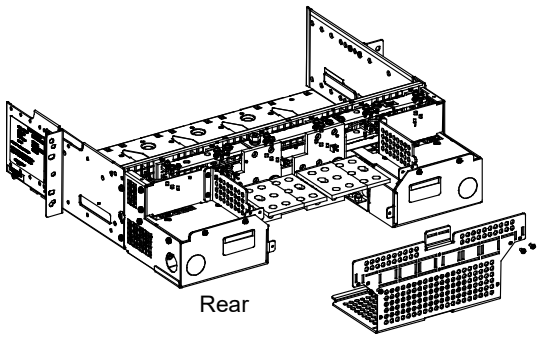
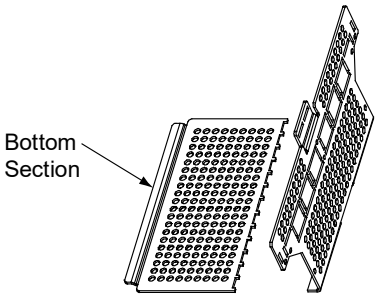


Figure 3.3 Rectifier Module Mounting Shelf Mounting

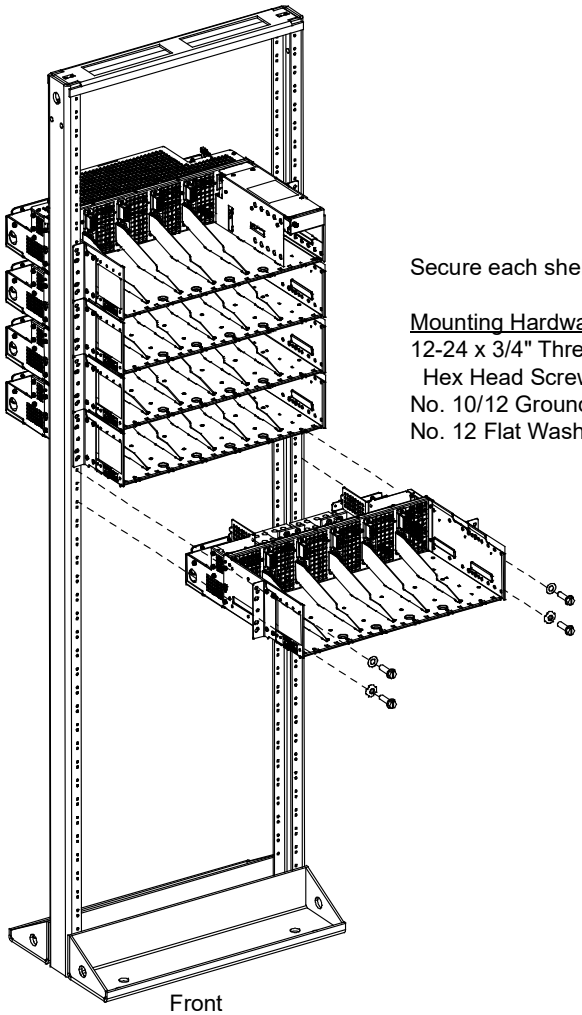


If multiple shelves are in the system, remove the rear center shield from each.

Save hardware for later re-installation.



If multiple shelves are in the system, remove and discard the bottom section of rear center shield for all shelves except the bottom shelf.



Secure each shelf to the relay rack.

Mounting Hardware
12-24 x 3/4" Thread Forming
Hex Head Screw (two per side)
No. 10/12 Ground Washer (one per side)
No. 12 Flat Washer (one per side)

Figure 3.4 Interconnecting the Rectifier Module Mounting Shelves Output Busbars

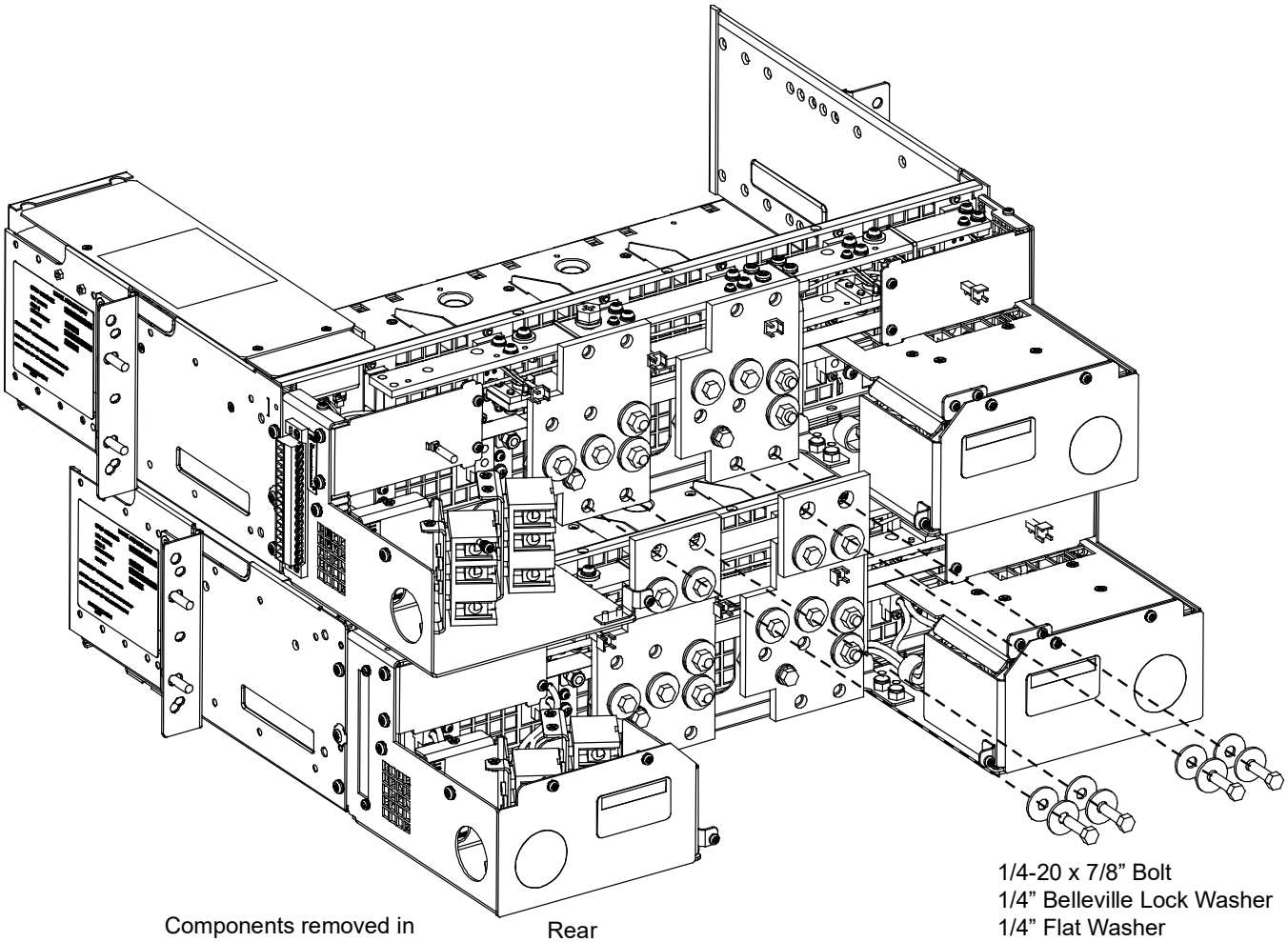
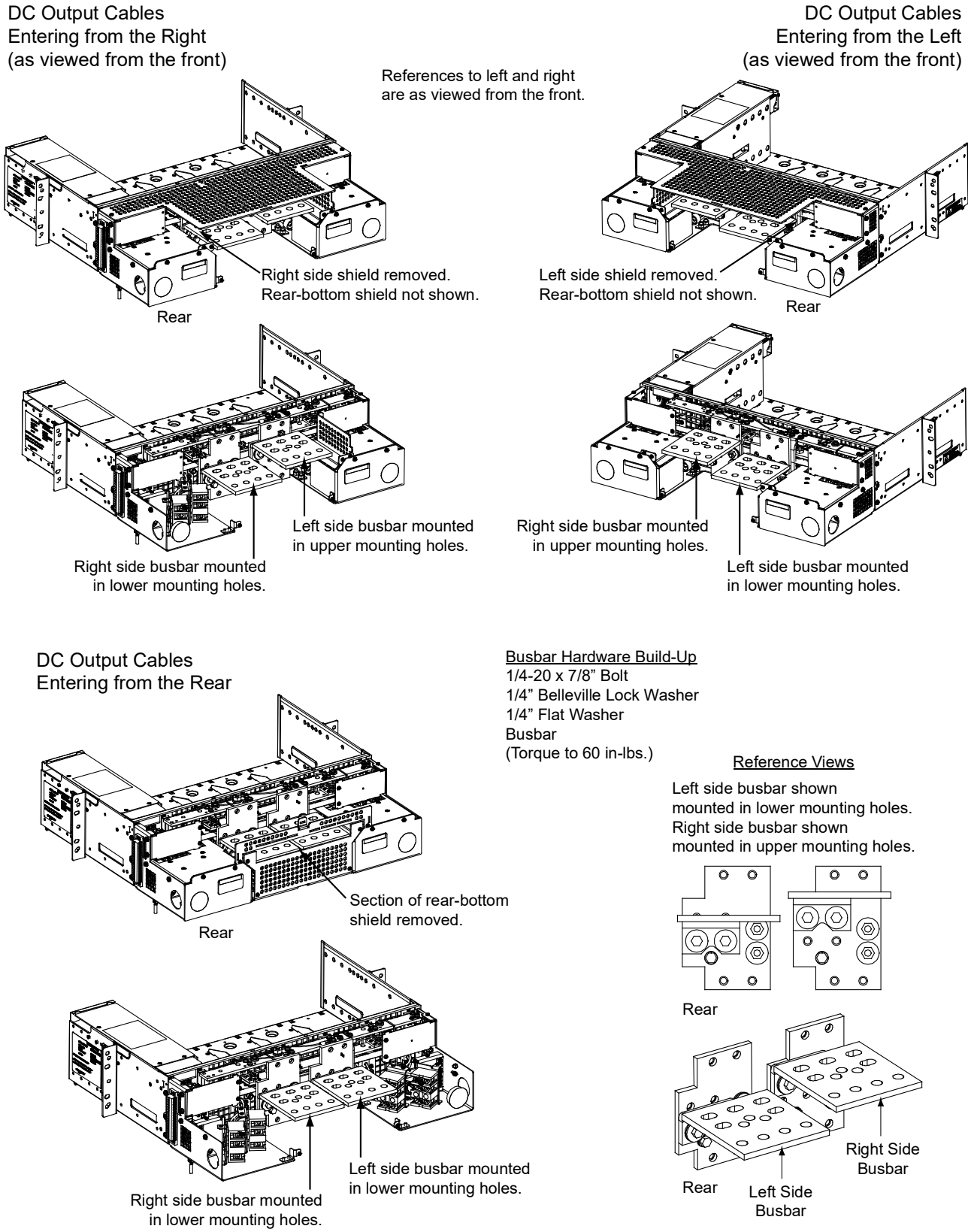


Figure 3.5 Changing the Direction of the DC Output Cables



Interconnecting the Rectifier Module Mounting Shelves CAN Bus

Each Spec. No. 588705000 rectifier module mounting shelf in the system is daisy-chained to the controller. An NCU CAN Bus connector is located at the top of each shelf and another at the bottom of each shelf. These connectors are used to interconnect the shelves to the controller. Refer to Figure 3.6 for connector locations. These connections are factory made for shelves factory installed. These connections must be made if a rectifier module mounting shelf(s) is field installed.

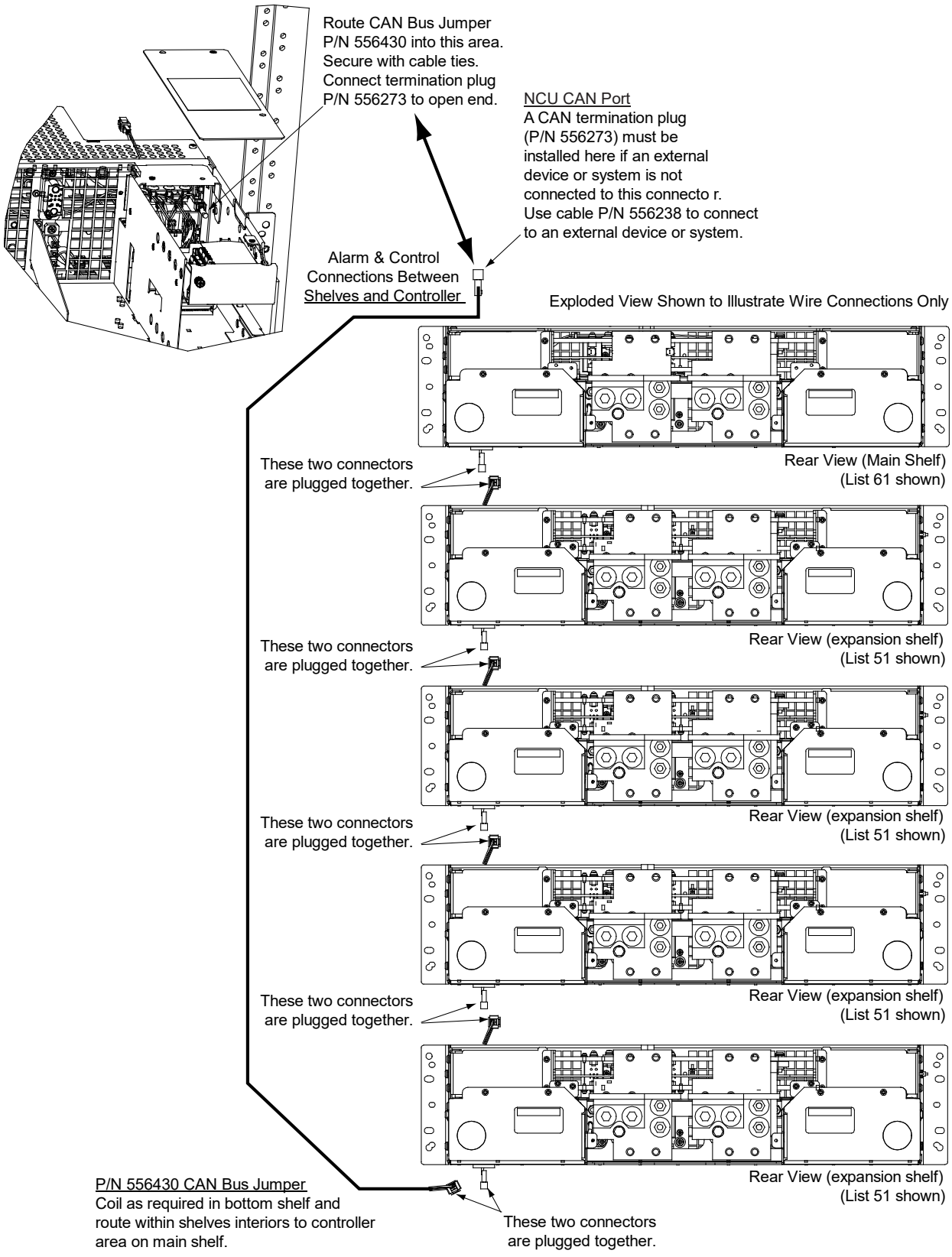
- The top connector of the top most rectifier module mounting shelf (main shelf) is internally connected to the controller.
- The bottom connector of a shelf plugs into the top connector on the shelf below it.
- The bottom connector on the bottom-most shelf must be terminated with a termination plug.

Procedure

NOTE! *Refer to Figure 3.6 as this procedure is performed.*

1. Connect the bottom connector on the main shelf to the top connector on the 1st expansion shelf.
2. Connect the bottom connector on the 1st expansion shelf to the top connector on the 2nd expansion shelf.
3. Connect the bottom connector on the 2nd expansion shelf to the top connector on the 3rd expansion shelf.
4. Connect the bottom connector on the 3rd expansion shelf to the top connector on the 4th expansion shelf.
5. Connect the bottom connector on the 4th expansion shelf (or bottom-most shelf for systems with less than four expansion shelves) to CAN Bus Jumper P/N 556430. Route CAN Bus Jumper P/N 556430 within the interiors of the shelves to the controller area in the main shelf. Terminate CAN Bus Jumper P/N 556430 with termination plug P/N 556273.

Figure 3.6 Control Bus Connections between Controller and Rectifier Module Mounting Shelves Spec. No. 588705000



4 Setting Switch Options

4.1 Switch Settings on IB2 Interface Board

Dip Switch SW1 on the IB2 board is used to set the communications address for this board.

Refer to Table 4.1 for SW1 settings. Refer to Figure 4.1 for SW1 location.

Perform the following procedure to verify the factory settings.

This procedure can also be used to make adjustments on a replacement circuit card.

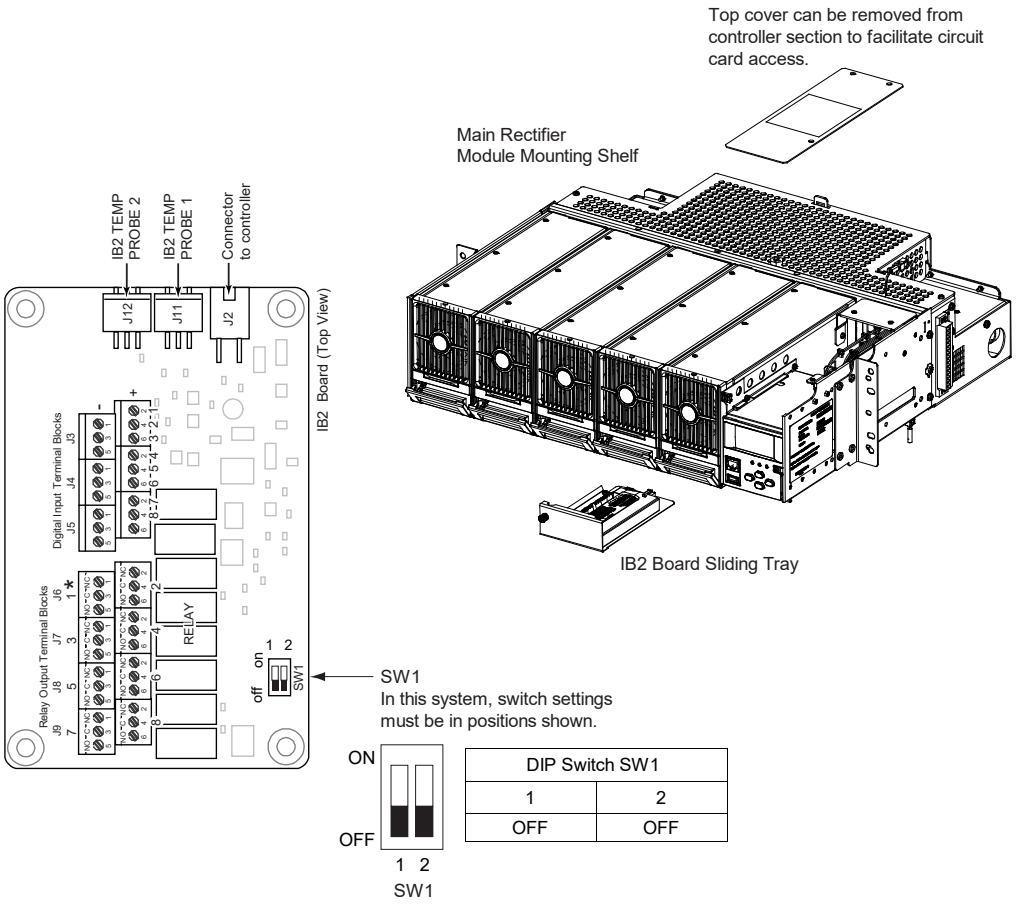
Procedure

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

Table 4.1 IB2 Interface Board Switch Settings

Setting	DIP Switch SW1	
	1	2
IB2	OFF	OFF

Figure 4.1 IB2 Interface Board Switch Location and Settings



5 Making Electrical Connections

5.1 Important Safety Instructions

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

5.2 Wiring Considerations

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

For wire size, branch circuit protection, crimp lug, and general wiring recommendations; refer to System Application Guide SAG582127100 and Power Data Sheet PD588705000.

Lugs should be crimped per lug manufacturer’s specifications.

5.3 Relay Rack Grounding Connection (Frame Ground)

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.

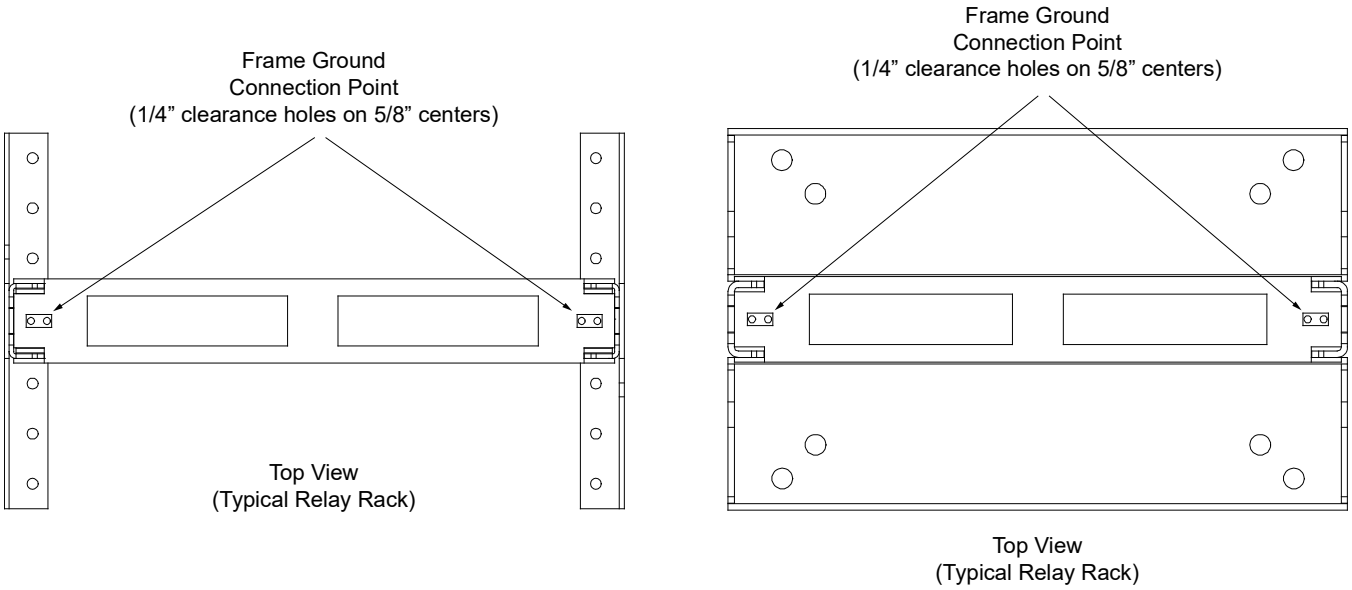
A customer's grounding network lead can be attached to the top of the relay rack. Provision is made for installing a lead with a two-hole lug that has 1/4" bolt clearance holes on 5/8" centers. When using 1/4-inch hardware, recommended torque is 84 in-lbs when a standard flat washer and lock washer are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

NOTE! *REMOVE TAPE FROM HOLE LOCATIONS BEFORE INSTALLING LUG.*

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

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

Figure 5.1 Relay Rack Frame Grounding Connection Points



5.4 AC Input and AC Input Equipment Grounding Connections to Rectifier Module Mounting Shelves

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

The rectifier module mounting shelves either provide a separate single phase AC input connection for each rectifier position (588705000 List 51 and 61), two 3 phase AC input connections (each phase of each input circuit supplies one rectifier module) (588705000 List 52 and 62), or the rectifier module mounting shelves may be equipped with AC line cords (588705000 List 53 and 63).

For 588705000 List 51, 52, 61, and 62; circular openings are provided in the side panels (side feed) and rear covers (rear feed) of the rectifier module mounting shelf for AC input and AC input equipment-grounding conductors. The openings accept 1-inch conduit fittings. AC input wiring should be provided to all rectifier module mounting positions, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.

NOTE! *A grounding conductor must be provided with each AC input feed.*

5.4.1 Connections to 588705000 List 51 and 61 (Single-Phase, Terminal Blocks)

Spec. No. 588705000 List 51 and 61 rectifier module mounting shelf provides a separate AC input connection for each rectifier module position in the shelf.

Refer to Figure 5.2 as this procedure is performed.

NOTE! *Repeat the following procedure for each rectifier module mounting shelf in the power system.*

Accessing Connections and Wire Routing

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

Making AC Input Connections

NOTE! *In each shelf, rectifier module mounting positions are number 1-6 from left to right as viewed from the front. Note that in the main shelf, the 6th position is occupied by the NCU Controller.*

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

Making AC Equipment Grounding Connections

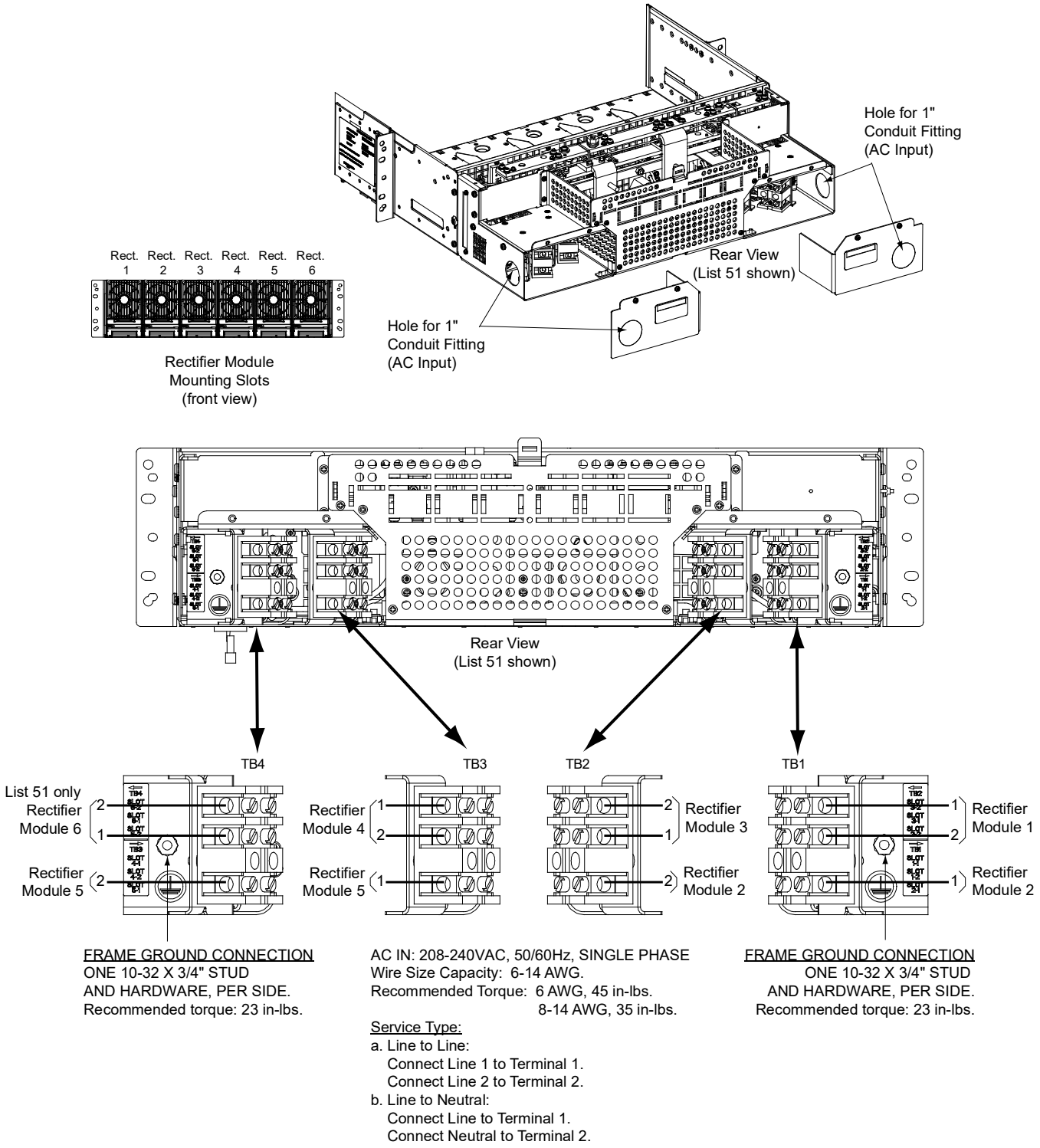
NOTE! *Make equipment grounding connections to earth ground, not to the branch circuit neutral conductor.*

1. Connect AC input equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Torque connections to value shown in Figure 5.2.

Reinstalling Covers

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

Figure 5.2 AC Input Connections to a 588705000 List 51 and 61 Rectifier Module Mounting Shelf (Single-Phase, Terminal Blocks)



5.4.2 Connections to 588705000 List 52 and 62 (Three-Phase, Terminal Blocks)

Spec. No. 588705000 List 52 and 62 rectifier module mounting shelf provides two 3-phase AC input connections. Each phase of each input circuit supplies one rectifier module.

Refer to Figure 5.3 as this procedure is performed.

NOTE! *Repeat the following procedure for each rectifier module mounting shelf in the power system.*

Accessing Connections and Wire Routing

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

Making AC Input Connections

NOTE! *In each shelf, rectifier module mounting positions are numbered 1-6 from left to right as viewed from the front. Note that in the main shelf, the 6th position is occupied by the NCU Controller.*

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

Making AC Equipment Grounding Connections

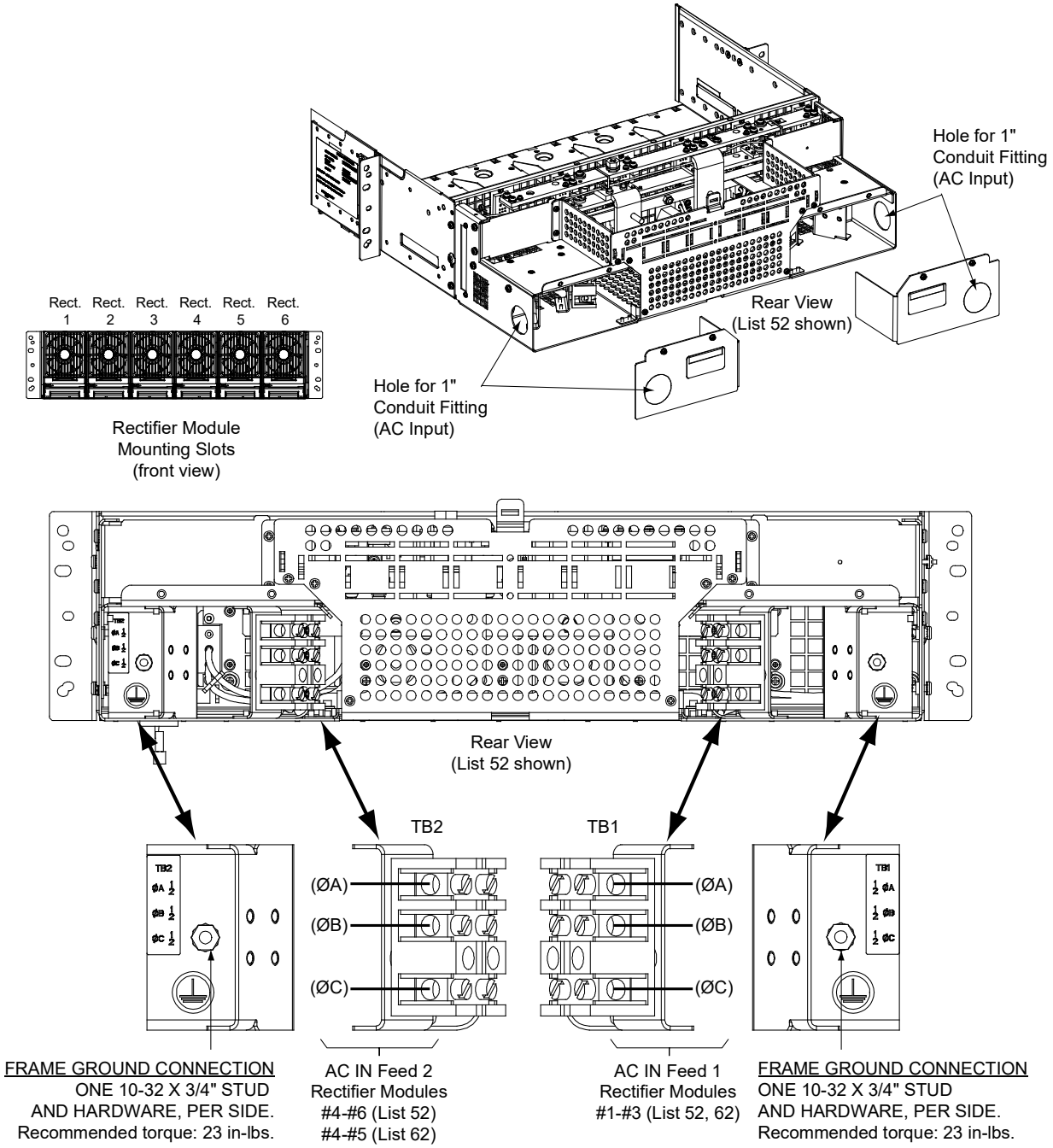
NOTE! *Make equipment grounding connections to earth ground, not to the branch circuit neutral conductor*

1. Connect AC input equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Torque connections to value shown in Figure 5.3.

Reinstalling Covers

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

Figure 5.3 AC Input Connections to a 588705000 List 52 and 62 Rectifier Module Mounting Shelf (Three-Phase, Terminal Blocks)



CONNECTIONS WITHIN THE SHELF

Mounting Position	TB1, Terminal			TB2, Terminal		
	1 (ØA)	2 (ØB)	3 (ØC)	1 (ØA)	2 (ØB)	3 (ØC)
Rect 1	L1	L2				
Rect 2	L1		L2			
Rect 3		L1	L2			
Rect 4				L1	L2	
Rect 5				L1		L2
Rect 6					L1	L2

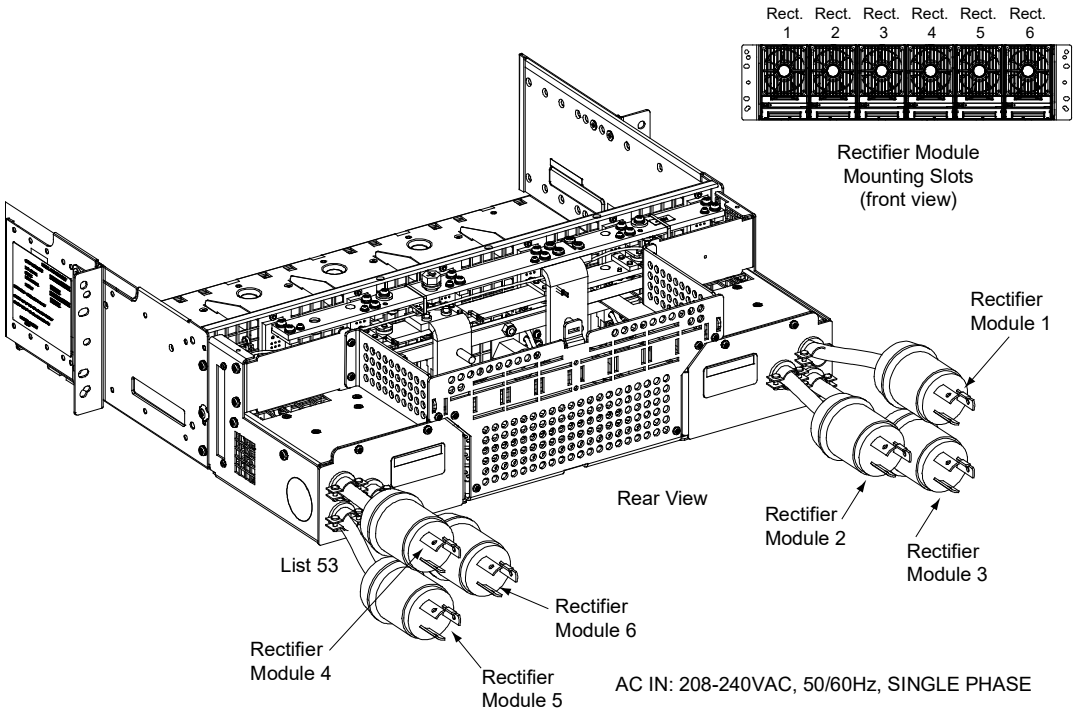
List 52 only

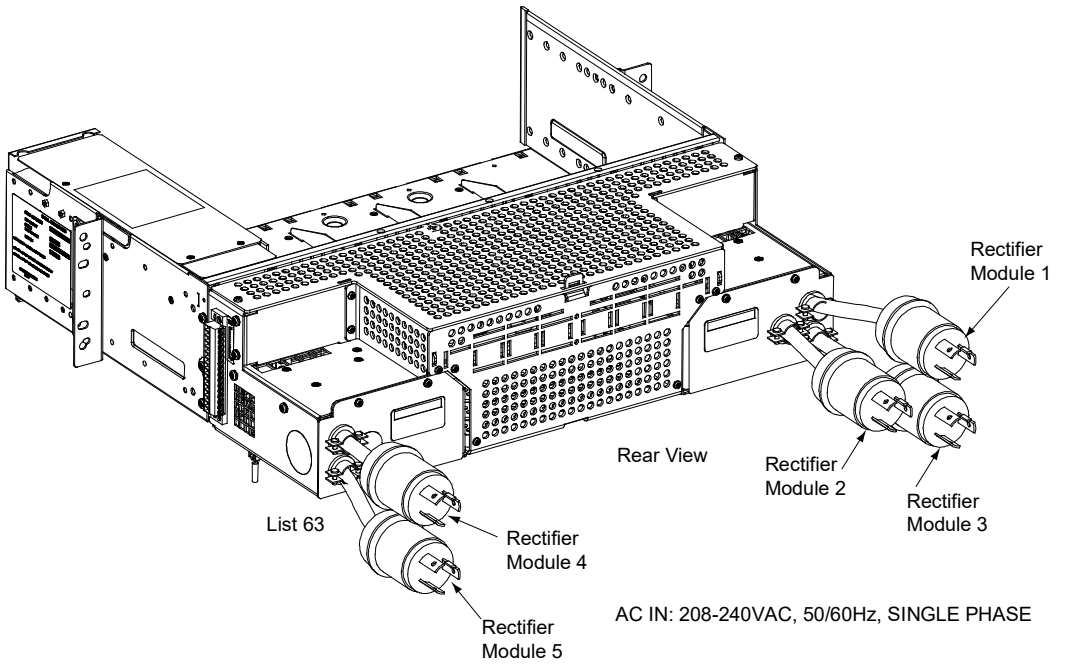
AC IN: 208-240VAC, 50/60Hz, THREE PHASE
Wire Size Capacity: 6-14 AWG.
Recommended Torque: 6 AWG, 45 in-lbs.
8-14 AWG, 35 in-lbs.

5.4.3 Connections to 588705000 List 53 and 63 (Single-Phase, Line Cords)

Spec. No. 588705000 List 53 and 63 rectifier module mounting shelf is provided with five (5) or six (6) factory installed AC input line cords (one for each rectifier module position). Plug each AC line cord into a properly wired AC outlet or distribution box. Refer to Figure 5.4.

Figure 5.4 AC Input Connections to a 588705000 List 53 and 63 Rectifier Module Mounting Shelf (Single-Phase, Line Cords)



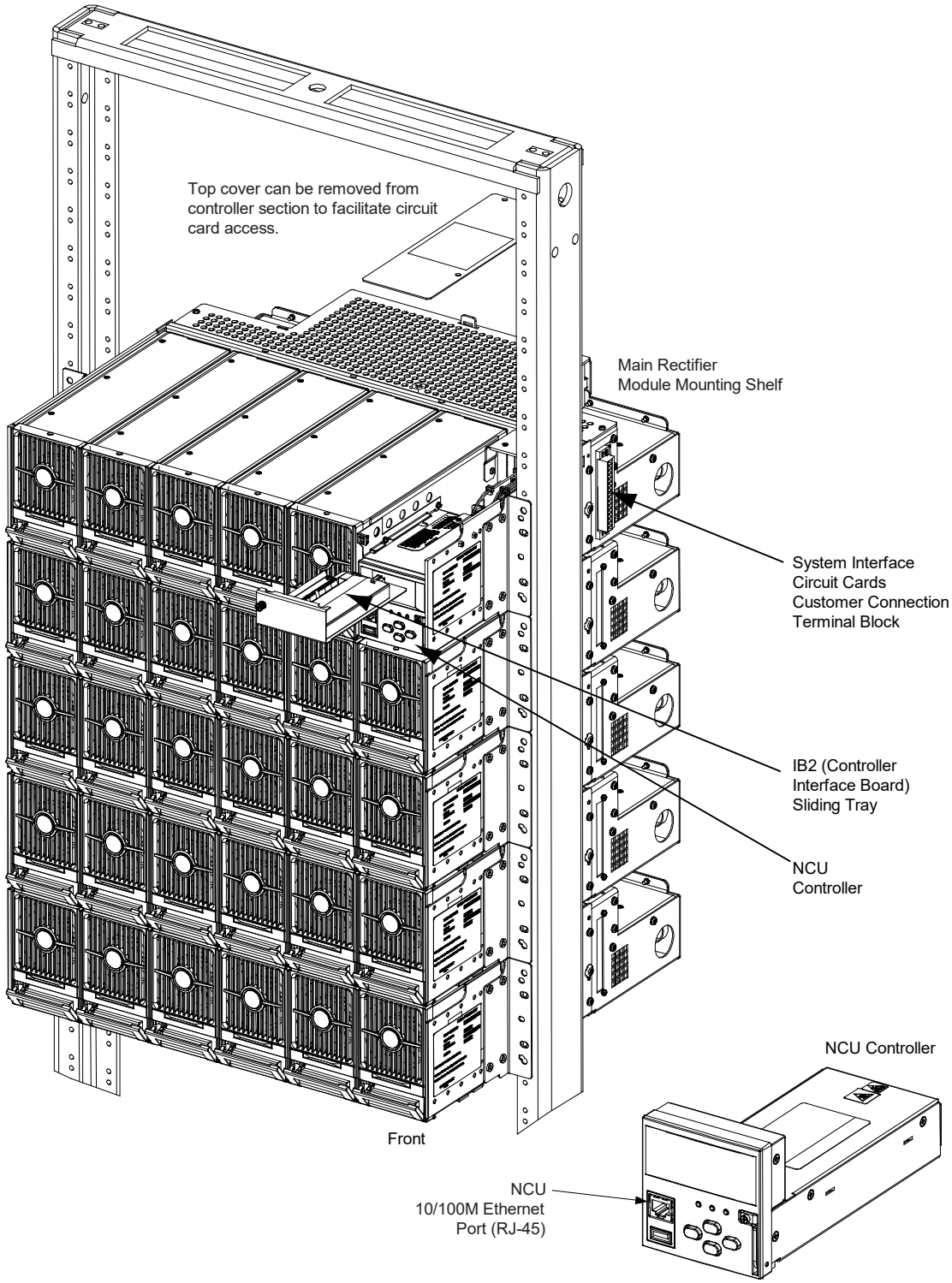


5.5 External Alarm, Reference, Monitoring, and Control Connections

5.5.1 External Alarm, Reference, Monitoring, and Control Connection Points Locations

Refer to Figure 5.5.

Figure 5.5 External Alarm, Reference, Monitoring, and Control Connection Points Locations



5.5.2 System Interface Circuit Cards Connections (if required)

Mounted in the main rectifier module mounting shelf is a system internal interface circuit card and a system external interface circuit card. Factory cabling is routed from the system interface circuit cards to terminal block TB5. Terminal block TB5 is located on the right side of the main rectifier module mounting shelf and is provided for customer connections to the system interface circuit cards. Refer to Figure 5.6 and Table 5.1. Refer also to Figure 5.6 for recommended torque. Note that terminal block TB5 is a screw-type terminal block and consists of two pieces that can be pulled apart for easy wiring.

System Internal Interface Circuit Card

The system internal interface circuit card provides connections for the following signals to terminal block TB5. Refer to Figure 5.6 and Table 5.1.

- Two (2) External Battery Fuse Alarm Inputs
- Four (4) External Load Fuse Alarm Inputs
- One (1) Load Shunt Input
- One (1) Battery Shunt Input
- One (1) LVD Driver Output
- One (1) LVD Sense Input
- RS-485 Port

Battery Fuse Alarm Input Rating: Refer to the following.

a) The default is 400mV. Anything greater than 400mV causes alarm to be raised.

Load Fuse Alarm Input Signal: Refer to the following.

a) Anything greater than 19V causes alarm to be raised.

Battery and Load Shunt Input Rating: Refer to the following.

a) 1mV – 150mV.

LVD Driver Output Rating: Refer to the following.

a) Mono-stable, normal state is 60V or less at 1A continuous rating. Normally closed contactors are used for mono-stable option.

b) Bi-Stable, normal state less than 60V and 2A at 500ms – 1000ms pulse rating.

LVD Sense Input Rating: Refer to the following.

a) Normal state is at 60V or less. A RTN signal indicates the contactor is open.

System External Interface Circuit Card

The system external interface circuit card provides direct connections for the following. Refer to Figure 5.6 and Table 5.1.

- RS-232 (used for communication with a DPU)
- Two (2) Temperature Probe Inputs (See Temperature Probes on page 21.)

Figure 5.6 System Interface Connections

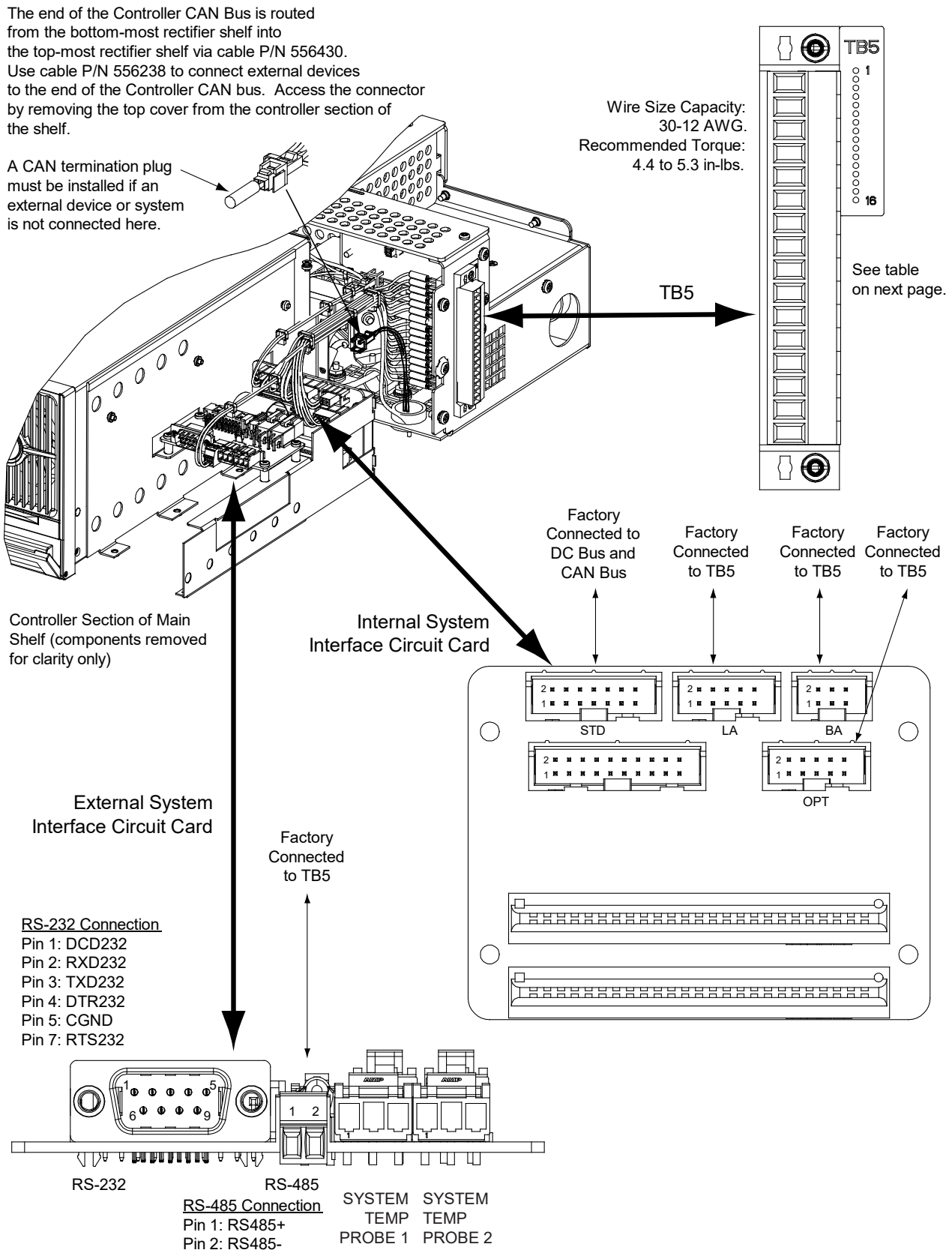


Table 5.1 System Interface Circuit Cards Signals Available on TB5

RS-485 (System External Interface Circuit Card)	
Signal	**TB5**
RS-485 (+)	1
RS-485 (-)	2
OPT (System Internal Interface Circuit Card)	
Signal	**TB5**
Battery 2 Shunt (-)	3
Battery 2 Shunt (+)	4
Load Shunt (-)	5
Load Shunt (+)	6
LVD2 Sense (-)	7
LVD2 Drive (+)	8
SPD (-)	not available
LVD2 Drive (-)	9
SPD (+)	not available
LVD2 Sense (+)	10
BA (System Internal Interface Circuit Card)	
Signal	**TB5**
Battery Fuse Alarm 1	11
Battery Fuse Alarm 2	12
Battery Fuse Alarm 3	not available
Battery Fuse Alarm 4	not available

LA (System Internal Interface Circuit Card)	
Signal	**TB5**
Load Fuse Alarm 1	13
Load Fuse Alarm 2	14
	Load Fuse Alarm 3
Load Fuse Alarm 4	16
Load Fuse Alarm 5	not available
Load Fuse Alarm 6	not available
Load Fuse Alarm 7	not available
Load Fuse Alarm 8	not available
Load Fuse Alarm 9	not available
Load Fuse Alarm 10	not available
STD (System Internal Interface Circuit Card)	
Signal	**TB5**
Battery 1 Shunt (-)	not available
LVD1 Drive (+)	not available
LVD1 Drive (-)	not available
Battery 1 Shunt (+)	not available
LVD1 Sense (-)	not available
LVD1 Sense (+)	not available

5.5.3 IB2 Controller Interface Board) Connections (if required)

The IB2 (Controller Interface Board) provides connection points for digital inputs, programmable relay outputs, and temperature probes. The IB2 interface board is mounted inside the main rectifier module mounting shelf. Refer to Figure 5.5.

Digital Inputs and Programmable Relay Outputs

Digital input and relay output leads are connected to screw-type terminal blocks located on the IB2. Recommended torque for these connections is 2.2 in-lbs. Refer to Figure 5.7 for terminal locations. Refer to Table 5.2 and Table 5.3 for pin-out information.

Digital Inputs

Connect up to eight (8) digital inputs to the IB2. Note that you must supply both paths for the digital input (either a positive or a negative signal and the opposite polarity return path). Observe proper polarity. Refer to Figure 5.7 for terminal locations and Table 5.2 for pin-out information.

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

Digital Input Ratings: Refer to the following.

a) Maximum Voltage Rating: 60V DC.

b) Active High: > 19V DC.

c) Active Low: < 1V DC.

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

Programmable Relay Outputs

The IB2 provides eight (8) programmable alarm relays with dry Form-C contacts. Connect up to eight (8) relay outputs to the IB2. Refer to Figure 5.7 for terminal locations and Table 5.3 for pin-out information.

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

Relay Ratings: Refer to the following.

a) Steady State: 0.5 A @ 60V DC; 1.0 A @ 30V DC.

b) Peak: 3 A @ 30V DC.

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

Temperature Probes

NOTE! *Each temperature probe consists of two pieces that plug together to make a complete probe. See SAG582127100 for part numbers and descriptions.*

Temperature probes are connected to the IB2 (Controller Interface Board) and/or the system external interface board mounted inside the main rectifier module mounting shelf. See Figure 5.6 and Figure 5.7.

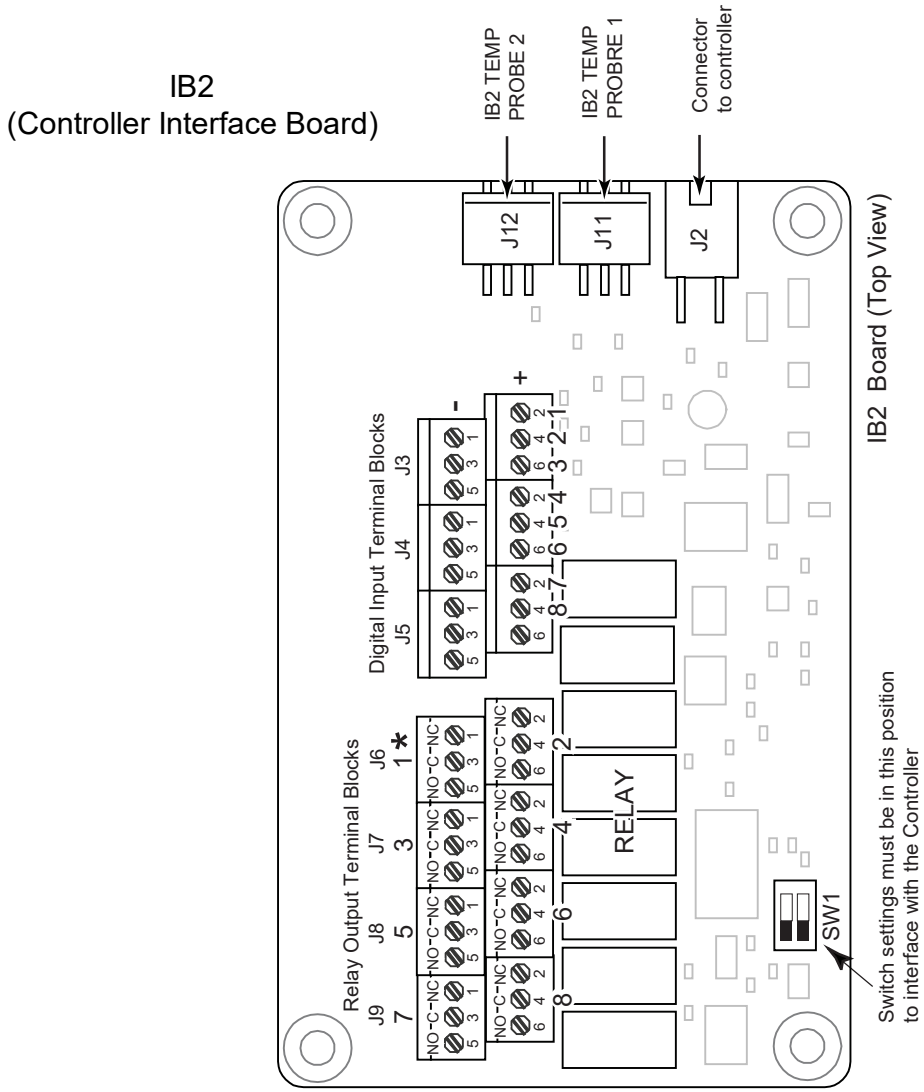
Up to two (2) temperature probes can be connected to the IB2. Up to two (2) additional temperature probes can be connected to the system external interface board. Any combination of the four (4) temperature probes can be programmed to monitor ambient temperature and/or battery temperature. A temperature probe set to monitor battery temperature can also be used for the rectifier battery charge temperature compensation feature, or the battery charge temperature compensation feature can be programmed to use the average or highest value of all battery temperature probes. The battery charge temperature compensation feature allows the

controller to automatically increase or decrease the output voltage of the system to maintain battery float current as battery temperature decreases or increases, respectively. Battery life can be extended when an optimum charge voltage to the battery with respect to temperature is maintained. A temperature probe set to monitor battery temperature can also be used for the BTRM (Battery Thermal Runaway Management) feature. The BTRM feature lowers output voltage when a high temperature condition exists to control against battery thermal runaway.

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

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

Figure 5.7 IB2 (Interface Board) Connections



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

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

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

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

Table 5.2 Programmable Digital Inputs – IB2

Programmable Digital Input	IB2 Pin No.		Factory Wiring	Default Digital Input Function	Customer Defined Digital Input Function
1	J3-2	+	The digital inputs may be preprogrammed for specific functions and have factory wiring connected. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.	The digital inputs may be preprogrammed for specific functions. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.	
	J3-1	–			
2	J3-4	+			
	J3-3	–			
3	J3-6	+			
	J3-5	–			
4	J4-2	+			
	J4-1	–			
5	J4-4	+			
	J4-3	–			
6	J4-6	+			
	J4-5	–			
7	J5-2	+			
	J5-1	–			
8	J5-4	+	--	ESTOP	
	J5-3	–	--		

Reference Voltages	IB2 Pin No.	Factory Wiring
-48VDC	J5-5	-48 VDC is factory supplied to J5-5.
Ground	J5-6	Ground is factory supplied to J5-6.

NOTE! *Digital Input #8 is factory configured for the ESTOP function. -48 VDC is factory supplied to J5-5. Ground is factory supplied to J5-6. To use ESTOP, the customer needs to jumper J5-3 (DI8-) to J5-5 (-48 VDC) and connect the ESTOP switch between J5-4 (DI8+) and J5-6 (ground). ESTOP switch closure activates the ESTOP function. See "ESTOP Function" on page 44.*

Table 5.3 Programmable Relay Outputs – IB2

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

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

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

5.5.4 Controller CAN Bus

The end of the Controller CAN Bus is routed into the controller section of the main rectifier module mounting shelf via cable P/N 556430. Use cable P/N 556238 to connect external devices to the end of the Controller CAN bus. Access the Controller CAN Bus connector by removing the top cover from the controller section of the main rectifier module mounting shelf. A CAN termination plug must be installed if an external device or system is not connected here. Refer to Figure 3.6, Figure 5.6, and Table 5.4.

Table 5.4 Controller CAN Bus Cables

P/N 556430 (Int. CAN) Cable		
Signal	**Wire Color**	**Pinouts**
CAN-H	Black	CANx-1
CAN-L	Red	CANx-2
P/N 556238 (Ext. CAN) Cable		
Signal	**Wire Color**	**Pinouts**
CAN-H	Black	CANx-1
CAN-L	Red	CANx-2

Connecting a Device or System to the Controller CAN Bus

A supporting device or system may be connected to the Controller CAN Port. Refer to Figure 3.6 and Figure 5.6 for location. A 10' long Controller CAN Bus Cable is available (P/N 556238) to extend the end of the Controller CAN Bus outside the main rectifier module mounting shelf to other equipment. See Table 5.4 for cable pinouts and wire colors. Refer also to the external device's or system's instruction manual.

Procedure

1. Remove the CAN termination plug from the Controller CAN Port (see Figure 3.6 and Figure 5.6 for location). Connect the device or system to the Controller CAN Port using cable P/N 556238. Refer to Table 5.4 for cable pinouts and wire colors. Note that you may have to cut the end off of the cable if it is not compatible with the device's CAN Bus connection points. Refer also to the external device's or system's instruction manual.

2. Reboot the Controller
   Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.
   Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.

Optional SM-Temp Module

The analog output of the SM-Temp Module may be connected to a controller temperature port input. In lieu of connecting the analog output of the SM-TEMP module to a controller temperature port input, the SM-TEMP module can simply be connected at the end of the Controller CAN Bus. Refer to the SM-Temp Module Instructions (UM547490) for details.

Procedure

1. Remove the CAN termination plug from the Controller CAN Port (see Figure 3.6 and Figure 5.6 for location). Connect the SM-Temp Module CAN Bus to the Controller CAN Port using cable P/N 556238. Refer to Table 5.1 for cable pinouts and wire colors. Note that you will have to cut the end off of the cable to connect it to the SM-Temp Module's CAN Bus connection points. Ensure the last SM-Temp Module (or if only one) has a CAN termination strap as shown in the SM-Temp Module Instructions (UM547490).

5.6 Controller Ethernet Connection (if required)

The controller provides a Web Interface via an Ethernet connection to a TCP/IP network. This interface can be accessed locally on a computer or remotely through a network. An RJ-45 10BaseT jack is provided on the front of the controller for connection into a customer's network. This jack has a standard Ethernet pin configuration scheme, twisted pair. Refer to Figure 5.5 for location and Table 5.5 for pin outs. Use shielded Ethernet cable (grounded at both ends). Note that the RJ-45 jack is connected to chassis ground. Refer to the NCU Instructions (UM1M830BNA) for operational details.

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

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

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

Table 5.5 RJ-45 Ethernet Port Pin Configuration

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

5.7 -48V DC Output Connections

Important Safety Instructions

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

ALERT! Observe proper polarity when making output connections.

Recommended Torques

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

General

DC output leads are connected to the output busbars located on the back of the rectifier shelves. These busbars provide 3/8” clearance holes for installation of customer-provided two hole lugs that have 1 inch centers and 3/8 inch bolt clearance holes. Customer must order or provide lug mounting hardware.

You connect DC output leads per a single rectifier shelf in the system or for pairs of rectifier shelves in the system (depending on how many shelves are in the system). Refer to Figure 5.8.

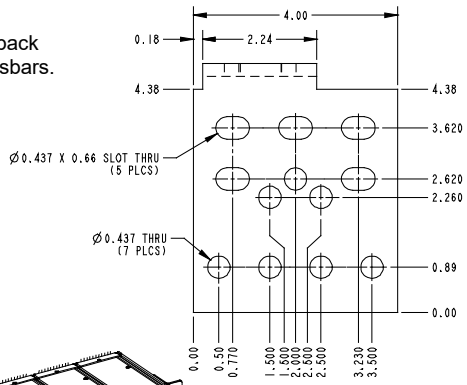
DC output cables can either enter from the right, from the left, or from the rear. The shelf should have been configured for your installation site per the “Changing the Direction of the DC Output Cables” procedure on page 5. Refer to Figure 5.9 for typical lug layout diagrams.

After making DC output connections, re-install any rear shield removed in “Mounting the Rectifier Module Mounting Shelf(s) to a Relay Rack” on page 4.

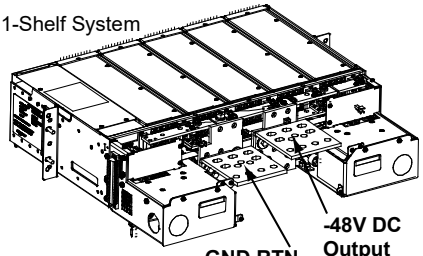
Figure 5.8 -48V DC Output Connections

-48V DC OUTPUT CONNECTIONS
3/8 Clearance Holes on 1" Centers
(Customer must order or supply
lug mounting hardware.)
Maximum Lug Width:
1.31" for three (3) lugs per polarity.
1.78" for two (2) lugs per polarity.

DC Output Connection Options
1. Route cables left, right, or out the back by repositioning the lug landing busbars.
2. Make connections to each shelf (List 10 and 11).
3. Make connections to every two (2) shelves (List 20 and 21).

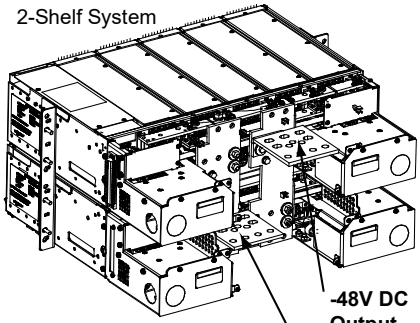


1-Shelf System



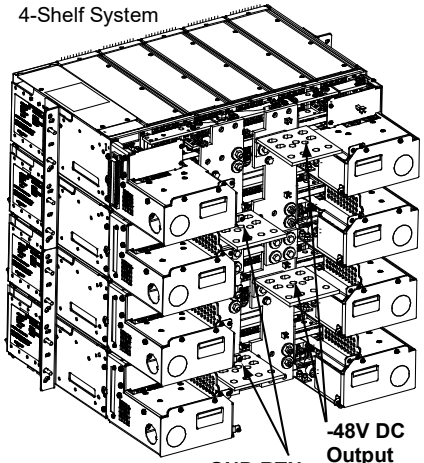
(1) connection per single shelf.

2-Shelf System



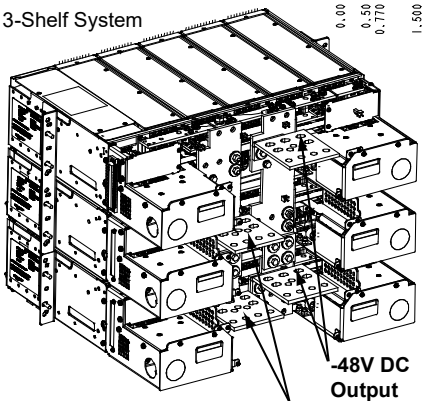
(1) connection per two shelves.

4-Shelf System



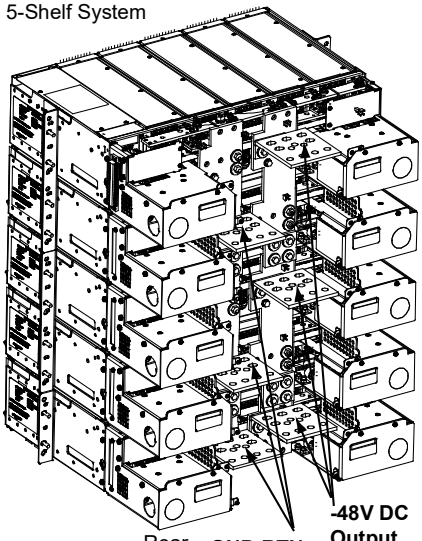
(1) connection per two shelves (top).
(1) connection per two shelves (bottom).

3-Shelf System



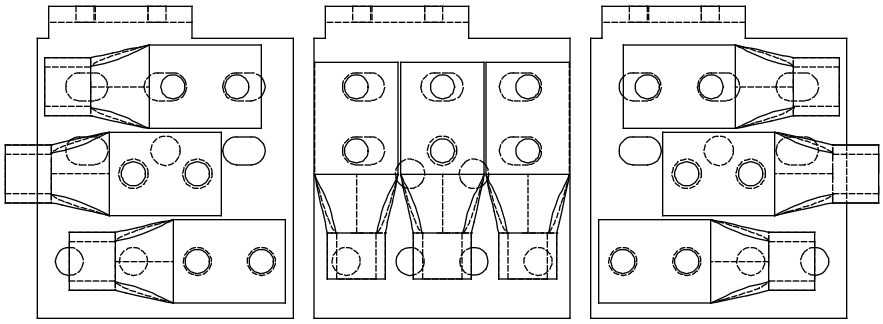
(1) connection per two shelves (top).
(1) connection per single shelf (bottom).

5-Shelf System

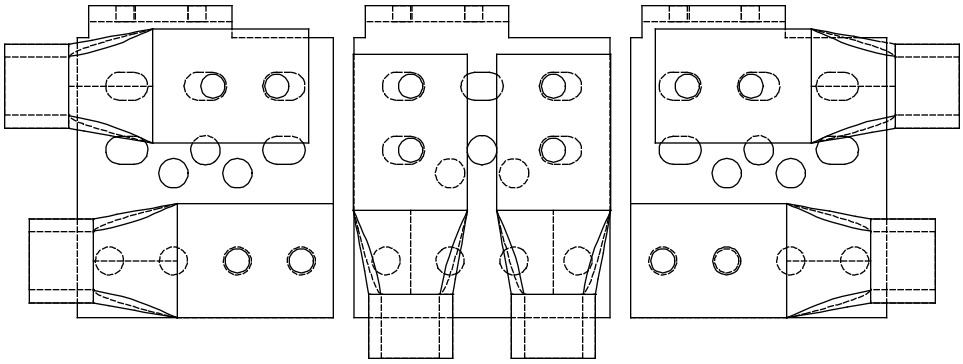


(1) connection per two shelves (top).
(1) connection per two shelves (middle).
(1) connection per single shelf (bottom).

Figure 5.9 Typical Lug Layout Diagrams



Three (3) Lugs Layout Diagram
Maximum Lug Tab Width: 1.31”



Two (2) Lugs Layout Diagram
Maximum Lug Tab Width: 1.78”

6 Installing the Rectifier Modules and Initially Starting the System

6.1 Installing the Rectifier Modules into Spec. No. 588705000 Rectifier Module Mounting Shelves

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

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

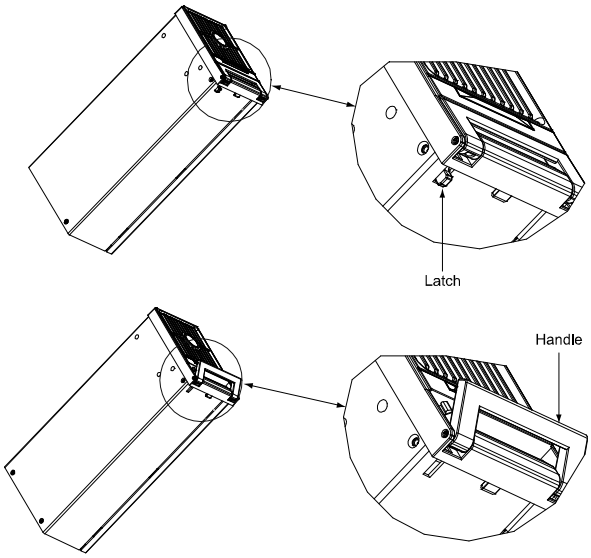
ALERT! To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing a rectifier module. **NEVER** hold the handle in the closed position when installing a rectifier module into a shelf.

NOTE! 588705000 List 52 and 62 Rectifier Mounting Shelves Only (3 Phase Input): *One three-phase input feeds the three rectifier modules on the left-hand side of the shelf. The second three-phase input feeds the two (List 62) or three (List 52) rectifier modules on the right-hand side. To maintain phase balance, install rectifier modules in groups of three (List 52); that is, fill all three mounting positions on the left and/or all three on the right. To maintain phase balance, install rectifier modules in groups of two or three (List 62); that is, fill all three mounting positions on the left and/or all two on the right.*

6.1.1 Procedure

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

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



7 Initially Starting, Configuring, and Checking System Operation

7.1 Important Safety Instructions

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

7.2 Initial Startup Preparation

- Ensure that all blocks, except the last one, in the “Installation Acceptance Checklist” starting on page 1 have been checked.
- Ensure that rectifier module mounting positions are filled by a rectifier module or a blank cover panel as desired. It is acceptable for positions to be left vacant.
- Refer to the configuration drawing (C-drawing) supplied with your power system documentation for factory settings of adjustable parameters.

7.3 Initially Starting the System

Procedure

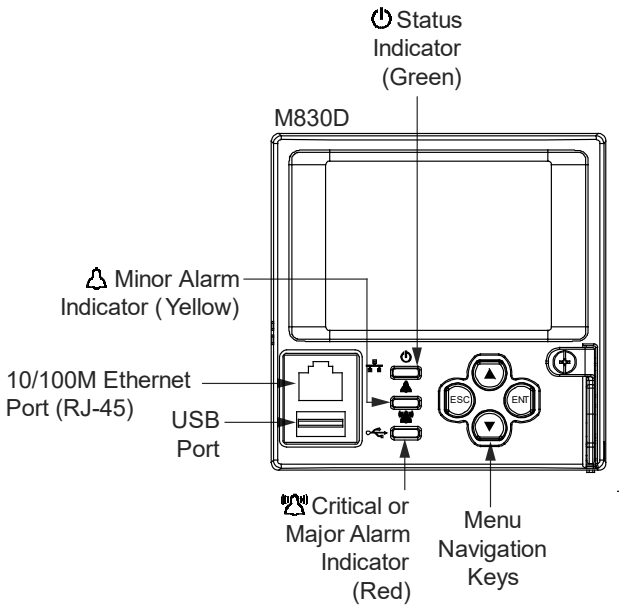
1. Apply DC input power to the system by closing the external DC disconnect(s) or protective device(s) that supplies battery power to the system, if furnished.
2. Apply AC input power to the system by closing ALL external AC disconnects or protective devices that supply AC power to the rectifier module mounting shelves. Rectifiers automatically start.

7.4 NCU Controller Initialization

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

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

Figure 7.1 NCU Local Indicators and Navigation Keys

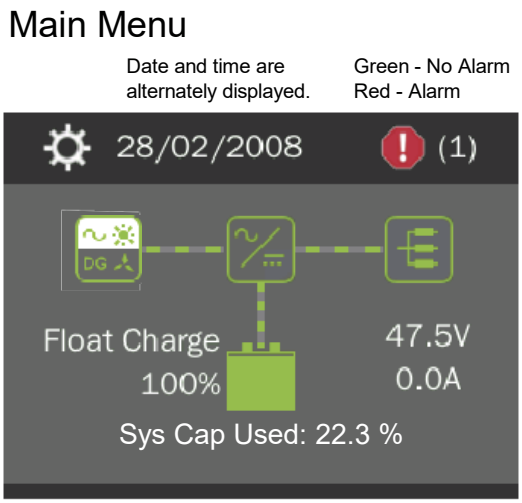


Procedure

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

1. After the NCU is powered on, the display shows the "logo" screen. The controller is initializing.
2. When initialization is complete, the language screen appears. Press the up or down arrow key to select the desired language. Press the ENT key to confirm the selection.
3. The Main Menu displays. See Figure 7.2.

Figure 7.2 NCU Local Display Main Menu



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

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

NOTE! *"Sys Cap Used" is based on the number of installed rectifiers.*

4. System information is displayed in multiple screens. Press the ESC key to view other system information. Press the down arrow key to view the next screen. Press the ESC key to return to the Main Menu.

5. From the Main Menu, press the UP and DOWN keys to highlight the desired Menu graphic in the Main Menu. Press the ENT key to enter the selected menu.

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

6. Verify and set the NCU controller as required for your application. Refer to the NCU Instructions (UM1M830BNA) for procedures. Note that you will have to program the NCU for any temperature probes and external inputs/outputs connected to the IB2 Interface Board. Refer also to "NCU Start Wizard" on page 39.

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

7.4.1 NCU Start Wizard

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

Verifying the Configuration File

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

Procedure

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

Checking Basic System Settings

Navigate through the controller menus and submenus to check system settings. You can adjust any parameter as required. Note that these settings can also be checked (and changed if required) via the WEB Interface. Refer also to "NCU Start Wizard" on page 39.

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

Procedure

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

Table 7.1 shows the menu navigation for some basic settings. Refer to the separate NCU Manual (UM1M830BNA) supplied with your power system for complete Local Display menus.

Table 7.1 NCU Basic Settings Menu Navigation

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

Changing Battery Capacity Rating in the NCU

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

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

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

   Web Menu Navigation:
   Settings Menu / Battery Tab / Batt1 Rated Capacity and Batt2 Rated Capacity.

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

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

Local Menu Navigation:
Main Menu / Settings Icon / Batt Settings / Basic Settings / Reset Batt Cap.

Web Menu Navigation:
Settings Menu / Battery Tab / Reset Battery Capacity.

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

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

When rectifiers are all installed prior to applying power and starting the system, the order in which the NCU identifies the rectifiers is by serial number (lowest serial number is Rect 1, next lowest is Rect 2, etc.). If you prefer the NCU to identify the rectifiers by position in the system, perform the following procedure.

Upon power up, the NCU arbitrarily assigns Feed AC1, AC2, or AC3 to each rectifier. This assignment is used to display rectifier AC input feed voltage(s). The User may reassign the feed to each rectifier per your specific installation by following the procedure below.

Local Menu Navigation:
None.

Web Menu Navigation:
Refer to the NCU Instructions (UM1M830BNA) for detailed instructions.

NCU Alarm Relay Check

To verify operation of the external alarm relays, use the NCU alarm relay test feature. Refer to the NCU Instructions (UM1M830BNA) for instructions in using this feature.

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

7.5 Checking System Status

Procedure

1. Observe the status of the indicators located on the controller and rectifiers. If the system is operating normally, the status of these is as shown in Table 7.2.

Table 7.2 Status and Alarm Indicators

Component	Indicator		Normal State
NCU		Status (Green)	On
		Minor (Yellow)	Off
		Critical or Major Alarm (Red)	Off
Rectifier Modules	 or 	Power (Green)	On
	 or 	Protection (Yellow)	Off
	 or 	Alarm (Red)	Off

7.6 Final Steps

Procedure

1. If any controller configuration settings were changed, refer to the NCU Instructions (UM1M830BNA) and save a copy of the configuration file. This file can be used to restore the controller settings, if required, at a later date.

NOTE! *Note that provided on a USB drive furnished with the system is a controller configuration drawing (C-drawing) and the controller configuration files loaded into the controller as shipped.*

2. Close the distribution cabinet's front door and turn the latch clockwise to secure the door (system's in a relay rack), or close the system's enclosure door.
3. Verify all rectifier modules and the controller are fully seated, latched, and the latch handle screws secured.
4. Verify there are no external alarms and the local indicators are as shown in Table 7.2.

8 Operating Procedures

8.1 Controller and Rectifiers

For operation instructions on these units, refer to the following documents.

- NCU Controller Instructions (UM1M830BNA)
- Rectifier Instructions (UM1R483500E)

8.2 ESTOP Function

An ESTOP switch can be wired to the IB2-1 Controller Interface Board to activate the ESTOP function (see Table 5.2). The ESTOP function shuts down and locks out the rectifiers. The controller will remain operational and the loads will be sustained by the battery voltage, if battery is connected.

When the ESTOP signal is removed, rectifiers will remain off. The rectifiers will restart when the input power is removed and restored after 30 seconds or more (until the LEDs on the modules extinguish).

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

8.3 NCU Battery Charge Current Limit Feature

Functionality: After a commercial AC failure or when some battery cells are permanently damaged, the current to the batteries can be quite extensive. To avoid overheating or further damages to the battery, the NCU can be programmed to limit the battery current to a preset level by limiting the charging voltage of the rectifiers. Should the battery current still exceed a higher preset value, an alarm is issued.

The controller limits the current going to the batteries based on the “Battery Current Limit” set point which is a percentage of the battery capacity in C10. For example, 0.1C10 would mean 10% of the battery capacity.

In this system, the NCU Battery Charge Current Limit feature is set to be enabled. If enabled, battery charge current is limited to the value set in the NCU Controller, as long as battery voltage is above 47VDC. Refer to the NCU Controller Instructions (UM1M830BNA) for more information.

8.4 Local Controls and Indicators

Refer to the Controller and Rectifier Instructions for descriptions of the local controls and indicators located on these units.

9 Maintenance

9.1 System Maintenance Procedures

It is recommended to perform the maintenance procedures listed in Table 9.1 every 6 months to ensure continual system operation.

Table 9.1 Maintenance Procedures to be Performed at 6-Month Intervals

PROCEDURE	REFERENCED IN
Check ventilation openings for obstructions such as dust, papers, manuals, etc.	--
Inspect and tighten all installer's connections.	"Making Electrical Connections" starting on page 14.

NOTE! *This table may be reproduced as necessary to record and document system performance.*

9.2 Adding a Rectifier Module to an Existing Rectifier Module Mounting Shelf Spec. No. 588705000

To increase system current capacity, a rectifier module can easily be added to an existing rectifier module mounting shelf Spec. No. 588705000 that contains an empty rectifier module mounting position.

It is recommended that the current limit point be checked whenever a rectifier module is added to or removed from the power system. Refer to "Checking the NCU Current Limit Point after Adding or Removing a Rectifier" on page 46.

The rectifier module being added is assigned by the NCU the lowest available identification number. If desired, you can change the identification number. See "Configuring the NCU Identification of Rectifiers and Assigning which Input Feed is Connected to the Rectifiers" on page 41.

- For rectifier module installation instructions, refer to "Installing the Rectifier Modules into Spec. No. 588705000 Rectifier Module Mounting Shelves" on page 35.

9.3 Installing a Field Expansion Rectifier Module Mounting Shelf Spec. No. 588705000

Refer to "Mounting System Components in a Relay Rack" on page 4.

10 Troubleshooting and Repair

10.1 Contact Information

Refer to Section 4154 (provided with your customer documentation) for support contact information.

10.2 Controller and Rectifiers

For troubleshooting and repair instructions on these units, refer to the following documents.

- NCU Controller Instructions (UM1M830BNA)
- Rectifier Instructions (UM1R483500E)

10.3 NCU Controller Configuration

If any NCU Controller configuration settings were changed, refer to the NCU Instructions (UM1M830BNA) and save a copy of the configuration file. This file can be used to restore the NCU Controller settings, if required, at a later date.

- Note that provided on a USB drive furnished with the system is an NCU configuration drawing (C drawing) and the NCU configuration files loaded into the NCU as shipped.

10.4 System Troubleshooting Information

This system is designed for ease in troubleshooting and repair. The various indicators as described in “Local Controls and Indicators” on page 35 and in the Controller and Rectifier Instructions are designed to isolate failure to a specific element. Once the faulty element has been identified, refer to “Refer to the NCU Instructions (UM1M830BNA) for a procedure to clear the alarm.

Replacement Information” on page 47 and “Replacement Procedures” on page 47.

Troubleshooting Alarm Conditions on the NCU Controller

The NCU Controller displays alarm conditions as listed in the “Resolving Alarms” section of the NCU Instructions (UM1M830BNA). Programmable external alarm relays are also available. Refer to “Digital Inputs and Programmable Relay Outputs” on page 25 and the configuration drawing (C-drawing) supplied with your power system documentation for your alarm relay configurations.

The NCU’s Active Alarm and Alarm History submenus allow the User to view alarm details. Refer to the NCU Instructions (UM1M830BNA) to access these menus.

Checking the NCU Current Limit Point after Adding or Removing a Rectifier

If a rectifier is added to the power system, the system current limit point will automatically increase by the percentage each existing rectifier was set to provide prior to the addition.

If a rectifier is removed from the system (and the Rect Comm Fail alarm is reset), the current limit point will remain unchanged unless the capacity of the remaining rectifiers is not sufficient to maintain the present current limit point. If that happens, the current limit point will automatically increase to the maximum (121% of the remaining rectifiers).

It is recommended that the current limit point be checked whenever a rectifier is added to or removed from the power system.

Refer to the NCU Instructions (UM1M830BNA) for a procedure.

Clearing a Rectifier Communications Fail Alarm after Removing a Rectifier

If a rectifier module is removed from the system, a rectifier communications failure alarm is generated. If the rectifier module will not be replaced, the alarm should be cleared.

Refer to the NCU Instructions (UM1M830BNA) for a procedure.

Clearing a Rectifier Lost Alarm

If the NCU Controller resets while a rectifier communications fail alarm is active, the rectifier communications fail alarm is replace with a rectifier lost alarm.

Refer to the NCU Instructions (UM1M830BNA) for a procedure to clear the alarm.

10.5 Replacement Information

When a trouble symptom is localized to a faulty rectifier module, controller, or system circuit card; that particular device or circuit card should be replaced in its entirety. No attempt should be made to troubleshoot or repair individual components on any rectifier module, controller, or circuit card.

Refer to SAG582127100 (System Application Guide) for replacement part numbers.

10.6 Replacement Procedures

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

Replacing a Rectifier Module

Refer to the Rectifier Instructions (UM1R483500E) for a rectifier module replacement procedure. Refer also to "System Troubleshooting Information" on page 46.

The rectifier module being replaced is assigned by the NCU the lowest available identification number. If desired, you can change the identification number. See "Configuring the NCU Identification of Rectifiers and Assigning which Input Feed is Connected to the Rectifiers" on page 41.

Replacing the NCU Controller

Refer to the NCU Instructions (UM1M830BNA) for a controller replacement procedure.

Replacing the IB2 (Controller Interface Board)

The following circuit card replacement procedure can be performed with the system operating.

ALERT! Circuit cards used in this power system contain static-sensitive devices. Read the Static Warning at the front of this document before performing any of the following procedures.

ALERT! When performing any step in these procedures that requires removal or installation of hardware, use caution to ensure no hardware is dropped and left inside the shelf; otherwise service interruption or equipment damage may occur.

NOTE! *When performing any step in these procedures that requires removal of existing hardware, retain all hardware for use in subsequent steps.*

Procedure

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

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

2. Connect an approved grounding strap to your wrist. Attach the other end to a suitable ground.

3. Loosen the captive fastener that secures the IB2 (Controller Interface Board) sliding tray to the main rectifier module mounting shelf. Carefully slide the assembly out until the wires are accessible. Refer to Figure 10.1. Note that the top cover can be removed from the controller section to facilitate IB2 replacement.
4. Remove the shield covering the IB2 (Controller Interface Board). The shield is secured with two (2) of the circuit card's mounting screws.
5. Carefully label the wires connected to the customer connection terminal blocks J3 through J9 on the circuit card. These wires must be connected to the same terminals on the replacement circuit card. Refer to Figure 10.1.
6. Carefully label the connectors plugged into the circuit card. These connectors must be plugged into the same connectors on the replacement circuit card. Refer to Figure 10.1.

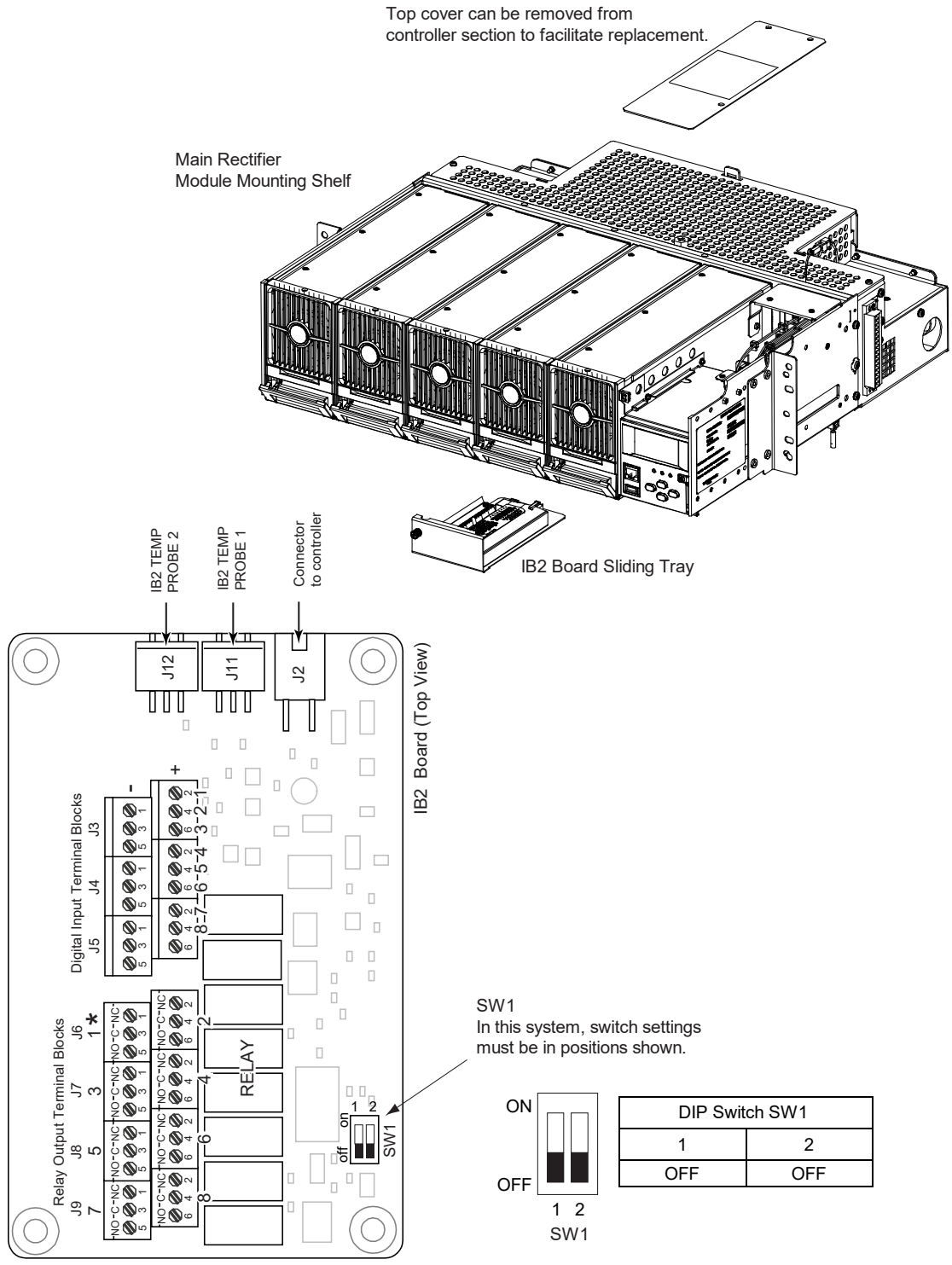
DANGER! In the next step, external wiring may be energized from an external source. DO NOT allow bare wire ends to contact any grounded or energized object.

7. Remove the external wiring from the customer connection terminal blocks. DO NOT allow the bare wire end to contact any grounded or energized object. Isolate the wire end with electrical tape. Repeat for each wire to be removed.
8. Unplug all connectors plugged into the circuit card.
9. Remove the remaining circuit card mounting screws and remove the circuit card from the mounting plate.
10. In this step, ensure you do not intermix the old and replacement circuit cards. Set the switch on the replacement circuit card to the same setting as the old circuit card. Refer to Figure 10.1.
11. Orient the replacement IB2 circuit card over its mounting position. Replace the shield over the circuit card and secure the circuit card to the mounting plate.
12. Carefully slide the IB2 (Controller Interface Board) assembly partially into the main rectifier module mounting shelf.
13. Plug all connectors removed from the old circuit card into the same position on the replacement circuit card.

DANGER! In the next step, external wiring may be energized from an external source. DO NOT allow bare wire ends to contact any grounded or energized object.

14. Reconnect the external wiring to the correct terminals on the customer connection terminal blocks. First remove the electrical tape that was applied to the bare wire end in a previous step. DO NOT allow the bare wire end to contact any grounded or energized object. After securing the wire, gently tug on the wire to ensure that it cannot be pulled out of the terminal block. Repeat for each wire to be reconnected.
15. Slide the IB2 (Controller Interface Board) assembly completely into the main rectifier module mounting shelf and secure with the captive fastener.
16. Remove the grounding wrist strap.
17. Reboot the Controller
    Local Menu Navigation: At the Main Screen, press ENT and ESC at the same time to reset the NCU Controller.
    Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.
18. Enable the external alarms, or notify appropriate personnel that this procedure is finished.
19. Ensure that there are no local or remote alarms active on the system.

Figure 10.1 IB2 (Controller Interface Board) Replacement



DIP Switch SW1	
1	2
OFF	OFF

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

This page intentionally left blank.

Connect with Vertiv on Social Media


https://www.facebook.com/vertiv/


https://www.instagram.com/vertiv/


https://www.linkedin.com/company/vertiv/


https://www.twitter.com/vertiv/

Vertiv.com | Vertiv Headquarters, 1050 Dearborn Drive, Columbus, OH, 43085, USA

UM582127100_REVK