



NetSure™ A50B50 DC Power Retrofit

Installation and User Instructions

Kit Specification Number: 588250400, A50IFRM
588250300, A50EFRM

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Technical Support Site

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

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

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Admonishments Used in this Document



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



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



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



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



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



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



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

Important Safety Instructions

Safety Admonishments Definitions

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

Safety and Regulatory Statements

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

Déclarations de Sécurité et de Réglementation

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

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1 Document Set

The following documents are provided with your system.

- **System Application Guide:** SAG588250400/SAG588250300
- **NCU Controller Instructions:** UM1M830BNA
- **Rectifier Instructions:** UM1R483500E
- **Schematic Diagram:** SD588250400/SD588250300
- **Wiring Diagram:** T588250400/T588250300
- **Power Data Sheet, A50B50 Cabinet:** PD588242400
- **SM TEMP Temperature Concentrator Instructions:** UM547490 (when SM TEMP is ordered)

2 Description

Vertiv™ NetSure™ A50B50 DC Power Retrofit is a power solution comprising one or more frames that allow new-generation NetSure rectifiers to be installed in the -48V Modular Power Series rectifier shelves that house the older model A50B50 rectifiers. The new rectifiers can operate with or without the original rectifiers in the same system and the same shelf.

The A50IFRM Intelligent Frame accommodates a Rectifier Module, a Controller Unit, a CAN Interface assembly, and IB2 assembly. The A50EFRM Expansion Frame accommodates a Rectifier Module and a CAN Interface assembly. One Intelligent Frame is required per power system. The Controller Unit may contain the standard configuration, or may contain an optional special application configuration.

For more information on system accessories, see SAG588250400.

3 Installation

3.1 Mounting

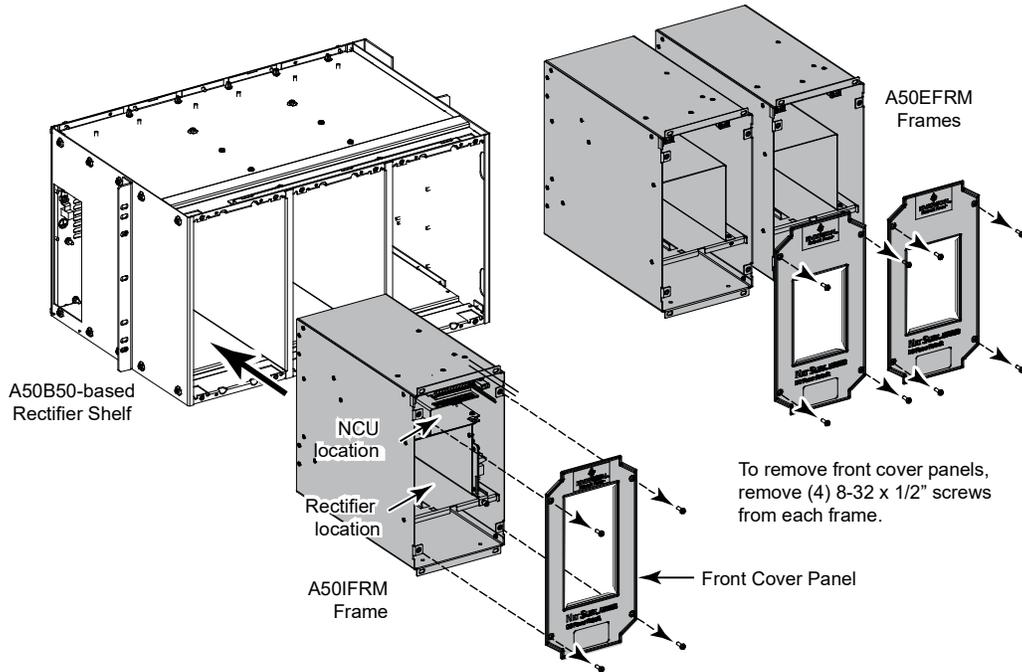
The A50IFRM Intelligent Frame and A50EFRM Expansion Frame are designed to mount inside A50B50-based rectifier shelves.

Ensure that all AC input and DC output connections to the shelf are intact. No changes or adjustments are required for these connections when installing the A50B50 Retrofit Solution. All wirings and grounding should follow the current edition of the National Electrical Code and applicable local codes. Follow the procedure below.

Procedure

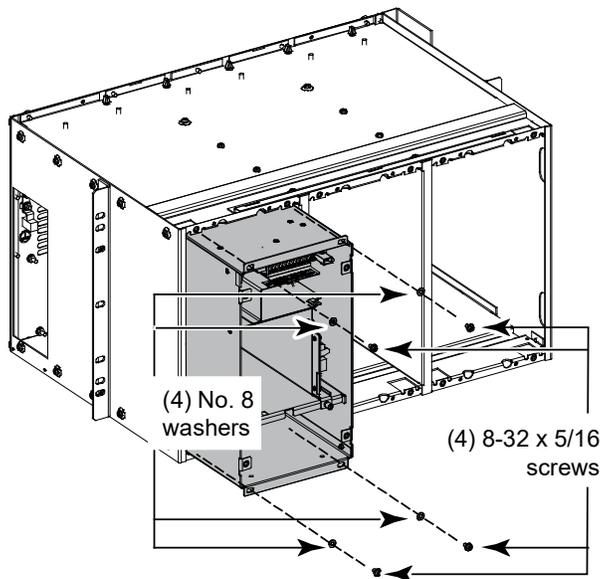
1. Remove the front cover panel from the frame, as shown in Figure 3.1 Set aside hardware for later use.
2. Slide the first empty frame into an open slot in the rectifier shelf.

Figure 3.1 Installing A50IFRM Intelligent Frame and A50EFRM Expansion Frame into the Existing Shelf



3. Using the hardware supplied, secure the frame to the shelf. Refer to Figure 3.2.
4. Do not install the front cover panel on the frame at this time.
5. Repeat the same steps for the rest of the frames.

Figure 3.2 Securing the Frame to the Shelf



3.2 Electrical Connections

Wiring Considerations

The AC input, DC output, and system alarm connections on the frame mate with the existing connectors in the shelf. No adjustments or alterations are required for these connections.

Making CAN Connections

CAN connections are made to allow expansion frames (A50EFRM) to connect to the main frame (A50IFRM) for rectifier control and alarming. Follow the procedure below.

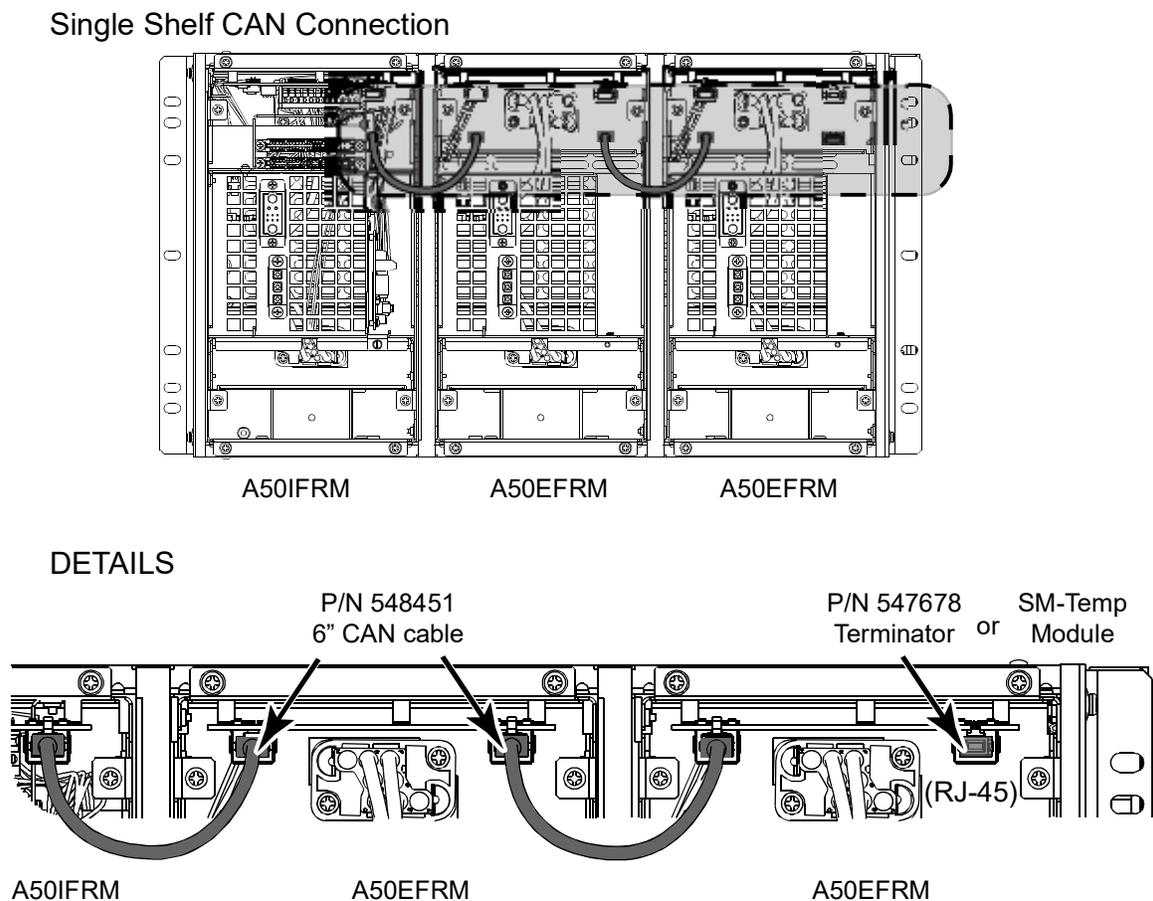


NOTE! If only one frame (A50IFRM) is used for application, install the furnished CAN bus termination plug (P/N 547678) to terminate the bus. This terminator is inserted into the socket at the upper right side of the frame. Refer to Figure 3.3 for details.

Single Shelf

- To connect adjacent frames in one existing shelf, use the 6-in long P/N 548451 CAN cable for each connection. Refer to Figure 3.3 for a sample configuration of (1) A50IFRM and (2) A50EFRMs.

Figure 3.3 CAN Connections in a Single Shelf



- To terminate the bus, plug the furnished termination plug (P/N 547678) into the right-hand CAN port of the last frame.
- For CAN connections with only one A50IFRM and one A50EFRM, insert the termination plug into the right-hand CAN port of the A50EFRM.

Alternatively, if the system is equipped with one or more SMTEMP modules, the first SMTEMP module's CAN interface should be connected to the right-hand CAN port of the last A50EFRM. The last SMTEMP module will provide the means to terminate the CAN per the SMTEMP user instructions, UM547490.

Multiple Shelves

1. To connect frames installed in different shelves, use the 24-in long CAN cable (P/N 547520) to provide a longer wiring distance. Refer to Figure 3.4 for a typical configuration of (1) A50IFRM and (8) A50EFRMs.



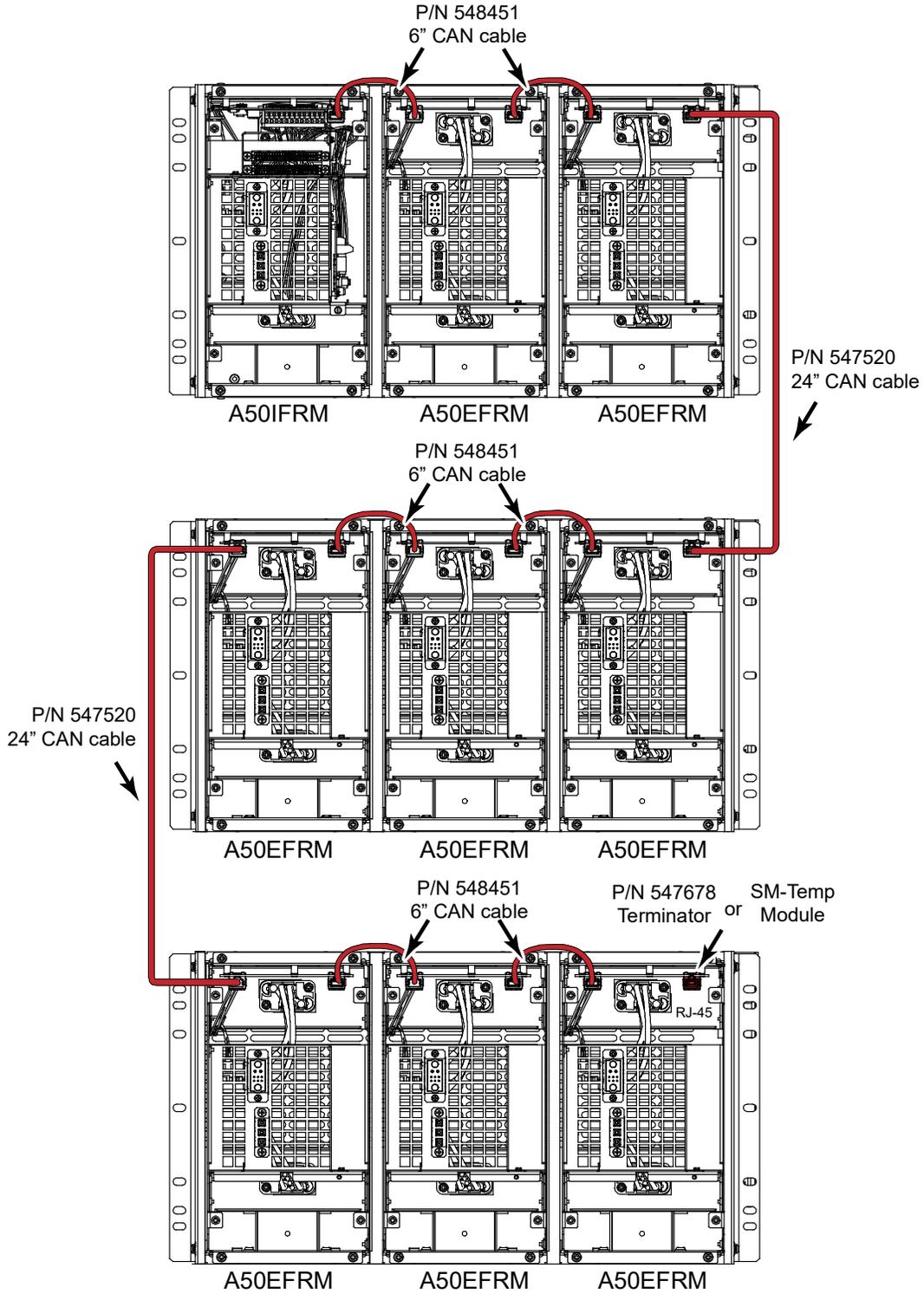
NOTE! *Figure 3.4 shows one way to make CAN bus connections between retrofit frames in systems with multiple shelves. You can use the supplied cables in any way that best fits your application. The only requirements are that all retrofit frames in the system must be connected in series (in any order) and the termination plug must be installed in the last available port.*

Alternatively, if the system is equipped with one or more SMTEMP modules, the first SMTEMP module's CAN interface should be connected to the right-hand CAN port of the last A50EFRM. The last SMTEMP module will provide the means to terminate the CAN per the SMTEMP user instructions, UM547490.

2. Similar to single shelf configuration of terminating the connection, use P/N 547678 CAN terminator/jumper and plug into the upper right CAT-5 socket of the last frame used.
3. When all CAN connections are made, the front covers can be mounted back on all frames.

Figure 3.4 CAN Connections in Multiple Shelves

Multiple Shelves CAN Connection



Making IB2 Board Connections

Digital inputs, relay outputs, and temperature probe(s) are connected to the IB2 Board. Refer to Figure 3.5 for connector locations, and Table 3.1 and Table 3.2 for pin-out information.

If required to access these connection points, loosen the captive fastener on the front of the IB2 Board, and slide the assembly partially out of the shelf. Recommended torque for the Digital Input and Relay Output terminal blocks is 5 in-lbs.

Connecting Digital Inputs

Connect up to six (6) digital inputs to the IB2 Board. (Inputs 7 and 8 are factory connected, as listed in Table 3.1.)

All user-defined digital inputs are set to alarm on a HIGH signal. Refer to the controller's User Manual for instructions on how to set these signals to be active LOW if desired.

An active HIGH signal means a voltage must be applied to generate an alarm. For example, if Digital Input No. 1 is used, connect -48V RTN to (+) and -48V to (-) to generate an alarm.

An active LOW signal means no voltage will generate an alarm. For example, if Digital Input No. 1 is used, connect -48V RTN to (+) and -48V to (-) for no alarm. Removing any of the signals will then generate an alarm.

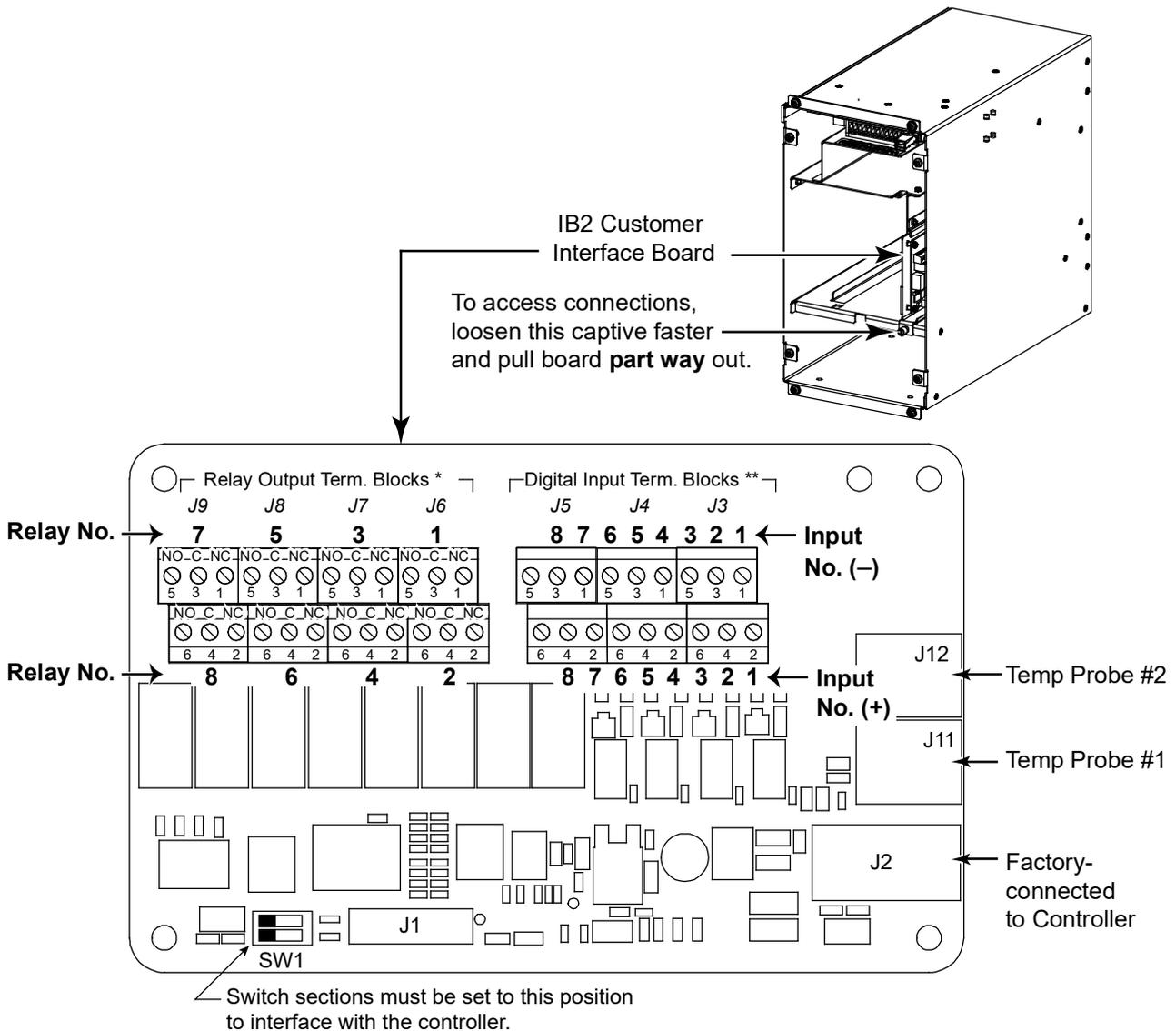
The digital inputs can be configured to provide an alarm when the signal is applied (HIGH) or removed (LOW).

Connecting Relay Outputs

The IB2 Board provides five (5) programmable alarm relays with Form-C contacts. Refer to Table 3.2 for pin-out information. (Relays 6 through 8 are factory connected, as listed in Table 3.2.)

Refer to the notes in Figure 3.5 for relay operation.

Figure 3.5 IB2 Board Connection



CAUTION: DO NOT disconnect any factory wiring when making connections.

* Alarm Relays 1 through 5 are available for customer use. Alarm Relays 6 through 8 are used internally. The relay assigned by the Controller to be the “Critical Summary” alarm or “Major Summary” alarm (relay 1 by default) will operate in the “Fail Safe Mode”. Fail Safe Mode means the relay 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) alarm 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.

** **WARNING:** Observe proper polarity when making Digital Input connections. Digital Inputs 1-6 can be programmed by the user. Digital Input 7 is predefined as the external Fuse Alarm input. Customer supplied -48V at J5-1 activates the alarm. Digital Input 8 is predefined as the ESTOP (Emergency Stop) input. Customer supplied RTN (+48V) at J5-4 activates ESTOP.

Table 3.1 Digital Inputs

Programmable Digital Input	Pin No.		Dedicated to...
1	J3-2	+	User Defined
	J3-1	-	
2	J3-4	+	User Defined
	J3-3	-	
3	J3-6	+	User Defined
	J3-5	-	
4	J4-2	+	User Defined
	J4-1	-	
5	J4-4	+	User Defined
	J4-3	-	
6	J4-6	+	User Defined
	J4-5	-	
7	J5-2	+	External Fuse Alarm (Pre-defined)
	J5-1	-	
8	J5-4*	+	Emergency Stop (Pre-defined)
	J5-3	-	
--	J5-5		Not Used
--	J5-6		

* When connecting to J5-4, do not remove the factory wiring connected to this terminal.



NOTE! Refer to the controller configuration drawing supplied with the system for digital input assignments associated with any custom configuration.

Table 3.2 Relay Outputs

Programmable Relay Output		NCU IB2 Pin No.	Alarms Assigned to this Relay (Default)	Alarms Assigned to this Relay (Custom)
1*	NO	J6-5	Any Major Alarm Any Critical Alarm	
	COM	J6-3		
	NC	J6-1		
2	NO	J6-6	Any Minor Alarm Any Major Alarm	
	COM	J6-4		
	NC	J6-2		
3	NO	J7-5	AC Failure	
	COM	J7-3		
	NC	J7-1		
4	NO	J7-6	DC Over Voltage 1	
	COM	J7-4		
	NC	J7-2		
5	NO	J8-5	DC Under Voltage 1	
	COM	J8-3		
	NC	J8-1		
6	NO	J8-6	Rectifier Fail Minor (Internal Wiring)	Not Available
	COM	J8-4		
	NC	J8-2		
7	NO	J9-5	Rectifier Fail Major (Internal Wiring)	Not Available
	COM	J9-3		
	NC	J9-1		
8	NO	J9-6	Rectifier Fan Failure (Internal Wiring)	Not Available
	COM	J9-4		
	NC	J9-2		



NOTE! Refer to the notes in Figure 3.5 for relay operation.



NOTE! Refer to the controller configuration drawing supplied with the system for relay assignments associated with any custom configuration.

Installing and Connecting Optional Temperature Probe(s)

Up to two (2) temperature probes can be connected to the Customer Interface (IB2) Board. See Figure 3.5 for connector location.



NOTE! Each temperature probe consists of two pieces that plug together to make a complete probe. See SAG588250400 for part numbers and descriptions.

Either or both probes can be programmed to monitor ambient temperature or battery temperature.

A temperature probe set as a battery probe can also be designated to be used for the battery charge temperature compensation feature. If the system is equipped with the NCU Controller, the battery charge temperature compensation feature can be programmed to use one probe or the average or highest value of all probes programmed to monitor battery temperature. (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.)

If the system is equipped with the NCU Controller, a temperature probe set as a battery probe can also be used for controlling against battery thermal runaway (BTRM feature).

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

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

Refer to "Initially Starting, Configuring, and Checking System Operation" beginning on page 21 for procedures for configuring the probes. For additional information, refer also to the separate Controller User Manual supplied with your retrofit.

3.2.1 Connecting an Optional SM-Temp Module to the NCU CAN Bus

An SM-Temp Module can be connected to the NCU's CAN Port located on the last retrofit frame. Refer to Figure 3.6 for port location and connections details. Refer to Table 3.3 for port pin-outs. Refer also to the SM-Temp Module Instructions (UM547490).

Procedure

1. Remove the CAN termination plug from the CAN Port connector located on the last retrofit frame (see Figure 3.6 for location). Connect the SM Temp Module CAN bus to this CAN Port connector. Refer to Table 3.3 for pin-outs. Ensure the last SM-Temp Module (or if only one) has a CAN termination strap as shown in the SM-Temp Module Instructions (UM547490).
2. Reboot the Controller

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

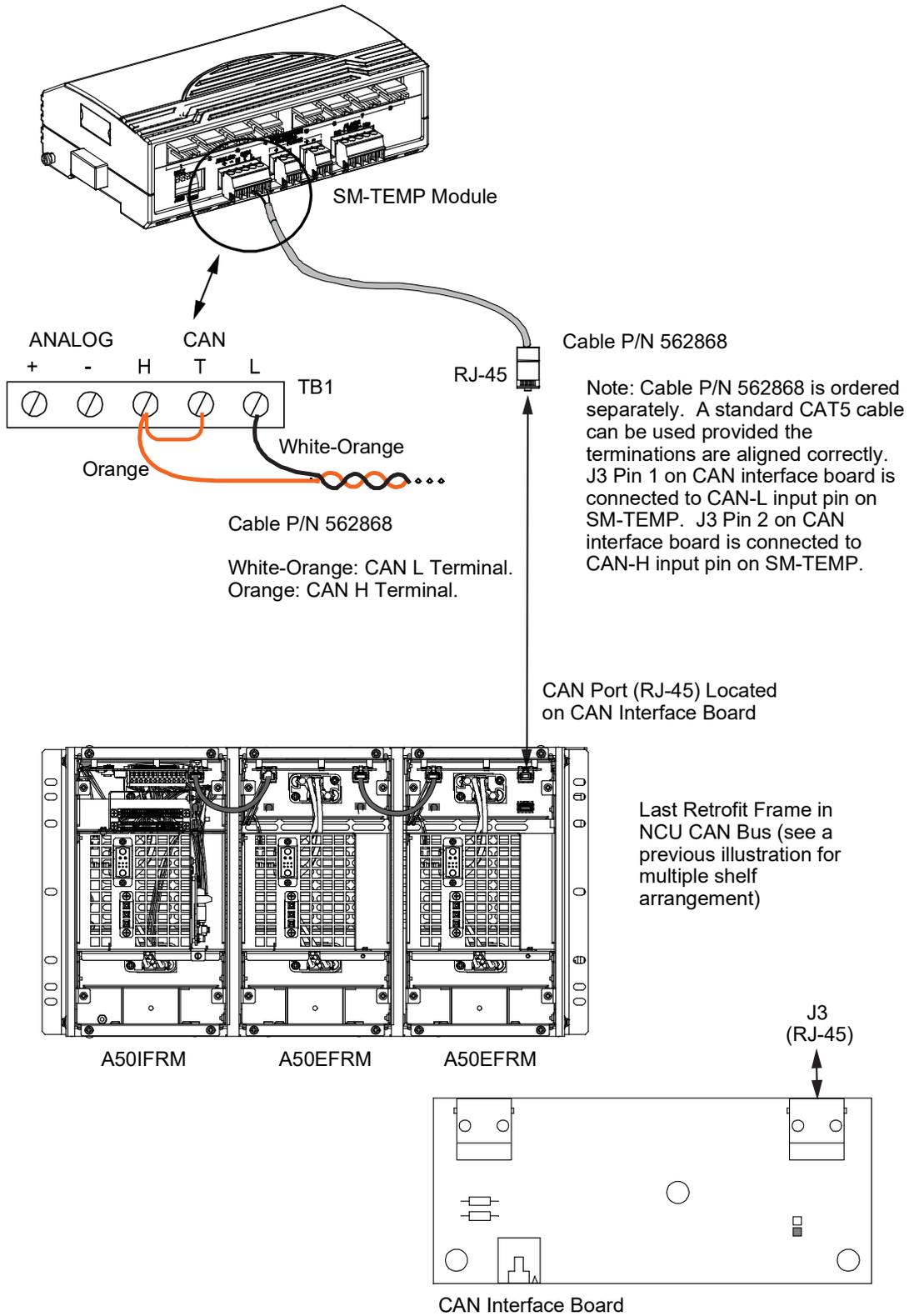
Web Menu Navigation: Go to Advance Settings Menu / SW Maintenance Tab / Reboot Controller button.

Table 3.3 CAN Port Connections

NCU CAN Port (RJ-45) on CAN Interface Board		SM-Temp Module CAN Port Pin Number
J3 Pin Number	Function	
J3-1	CAN L	TB1-5 (CAN L)
J3-2	CAN H	TB1-3 (CAN H)
J3-3	--	--
J3-4	--	--
J3-5	--	--
J3-6	--	--
J3-7	--	--
J3-8	--	--

Figure 3.6 Connecting an Optional SM-Temp Module

Connecting the SM-TEMP Module's CAN Terminals to the NCU CAN Bus



Making CAN Interface Board Connections

The CAN Interface Board allows for connecting the A50IFRM and A50EFRM frames together, or to terminate the last frame. This procedure has been previously described.

This board is also used for other customer inputs/outputs, such as Battery Shunt Input, Load Shunt Input, LVD controls and Battery Voltage Input via its TB1 connector.

To setup controller connections to TB1, refer to Figure 3.7 for connector locations and Table 3.4 for pin-out information. A pin-out label is also located on the controller bracket near the CAN Interface board. See Figure 3.8 for the actual location of the label on the main frame.

A four-position switch (S1) is provided which selects what type of signal is provided to J8 pin 12 (or TB2 pin 1) of A50B50 cabinet during a rectifier fail alarm condition - either one of three available resistive ground signals, or a ground (+BAT) signal. Switch S1 is located on CAN Interface board (see Figure 3.7) in A50IFRM. Refer to Table 3.5, and adjust switch S1 per requirements of the specific installation. Refer to Table 3.6 for resistance values of the three groups.

Figure 3.7 CAN Interface Board Connections

CAN Interface Board (mounted on top panel)

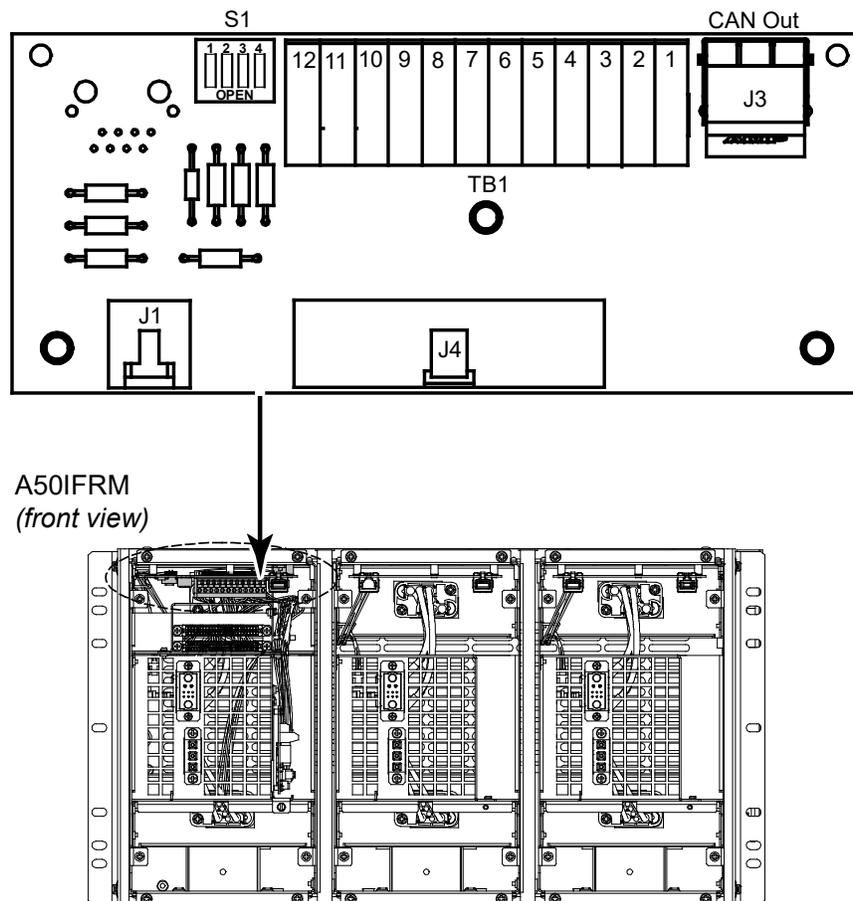


Table 3.4 TB1 Pin-outs

PIN No.	Signal Name	Description
1	- BAT	Negative Battery
2	+ BAT	Positive Battery
3	LVD2_AUX	LVD2 Feedback
4	LVD2-	LVD2 Drive Voltage, Negative
5	LVD2+	LVD2 Drive Voltage, Positive
6	LVD1_AUX	LVD1 Feedback
7	LVD1-	LVD1 Drive Voltage, Negative
8	LVD1+	LVD1 Drive Voltage, Positive
9	BAT_SH-	Battery Shunt, Negative
10	BAT_SH+	Battery Shunt, Positive
11	LOAD_SH-	Load Shunt, Negative
12	LOAD_SH+	Load Shunt, Positive

Notes:

1. Shunts must be installed in the -48V Bus.
2. LVD(s) must be mono-stable type.
3. LVDx_AUX must be a -48V RTN signal from auxiliary contacts of contactor when the contactor is de-energized.

Figure 3.8 Pin-out Label

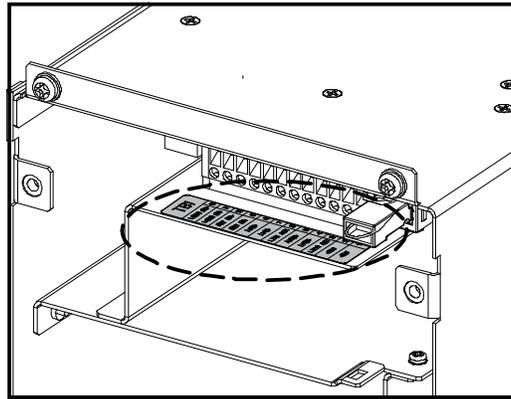


Table 3.5 Switch S1 Settings

Resistance Values of Group (See Table 5)	Switch S1 Settings		Settings Capable with Alarm and Control Panel(s), Part No(s).
	Switch Position	Open/ Close	
1	1	Open	437422100 437422800 437423000 437423100
	2	Open	
	3	Open	
	4	Closed	
2	1	Open	437420600, 437420700, 437420800, 437420900, 437421600, 437421900, 437422300, 437423300, 437423400
	2	Open	
	3	Closed	
	4	Open	
3	1	Open	437417400
	2	Closed	
	3	Open	
	4	Open	
Ground (+BAT) Signal Provided	1	Closed	--
	2	Open	
	3	Open	
	4	Open	

Table 3.6 Three Groups of Resistance Values

No. of Failed Modules	Alarm Resistance Value (Ohms) Group 1	Alarm Resistance Value (Ohms) Group 2	Alarm Resistance Value (Ohms) Group 3
1	27.4K	41.2K	10K
2 or more	7.3K	8K	5K

3.2.2 Installing the Controller

Procedure

Refer to the following and place the NCU controller into the controller mounting position.



ALERT! CONTROLLER HANDLING.

Installation or removal of the controller requires careful handling. To avoid possibility of controller damage from static discharge, a static wrist strap grounded through a one megohm resistor should always be worn when handling the controller. ESD protective packaging material must also be used when carrying/shipping the controller.



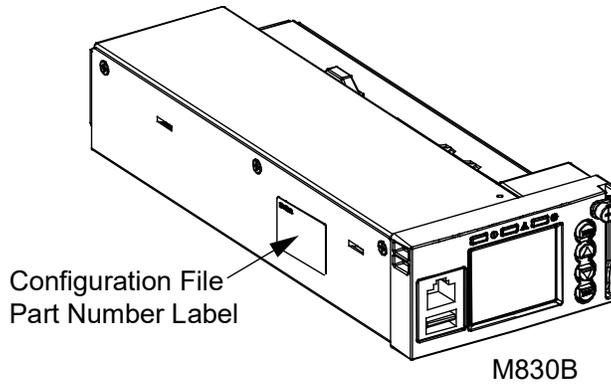
NOTE! Depending on your network security settings, when you remove a device that is connected to your network and assign the same IP address to the replacement device, you may not be allowed to communicate with the replacement device over the network. Contact your network administrator for assistance.



NOTE! The controller is hot swappable. It can be removed and installed with the system operating and without affecting the output bus.

1. Ensure that NCU contains configuration file or refer to the Configuration File Part Number Label on the side of the NCU for the Configuration Part Number (see Figure 3.9).

Figure 3.9 NCU Configuration Label Location



2. If not already done, connect an approved grounding strap to your wrist. Attach the other end to a suitable ground.
3. Loosen the captive fastener securing the latch mechanism to the front of the NCU. Pull the latch mechanism away from the NCU (this will retract the latch mechanism located on the bottom of the NCU). See Figure 3.10.
4. Slide the NCU completely into its mounting position. See Figure 3.11.
5. Push the latch mechanism into the front panel of the NCU, and secure by tightening the captive fastener. This locks the NCU securely to the system. See Figure 3.11.
6. After the NCU is powered on, the display shows the "Vertiv" screen. The controller is initializing.



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.

7. 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.
8. The Main Menu displays. See Figure 3.12.

Figure 3.10 Latch Mechanism on the NCU

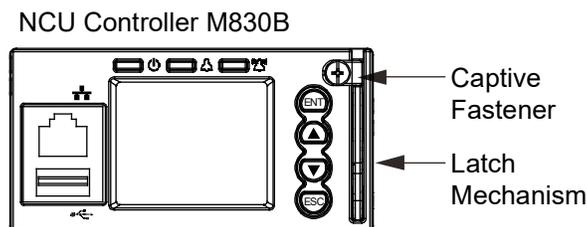


Figure 3.11 Inserting the Controller into the A50IFRM

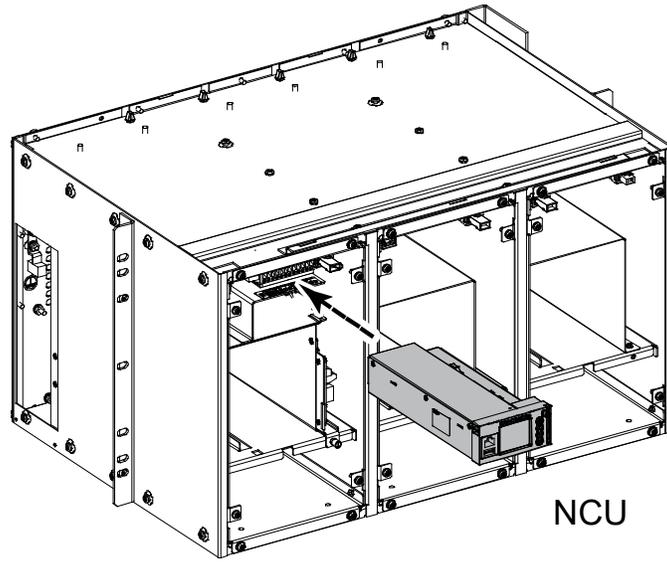
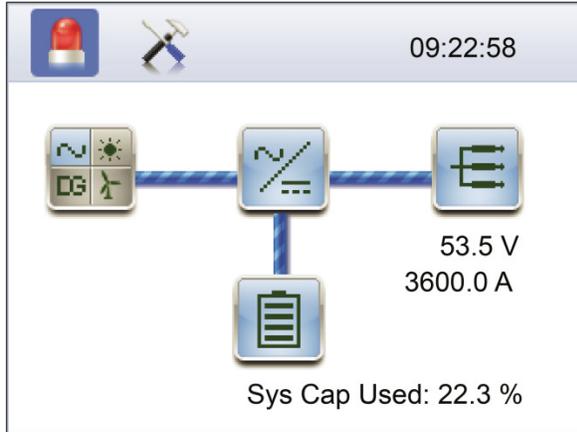


Figure 3.12 NCU Main Menu

Green - No Alarm
Red - Alarm

Main Menu

Date and time are alternately displayed.



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.

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.

To log out, from the Main Menu, press the **Up Arrow**, **Down Arrow**, and **ESC** at the same time. Release all keys.

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

Privilege Level	Default User Name and Password	Authority
Level A (Browser)	none set	The User can only read (browse) information in the menus.
Level B (Operator)	none set	The User has access to the system "Control" menus.
Level C (Engineer)	none set	The User has access to the system "Settings" menus and can download the configuration package. The User does not have access to update the OS application and modify, add, or delete Users.
Level D (Administrator)	admin, 640275	The User has full access to all menus; including update the OS application and modifying, adding, and deleting Users.

Once a password is entered, it remains in effect for a preset time period to allow navigating between menus without re-entering the password.

A User has access to his/her level menus, plus all menus of the lesser access levels.

Refer to the Controller User Manual (UM1M830BNA) for additional information. Set the date and time, site specific information (site name, location and system name), and battery capacity via the Quick Settings menu on the web interface.

3.2.3 Installing the Rectifier

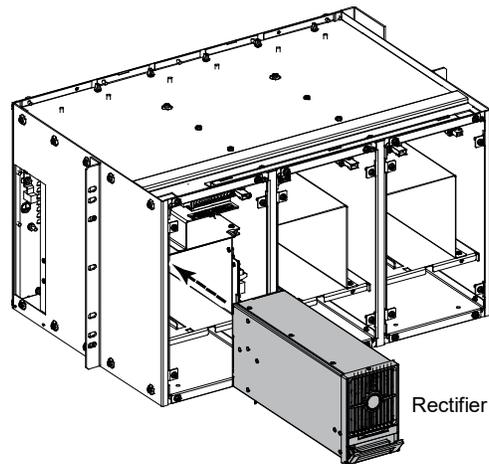
To install a Rectifier Module in a mounting frame, follow the procedure detailed below.

The Rectifier Module is hot swappable. It can be installed or removed with the system operating.

Procedure

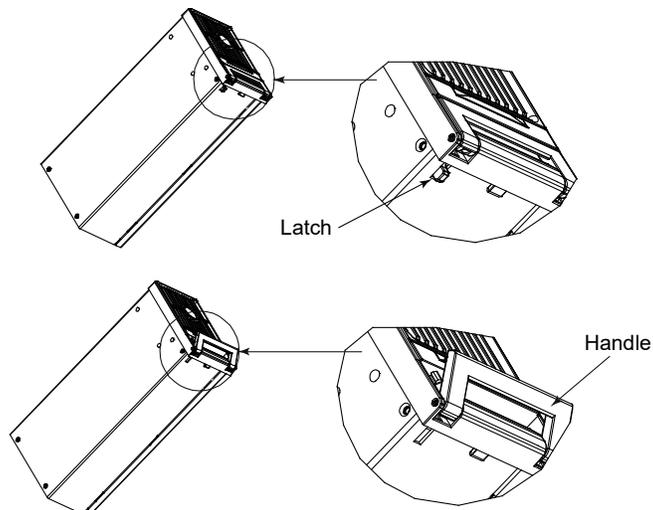
1. Place the Rectifier Module into an unoccupied mounting position without sliding it in completely. Refer to Figure 3.13.
2. Click the Rectifier Module handle in order to pop it forwards out of the Rectifier Module's front panel (this will also retract the latch mechanism located on the underside of the Rectifier Module). See Figure 3.14.

Figure 3.13 Installing the Rectifier



3. Push the Rectifier Module completely into the shelf.
4. Push the handle into the front panel of the Rectifier Module. This will make the latch lock the Rectifier Module securely to the shelf. See Figure 3.14. Repeat the above steps for each Rectifier Module being installed in the system.
5. Repeat procedure for the rest of the A50FRM frames.

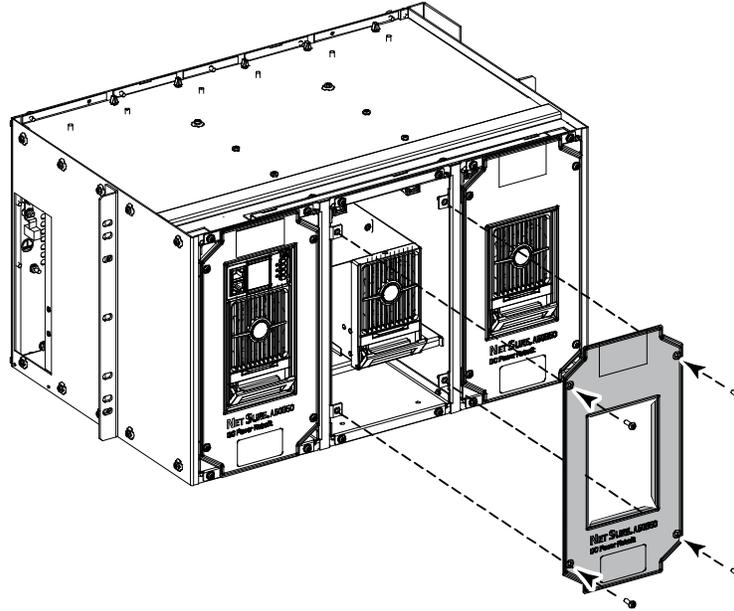
Figure 3.14 Latch Mechanism on the Rectifier Module



3.2.4 Re-installing the Front Cover Panel(s)

After all the wiring is done, the front cover panel should be re-installed into the frame. Secure the front cover panel to the frame using the hardware previously disassembled. Refer to Figure 3.15.

Figure 3.15 Securing the Front Cover Panel



4 Initially Starting, Configuring, and Checking System Operation

4.1 Initial Startup Preparation

Ensure that every Rectifier Module mounting position is filled by a Rectifier Module.

4.2 Initially Starting the System

1. Apply DC 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 the external AC disconnects or protective devices that supplies power to the shelf(s).

Note that the system requires multiple AC input branch circuits.

The rectifiers start and supply power to the loads.

Refer to the separate Controller User Instructions (UM1M830BNA) for information on other parameters in the Controller.

4.3 Checking System Status

Observe the status of the indicators located on the Rectifier Modules and Controller. If the system is operating normally, the status of these is as shown in Table 4.1.

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

Table 4.1 Status and Alarm Indicators

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

4.4 Checking System Operation

The NCU has been pre-programmed with the required set points and configuration for this application. No adjustments are required. Refer to the NCU User Manual (UM1M830BNA) for operation of the controller and navigation instructions of the controller menu and web pages.

Check rectifier alarm. Pull one of the NetSure rectifiers from its frame and verify that the original system level alarm panel registers a Rectifier Alarm. Re-install the rectifier.

If no alarms are present, contact the Network Operation Center (NOC) that the work has been completed and the alarm log for this site can be closed. If alarms are present, contact the Vertiv Technical Support desk. Contact information is located near the end of this document under NetPerform Optimization Services, Technical Support.

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