an EnerSys® company

Cordex® CXPS-HX-FA, CXPS-HX
Power System

User Guide ID: 0913000-J0
Effective: 04/2025

Read this document carefully.
Learn how to protect your equipment from damage and fully understand its functions.

Contents

1. Safety

Save these instructions

This document contains important safety instructions that must be followed during the installation, servicing, and maintenance of the product. Keep it in a safe place. Review the drawings and illustrations contained in this document before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies Ltd. or the nearest Alpha® power system representative.

1.1 Safety symbols

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this document. Where these symbols appear, use extra care and attention.

Symbol	Type	Description
	**WARNING**	Risk of serious injury or death Equipment in operation poses a potential electrical hazard which could result in serious injury or death to personnel. This hazard may continue even when power is disconnected.
	**CAUTION**	Cautions indicate the potential for injury to personnel.
	**CAUTION**	Risk of burns A device in operation can reach temperature levels which could cause burns.
	**ATTENTION**	The use of attention indicates specific regulatory or code requirements that may affect the placement of equipment or installation procedures. Follow the prescribed procedures to avoid equipment damage or service interruption.
	**GROUNDING**	This symbol indicates the location or terminal intended for the connection to protective earth. An enclosure that is not properly connected to protective earth presents an electrical hazard. Only a licensed electrician can connect AC power and protective earth to the enclosure.
	**NOTICE**	A notice provides additional information to help complete a specific task or procedure or general information about the product.

1.2 General warnings and cautions

You must read and understand the following warnings before installing the power system and its component. Failure to do so could result in personal injury or death.

- Read and follow all instructions included in this document.
- Only trained personnel are qualified to install or replace this equipment and its components.
- Use proper lifting techniques whenever handling equipment, parts, or batteries.

WARNING

This system is designed to be installed in a restricted access location that is inaccessible to the general public.

AVERTISSEMENT

Ce système est conçu pour être installé dans un endroit à accès restreint inaccessible au grand public.

WARNING

This equipment is not suitable for use in locations where children are likely to be present.

AVERTISSEMENT

Cet équipement ne convient pas pour une utilisation dans des lieux ou des enfants sont susceptibles d'être présents.

1.3 Mechanical safety

- Keep hands and tools clear of fans. Fans are thermostatically controlled and switch on automatically.
- Power supplies can reach extreme temperatures under load.
- Use caution around sheet metal components and sharp edges.

1.4 Electrical safety

WARNING

Hazardous voltages are present at the input of power systems. The DC output from converter modules, though not dangerous in voltage, has a high short-circuit current capacity that can cause severe burns and electrical arcing.

The DC output from converters is a potentially hazardous voltage. Do not touch the output connections when under power. Ensure that power has been removed from the outputs before working on them.

Before working with any live battery or power system, follow these precautions:

- Remove all metallic jewelry, such as watches, rings, metal rimmed glasses, or necklaces.
- Wear safety glasses with side shields at all times during the installation.
- Use Occupational Safety and Health Administration (OSHA®) approved insulated hand tools. Do not rest tools on top of batteries.

WARNING

Lethal voltages are present within the power system. Always assume that an electrical connection or conductor is energized. Check the circuit with a voltmeter with respect to the grounded portion of the enclosure (both AC and DC) before performing any installation or removal procedure.

WARNING

High leakage current

Earth connection is essential before connecting the power supply.

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Hazardous voltages are present at the input of power systems. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.

- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.
- Always assume electrical connections or conductors are live. Turn off all circuit breakers and double-check with a voltmeter before performing installation or maintenance.
- Place a warning label on the utility panel to warn emergency personnel that a reserve battery source is present which will power the loads in a power outage condition or if the AC disconnect breaker is turned off.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

1.5 Installation and safety precautions

- Only qualified personnel should install and connect the power components within the power system.
- Make sure to connect the protective earthing (master grounding) terminal within the AC load center of the equipment to the earth point in the building installation or the site reference ground.
- Only install the power system using the mounting hardware provided by Alpha Technologies Ltd.

1.6 Lifting

CAUTION

Follow all local safety practices and guidelines while lifting the enclosure. All personnel involved with lifting and positioning the enclosure must wear head and eye protection, and gloves. Only properly trained and certified personnel should operate the crane. Only properly trained and certified personnel should operate the forklift.

Before lifting the power system into place:

- Ensure the modules are not installed.
- The distribution panel door is firmly affixed.
- Open and latch the enclosure front door.

1.7 Battery safety

WARNING

Follow the battery manufacturer's safety recommendations when working around battery systems. Do not smoke or introduce an open flame when batteries (especially vented batteries) are charging. When charging, batteries vent hydrogen gas, which can explode.

Batteries are hazardous to the environment and should be disposed at a recycling facility. Consult the battery manufacturer for recommended local authorized recyclers.

ATTENTION

Battery safety data sheets

Read the battery safety data sheet (SDS) before installing batteries in the power system. The SDS provides important information including hazard identification, first aid measures, handling and storage, and personal protective equipment (PPE).

2. Introduction

2.1 Document scope

This document covers the features, options, installation, and startup of the Cordex® CXPS-HX-FA, CXPS-HX power system. Images contained in this document are for illustrative purposes only and may not exactly match your installation.

2.2 Product overview

The Cordex® CXPS-HX-FA, CXPS-HX power system provides high capacity DC power for large communication network applications. This system combines the capabilities of tiered distribution, advanced system controller, and rectifier modules in a single integrated bay. Two bays can easily be linked together and share a central system controller to double the system capacity.

Power systems are available with front access (CXPS-HX-FA) or standard (CXPS-HX) connections. Front access AC input termination panel increases usable floor space, reduces installation time and simplifies maintenance

Figure 1: Cordex® CXPS-HX power system

2.3 Single cabinet architecture

The power system as a single cabinet operates very similar to a centralized architecture. With the internal rectifier modules being connected to a single bus with the distribution panels, the internal bus is rated for the maximum available power from the internal rectifier modules. External batteries would also connect to the same internal bus.

2.4 Centralized architecture

The power system can be setup for a centralized architecture when using the larger distribution tiers (bolt-in high capacity breakers or high capacity TPL fuses). The intent of a centralized system is to have all the components working through a single point. To add more components (rectifier modules and distribution for example) the components are connected to the central point as long as that point is sized for complete capacity of the existing components plus the additions.

2.5 Distributed architecture

A distributed architecture is when multiple systems are connected with each other to help with imbalances and incorrect sizing of components. Each system contains the rectifier modules, AC input, battery connections, and DC distribution to operate independently.

Each system will be approximately sized for the DC power that it being consumed through its distribution. Any load power that is greater than the system will be shared between systems as needed by either supplying excess power or distributing the extra power.

The distributed architecture can be expanded by adding power systems with their own batteries sized approximately for their load to an existing system then connecting the main bus of the systems.

2.5.1 Distributed architecture (large distribution)

The power system can be setup using larger TPL fuse distribution or high capacity breakers for a multi-stage distribution, with the large distribution protection devices feeding secondary distribution components such as a battery distribution fuse bay or Alpha® smart E2 remote distribution panels. From these secondary levels of distribution, the DC power can be further split into tertiary distribution such as fuse panels or onto larger loads.

2.5.2 Distributed architecture (small distribution)

The power system can be setup using smaller distribution tiers for a single distribution point. With a single-stage distribution, the loads are connected directly to power system with no secondary or tertiary levels of distribution being required.

Front Access

2.6 Cordex® CXPS-HX-FA Front Access Power System

The Cordex® CXPS-HX-FA front access power system is an evolution of the popular Cordex® CXPS-HX power system. All AC terminations have been moved to the front of the bay. The system controller has also been relocated to provide easier access and better visibility of the display panel. For more information, see the drawings at the end of this document.

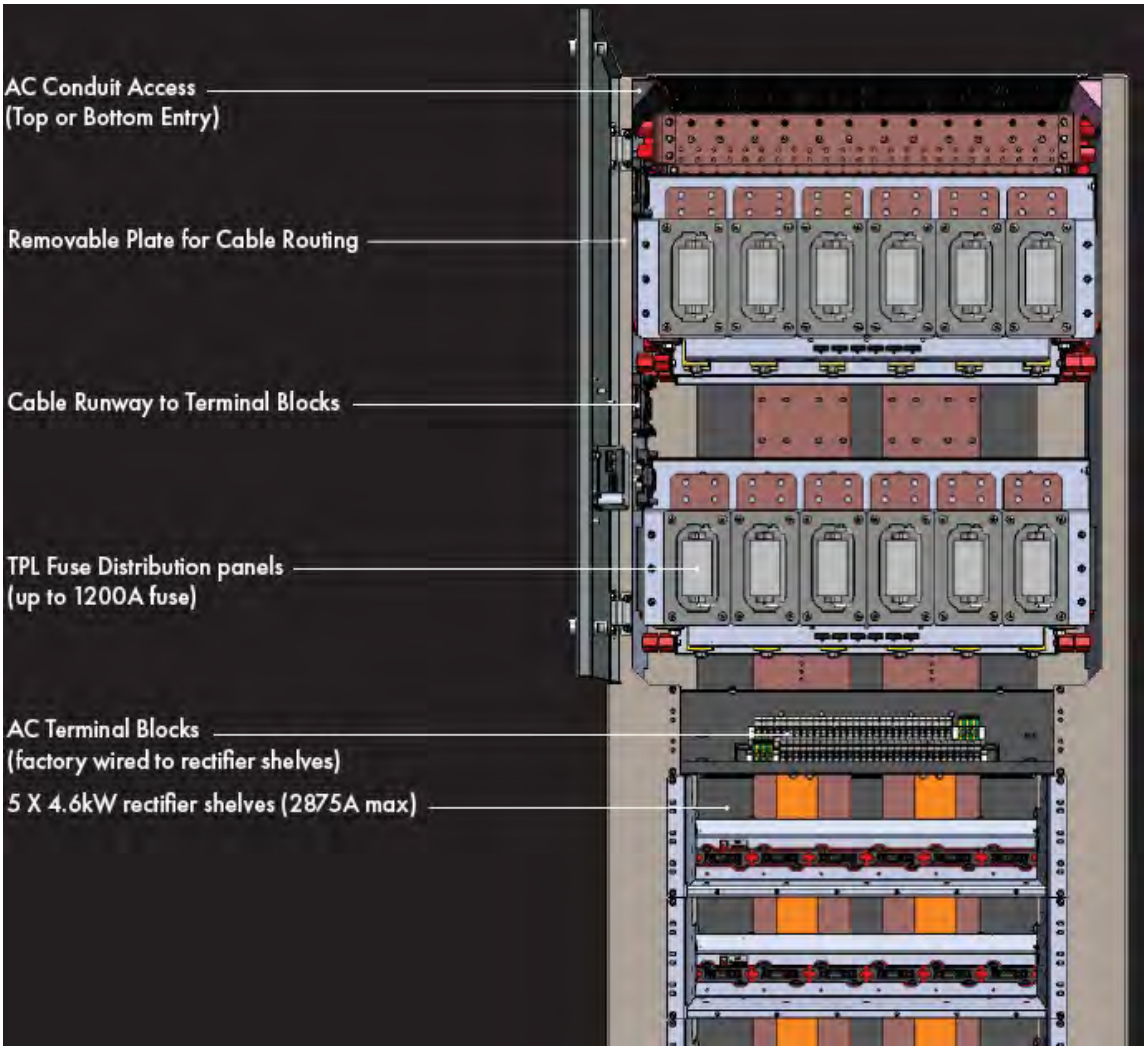


Figure 2: Cordex® CXPS-HX-FA power system

3. Specifications

Front Access

3.1 Cordex® CXPS-HX-FA Front Access Power System

Table A: Cordex® CXPS-HX-FA front access power system specifications

Electrical			
Output voltage	–48 VDC (nominal)		
Output capacity	**One bay system:** 138 kW		
	Two bay system: 276 kW		
Maximum bus capacity	**One bay system:** 2,875 A		
	Two bay system: 5,000 A		
Cordex® HP 4.0/4.6 kW rectifier system	30 feed 30 A, 1-phase, 208 to 277 VAC (2W+G)		
	5 feed 100 A, 3-phase, 208 VAC (3W+G)		
	5 feed 50 A, 3-phase, 277/480 VAC (4W+G neutral required)		
	10 feed 50 A, 3-phase, 208 VAC (3W+G)		
	10 feed 30 A, 3-phase, 277/480 VAC (4W+G neutral required)		
Distribution			
System ampacity ratings (continuous)	2-tier system bus capacity: 2,875 A		
Fuses			
TPL fuses	Up to 1,200 A		
	6 TPL fuse holders per panel		
	Maximum 2 fuse panels per bay		
Circuit breakers			
Panel type	**Rating**	**Capacity**	**Max. rating per panel**
Bolt-in high capacity breakers	3-pole 600 A	Up to 15 poles per panel	2,875 A per panel
Output termination			
TPL fuses	2-hole, ⅜ inch diameter holes on 1 inch centers		
Bolt-in high capacity breakers	15 1-position 2-hole, ⅜ inch diameter holes on 1 inch centers only		
Internal ground bar	2-hole, ¼ inch diameter holes on ⅝ inch centers, ⅜ inch diameter holes on 1 inch centers		
Battery	2-hole, 6 sets ⅜ inch diameter holes on 1 inch centers		
System level alarms and controls			
Alarm and control parameters are user-programmable through built-in system controller.			
Controller	EnVision™ Elite Touch 2RU touchscreen controller		
	Cordex® CXC HP 2RU touchscreen system controller		
LEDs	Status and alarms		
Alarm connections	14 to 22 AWG (0.34 to 2.5 mm²)		
Mechanical			
Dimensions H × W × D	84 × 30 × 26 in. (2133 × 762 × 660 mm)		
Net weight	600 to 900 lb (270 to 410 kg) approximately		
Mounting	23-inch relay rack (flush rack mount) in a box bay		

Environmental	
Operating temperature	32 to 104˚F (0 to 40˚C)
Storage temperature	–40 to 185°F (–40 to 85°C)
Relative Humidity	0 to 95% non-condensing
Elevation	Up to 9,186 ft (2,800 m)
Regulatory compliance	
Safety	CAN/CSA C22.2 No. 62368-1
	UL 62368-1
Network Equipment-Building Systems	Designed to meet NEBS Level 3

NOTICE

Refer to the rectifier and controller documentation for more information regarding modules and shelves included in your power system.

ATTENTION

To comply with regulations in terms of radiated emissions, the CAN communication cable shall be wound in three loops around a ferrite PN: 417-401-10/19 (Fair-Rite® PN: 0443167251), placed close to the socket in the shelf.

3.2 Cordex® CXPS-HX Power System

Table B: Cordex® CXPS-HX power system specifications

Electrical			
Output voltage	–48 VDC (nominal)		
Output capacity	**One bay system:** 138 kW		
	Two bay system: 276 kW		
Maximum bus capacity	**One bay system:** 2,875 A		
	Two bay system: 5,000 A		
Cordex® HP 4.0/4.6 kW rectifier system	30 feed 30 A, 1-phase, 208 to 277 VAC (2W+G)		
	5 feed 100 A, 3-phase, 208 VAC (3W+G)		
	5 feed 50 A, 3-phase, 277/480 VAC (4W+G neutral required)		
	10 feed 50 A, 3-phase, 208 VAC (3W+G)		
	10 feed 30 A, 3-phase, 277/480 VAC (4W+G neutral required)		
Cordex® HP 12 kW rectifier system	5 feed 50 A, 3-phase, 480 VAC (3W+G)		
	10 feed 30 A, 3-phase, 480 VAC (3W+G)		
Distribution			
System ampacity ratings (continuous)	**2-tier system bus capacity:** 2,875 A		
	3-tier system bus capacity: 2,875 A		
Fuses			
TPL fuses	Up to 800 A		
	4 TPL fuse holders per panel		
	Maximum 3 fuse panels per bay		
TPS/TLS fuses	Up to 125 A		
	18 fuse holders per panel		
	Maximum 6 fuse panels per bay		
Circuit breakers			
Panel type	**Rating**	**Capacity**	**Max. rating per panel**
Bolt-in high capacity breakers	1-pole up to 250 A	Up to 12 poles per panel	2,000 A per panel
	2-pole 275 to 400 A		
	3-pole 450 to 700 A		
	4-pole 750 to 800 A		
	5-pole 850 to 1,000 A		
	6-pole 1,050 to 1,200 A		
Plug-in bullet breakers	1-pole up to 100 A	Up to 18 poles per panel	600 A per panel
	2-pole 110 to 200 A		
	3-pole 225 to 300 A		
Output termination			
TPL fuses	2-hole, ⅜ inch diameter studs on 1 inch centers and ½ inch diameter studs on 1-¾ inch centers		
TLS/TPS/AM breakers	1-pole, 2-hole, ¼ inch diameter studs on ⅝ inch centers		
	2- and 3-pole, 2-hole, ⅜ inch diameter studs on 1 inch centers		
Bolt-in high capacity breakers	2-hole, ⅜ inch diameter studs on 1 inch centers and ½ inch diameter studs on 1-¾ inch centers		
	12 1-position 2-hole, ⅜ inch diameter studs on 1 inch centers only		

Internal ground bar (optional)	2-hole, ¼ inch diameter studs on 5⁄8 inch centers, 3⁄8 inch diameter studs on 1 inch centers and 1 inch diameter studs on 1-3⁄4 inch centers
Battery	2-hole, 6 sets 3⁄8 inch diameter holes on 1 inch centers and ½ inch diameter holes on 1-3⁄4 inch centers
System level alarms and controls	
Alarm and control parameters are user-programmable through built-in system controller.	
Controller	EnVision™ Elite Touch 2RU touchscreen controller
	Cordex® CXC HP 2RU touchscreen system controller
LEDs	Status and alarms
Alarm connections	14 to 22 AWG (0.34 to 2.5 mm²)
Mechanical	
Dimensions H × W × D	84 × 28 × 28 in. (2133 × 711 × 711 mm)
Net weight	600 to 900 lb (270 to 410 kg) approximately
Mounting	23-inch relay rack (flush rack mount) in a box bay
Environmental	
Operating temperature	32 to 104˚F (0 to 40˚C)
Storage temperature	–40 to 185°F (–40 to 85°C)
Relative Humidity	0 to 95% non-condensing
Elevation	Up to 9,186 ft (2,800 m)
Regulatory compliance	
Safety	CAN/CSA C22.2 No. 62368-1
	UL 62368-1
Network Equipment-Building Systems	NEBS Level 3 Certified

NOTICE

Refer to the rectifier and controller documentation for more information regarding modules and shelves included in your power system.

ATTENTION

To comply with regulations in terms of radiated emissions, the CAN communication cable shall be wound in three loops around a ferrite PN: 417-401-10/19 (Fair-Rite® PN: 0443167251), placed close to the socket in the shelf.

4. Features

The power system is a high capacity power system that combines both power and distribution efficiently into a single standard box bay configuration. Power systems are available with front access or standard connections.

Basic power system

- Each 2,875 A bay combines rectifier modules, battery termination, and distribution
- Up to five 1-phase or 2-phase rectifier shelves with an AC input of 208 to 240 VAC or 480 VAC
- System distribution section consists of up to three distribution tiers
- System controller

Expandable

The dual bay kit links two 2,875 A bays to share a central system controller and doubles the power system capacity.

4.1 AC termination wiring

The required input voltage depends on the rectifier module options chosen at the time of ordering. Refer to the specifications sections.

An optional AC distribution assembly at the top of each power bay provides front access AC overhead termination.

NOTICE

An external surge protection device is not required. The rectifier modules are protected by internal metal oxide varistors (MOVs).

4.2 Cordex® HP 4.0/4.6 kW Rectifier Modules

Figure 3: Cordex® HP 4.0 kW rectifier module front panel LEDs

4.2.1 Rectifier module features

- High performance 83.3 A rectifier module for 48 VDC telecom applications
- High power density 4RU compact form factor delivering up to 24 kW per 23-inch shelf
- Power limiting and wide range AC input for global installation requirements
- Extended operating temperature range for deployment in the harshest outdoor environments
- Backwards compatibility with Cordex® HP 3.6 kW rectifier shelves and power solutions providing cost effective upgrade path

4.2.2 Front access system: AC wiring

NOTICE

AC connections from front access systems are located at the front middle of the bay. For more information, see the 7401328-08 drawing at the end of this document.

Front Access

The Cordex® HP 4.0/4.6 kW rectifier shelves used within the power system are 23 inches in width. The individual rectifier shelves are wired to the AC power distribution panel provided by the customer. The AC input wiring is routed from the top chassis conduit knockouts and through the inner wire ducts on the sides of the DC distribution area to the front accessible AC terminal block assembly. The AC wiring size depends upon the rectifier shelf input voltage configuration and local electrical code.

The recommended AC circuit breaker size, wire gauge, and conduit trade sizes are as follows:

Table C: Canadian Electrical Code (CEC®) conduit size input feed

Rectifier modules per conduit	Rectifier modules per feed	Min. external breaker	Wire gauge	Min. conductor rating[1]	Conductors per conduit[1, 2]	Conduit trade size
7 or 8	1 (1P, 2W)	30 A	8 AWG (10 mm^2)	55 A × 0.91 × 0.7 = 35 A rating	**Recommended:** 17 **Maximum:** 21	1-½ inch

6 to 8	2 (1P, 2W)	60 A	6 AWG (16 mm²)	75 A × 0.91× 0.7 = 48 A rating	**Recommended:** 9 **Maximum:** 15	1-½ inch
6 to 9	3 (3P, 4W)	30 A	8 AWG (10 mm²)	55 A × 0.91× 0.7 = 35 A rating	**Recommended:** 13 **Maximum:** 21	1-½ inch
6 to 9	3 (3P, 3W)	50 A	6 AWG (16 mm²)	75 A × 0.91× 0.7 = 48 A rating	**Recommended:** 10 **Maximum:** 15	1-½ inch

[1] Based on CEC® 194°F (90°C) conductor, 104°F (40°C) ambient, and number of wires in conduit.
[2] Including one ground per conduit.

Table D: National Electrical Code (NEC®) conduit size input feed

Rectifier modules per conduit	Rectifier modules per feed	Min. external breaker	Wire gauge	Min. conductor rating[1]	Conductors per conduit[1, 2]	Conduit trade size
7 or 8	1 (1P, 2W)	30 A	8 AWG (10 mm²)	55 A × 0.91× 0.7 = 35 A rating	**Recommended:** 17 **Maximum:** 21	1-½ inch
6	2 (1P, 2W)	60 A	6 AWG (16 mm²)	75 A × 0.91× 0.7 = 48 A rating	**Recommended:** 7 **Maximum:** 7	1 inch
3 to 6	3 (3P, 4W)	30 A	8 AWG (10 mm²)	55 A × 0.91× 0.7 = 35 A rating	**Recommended:** 9 **Maximum:** 9	1 inch
3 to 6	3 (3P, 3W)	50 A	6 AWG (16 mm²)	75 A × 0.91× 0.7 = 48 A rating	**Recommended:** 7 **Maximum:** 7	1 inch

[1] Based on NEC® 194°F (90°C) conductor, 104°F (40°C) ambient, and number of wires in conduit.
[2] Including one ground per conduit.

4.2.3 Standard system: AC wiring

The Cordex® HP 4.0/4.6 kW rectifier shelves used in the power system are 23 inches in width. The individual rectifier shelves are wired to the AC power distribution panel provided by the customer. The AC input wiring is routed through a one inch trade size conduit knockout on the side of the shelf to a terminal block connection. The AC wiring size depends upon the rectifier shelf input voltage configuration and local electrical code.

The recommended AC circuit breaker size and wire gauge are as follows:

Table E: Recommended AC breaker size and wire gauge

Rectifier shelf	Recommended AC breaker size	Recommended AC wire gauge
1-phase 208 to 277 VAC	6 × 30 A AC breakers	10 AWG (6 mm²)
3-phase 208 VAC (without neutral)	2 × 50 A AC breakers	6 AWG (16 mm²)
3-phase 277/480 VAC (with neutral)	2 × 30 A AC breakers	10 AWG (6 mm²)

4.2.4 LEDs

Each rectifier module contains three LEDs for status indication. See the Troubleshooting section for LED states and meanings.

4.3 Cordex® HP 12 kW Rectifier Modules

Figure 4: Cordex® HP 12 kW 480 VAC (3-phase) rectifier module

4.3.1 Rectifier module features

- High performance compact 250 A rectifier module for 48 VDC telecom application
- High temperature operating range for installation in non-controlled environments
- Simple configurations providing 500 A or 24 kW in a compact 4RU shelf
- True 3-phase 3-wire 480 VAC input
- Extended operating temperature range for deployment in harsh environments

NOTICE

Front access systems do not support the Cordex® HP 12 kW rectifier system.

4.3.2 AC wiring

The Cordex® HP 12 kW rectifier shelves used within the power systems are 23 inches in width. The individual rectifier shelves are either wired directly to the customer provided AC terminal block panel or wired internally to AC terminal block panel at the top of the power system bay. The AC input wiring is routed through a one inch trade size conduit knockout on the side of the shelf for a direct connection. The AC wiring size depends upon the rectifier shelf input voltage configuration and local electrical code.

The recommended AC circuit breaker size and wire gauge are as follows:

Table F: Recommended AC breaker size and wire gauge

Rectifier shelf	Recommended AC breaker size	Recommended AC wire gauge
3-phase, 480 VAC (without neutral)	10 × 30 A breakers	8 AWG (10 mm²)

4.3.3 LEDs

Each rectifier module contains three LEDs for status indication. See the Troubleshooting section for LED states and meanings.

4.4 Distribution features

The power system can have either a 2-tier distribution or a 3-tier distribution. The 2-tier systems have a built in AC wire terminal block panel occupying the final tier position. This terminal block panel is used to ease access for installation of the AC input wires into the power system. With a 3-tier distribution system there is no AC wire terminal block panel to allow for a third distribution tier to be installed. The AC input wires must be directly connected down to the rectifier shelves.

NOTICE

Front access systems support 2-tier distribution only. Either six TPL fuse positions or 15 high capacity breaker positions.

Front Access

4.4.1 6-position TPL fuse tier (front access system only)

- Occupies one tier position
- 2,875 A tier rating
- Each position accepts maximum 800 A or 1,200 A TPL fuse maximum (depending on option)
- Current on each fuse is monitored by a shunt and alarm
- Two landings per fuse, 2-hole, ⅜ inch diameter on 1 inch centers

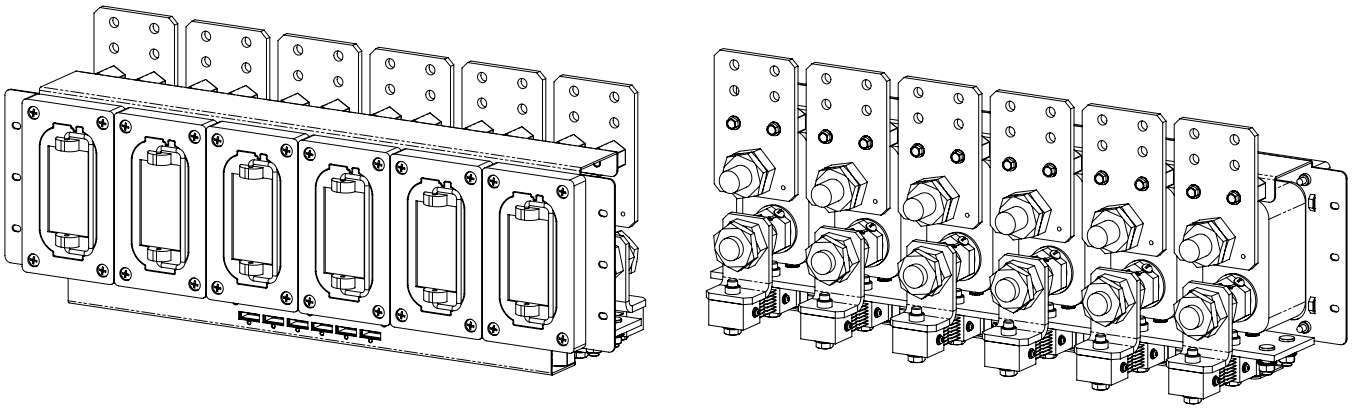


Figure 5: 6-position TPL fuse (front access system only)

Front Access

4.4.2 15-position high capacity breaker tier (front access system only)

- Occupies one tier position
- 2,875 A tier rating
- Can accept 15 1-pole (250 A maximum), seven 2-pole (450 A maximum), or five 3-pole (600 A maximum) high capacity breakers
- Shunts are integrated into breakers and the shunt rating is based on the breaker capacity
- 1-position one landing per position 2-hole, ⅜ inch diameter studs on 1 inch centers

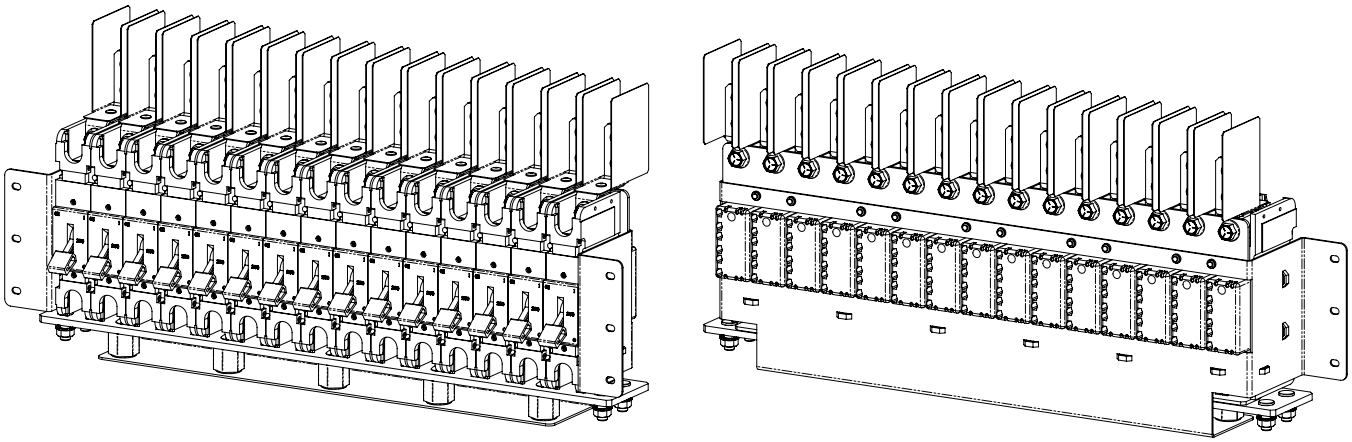


Figure 6: 15 1-position high capacity breaker (front access system only)

4.4.3 4-position TPL fuse tier (standard system only)

- Occupies one tier position
- 2,000 A tier rating
- Each position accepts a 800 A TPL fuse (maximum)
- Current on each TPL fuse is monitored by 800 A shunts
- Two landings per fuse 2-hole, ⅜ inch diameter on 1 inch centers **or** ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

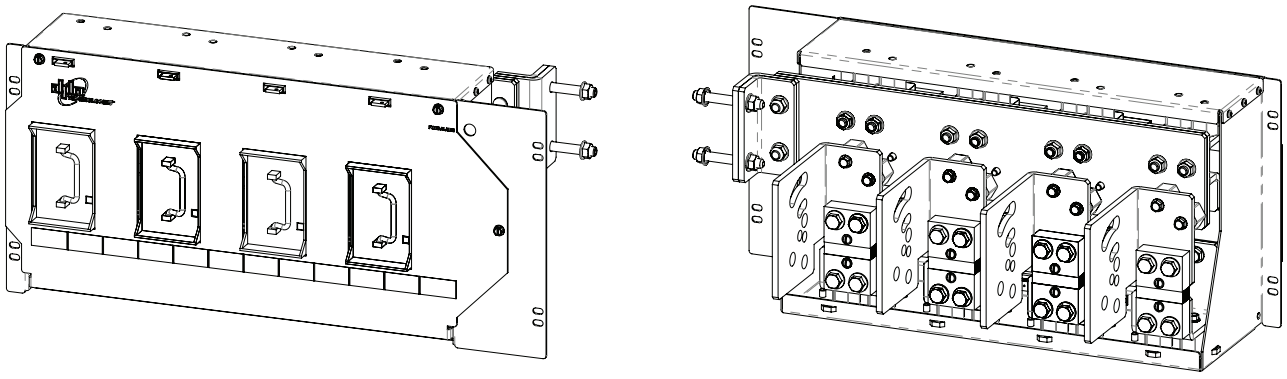


Figure 7: 4-position TPL fuse

4.4.4 12 1-position high capacity breaker tier (standard system only)

- Occupies one tier position
- 2,000 A tier rating
- Can accept 1-position (250 A maximum) high capacity breakers
- Individually monitored by 300 A shunts
- One landing per position 2-hole, ⅜ inch diameter on 1 inch centers
- Option for whole tier LVD 2,000 A disconnect

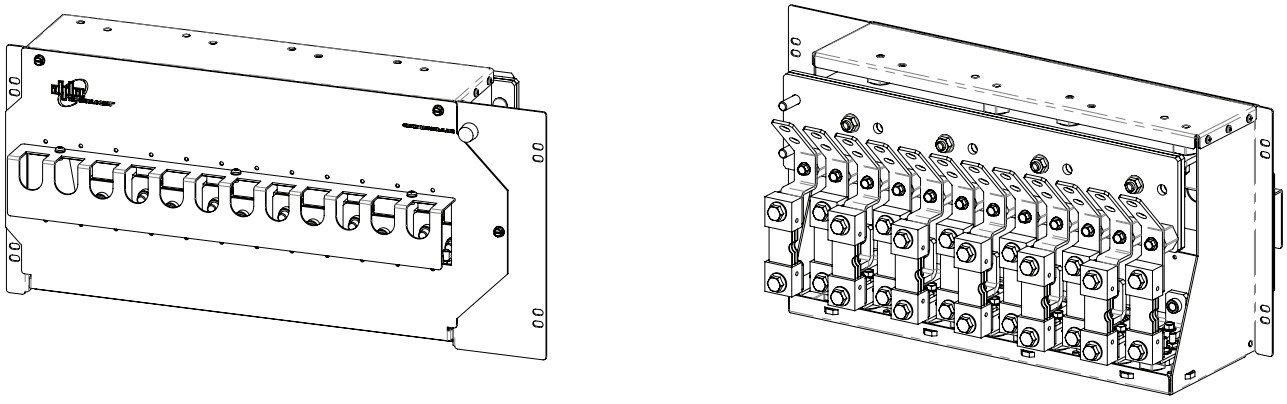


Figure 8: 12 1-position high capacity breaker

4.4.5 Six 2-position high capacity breaker tier (standard system only)

- Occupies one tier position
- 2,000 A tier rating
- Can accept 2-position (300 to 400 A) high capacity breakers
- Individually monitored by 800 A shunts
- Two landings per position, 2-hole, ⅜ inch diameter on 1 inch centers and ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

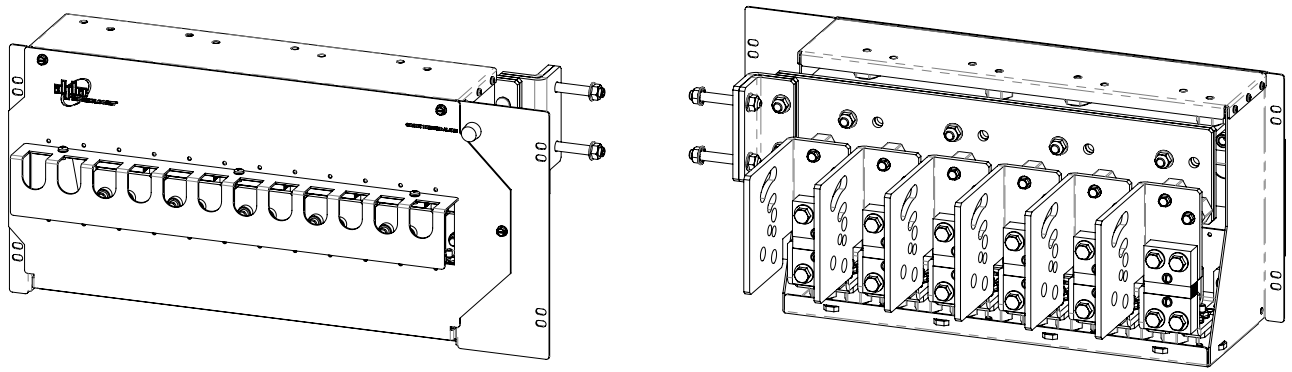


Figure 9: Six 2-position high capacity breaker

4.4.6 Four 3-position high capacity breaker tier (standard system only)

- Occupies one tier position
- 2,000 A tier rating
- Can accept 3-position (500 to 700 A) high capacity breakers
- Individually monitored by 1,000 A shunts
- Two landings per position 2-hole, ⅜ inch diameter on 1 inch centers and ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

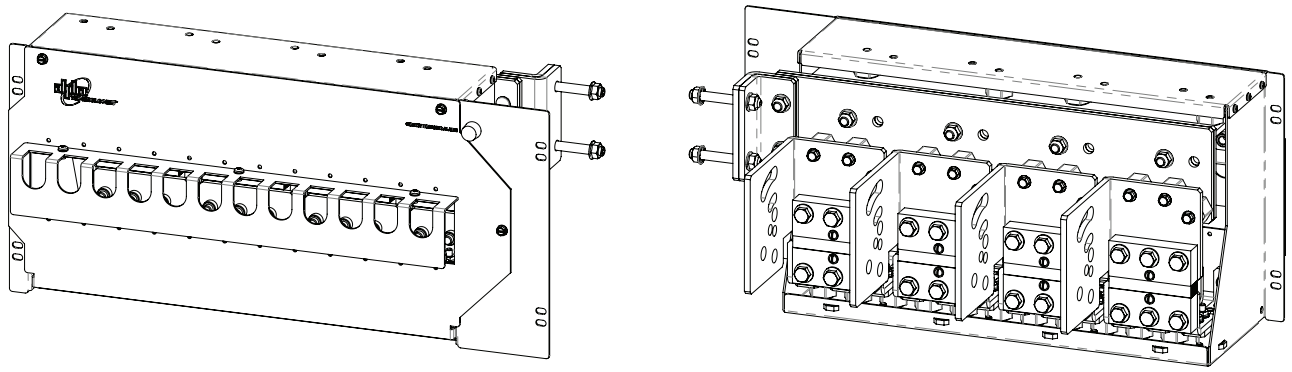


Figure 10: Four 3-position high capacity breaker

4.4.7 Three 4-position high capacity breaker tier (standard system only)

- Occupies one tier positions
- 2,000 A tier rating
- Can accept 4-position (800 A) high capacity breakers
- Individually monitored by 1,000 A shunts
- Two landings per position 2-hole, ⅜ inch diameter on 1 inch centers and ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

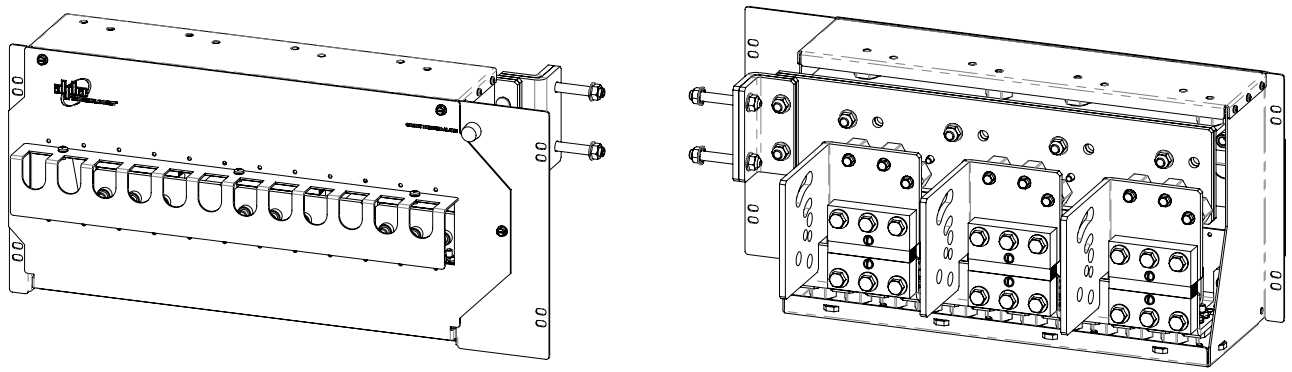


Figure 11: Three 4-position high capacity breaker

4.4.8 Two 5-position high capacity breaker tier (standard system only)

- Occupies one tier positions
- 2,000 A tier rating
- Can accept 5-position (1,000 A) high capacity breakers
- Individually monitored by 1,500 A shunts
- Two landings per position 2-hole, ⅜ inch diameter on 1 inch centers and ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

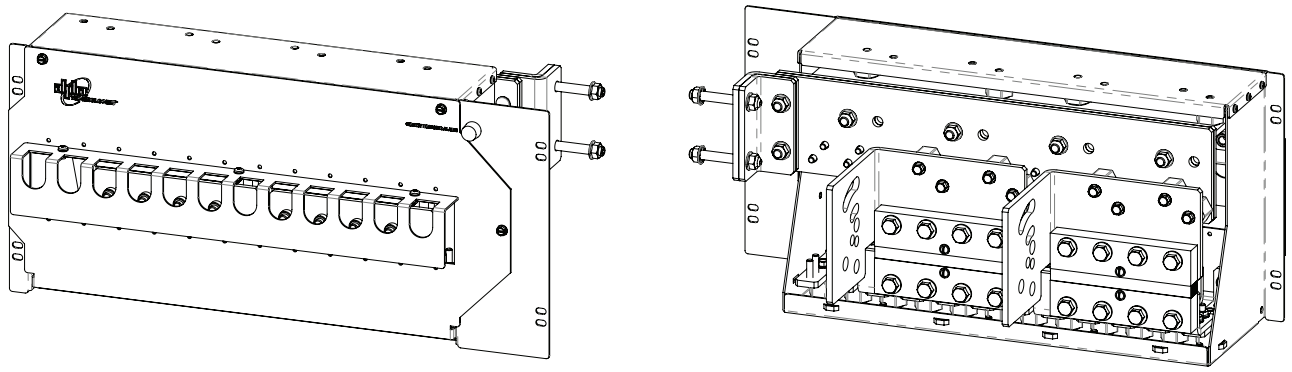


Figure 12: Two 5-position high capacity breaker

4.4.9 Two 6-position high capacity breaker tier (standard system only)

- Occupies one tier position
- 2,000 A tier rating
- Can accept 6-position (1,200 A) high capacity breakers
- Individually monitored by 1,500 A shunts
- Two landings per position 2-hole, ⅜ inch diameter on 1 inch centers and ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

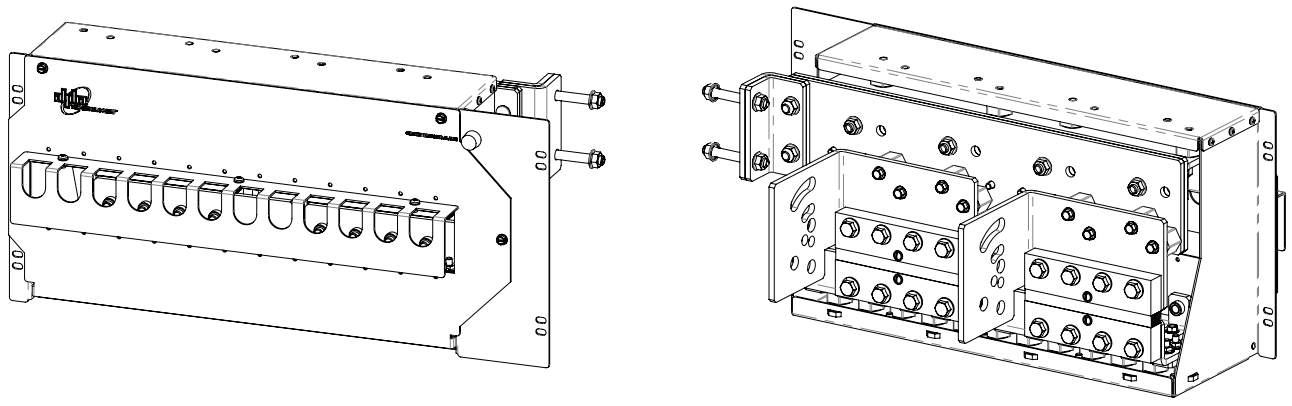


Figure 13: Two 6-position high capacity breaker

4.4.10 Four 2-position and four 1-position high capacity breaker tier (standard system only)

- Occupies one tier position
- 2,000 A tier rating
- Can accept four 1-position (250 A maximum) high capacity breakers
- Can accept four 2-position (300 to 400 A) high capacity breakers
- Individually monitored by 400 A and 800 A shunts
- 1-position one landing per position 2-hole, ⅜ inch diameter on 1 inch centers
- 2-position two landings per position 2-hole, ⅜ inch diameter on 1 inch centers and ½ inch diameter on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

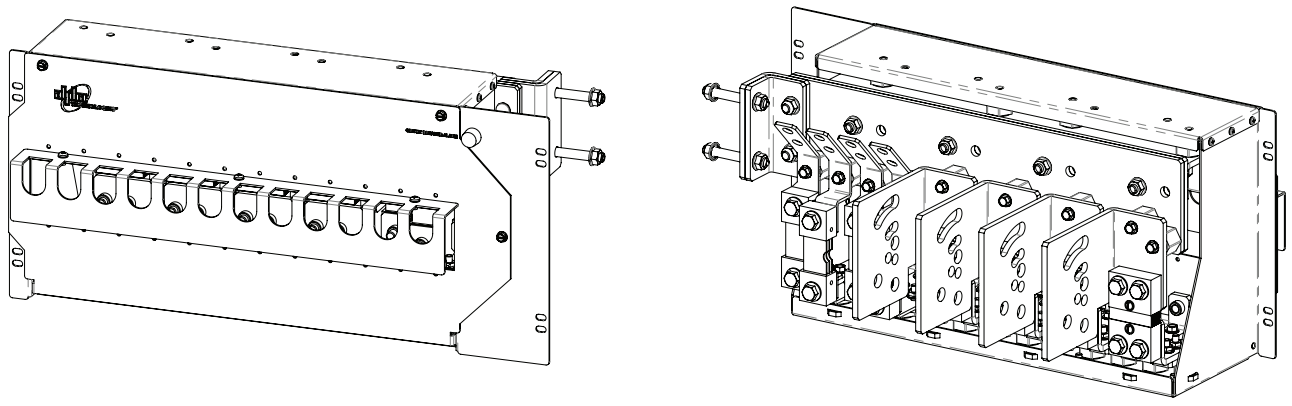


Figure 14: Four 2-position and four 1-position high capacity breaker

4.4.11 18-position bullet breaker tier (standard system only)

- Occupies half tier positions
- 600 A tier rating
- Can accept standard 1-position (125 A), 2-position (200 A), and 3-position (300 A) plug in breakers
- Total shelf monitoring by 800 A shunts
- 1-pole breaker or fuse (1-pole, 2-hole, ¼ inch diameter on ⅝ inch centers)
- 2-pole and 3-pole (2-hole, ⅜ inch diameter on 1 inch centers) via adapters
- Option for whole tier LVD 600 A disconnect
- 100 A and 125 A breakers/fuses need one breaker space

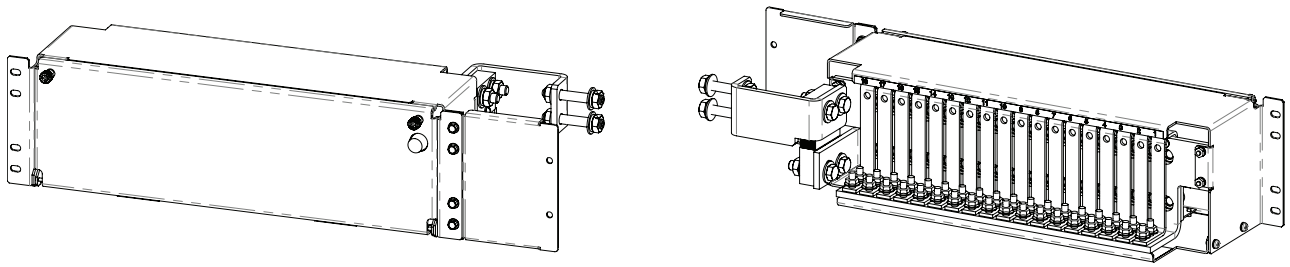


Figure 15: 18-position bullet breaker

4.4.12 18-position bullet breaker return (standard system only)

- Occupies half tier positions
- 600 A tier rating

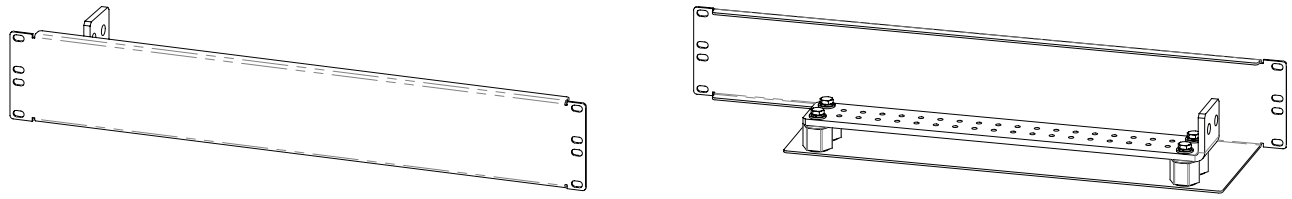


Figure 16: 18-position bullet breaker return

4.4.13 Distribution panel alarms

Fuse or breaker alarms occur when one or more fuse or breaker has opened. The alarm for each fuse or breaker is daisy-chained back to the main system controller.

Alarm indication is provided by a red lamp on each distribution panel.

When a secondary bay is installed, the alarm is wired to the system controller on the primary bay.

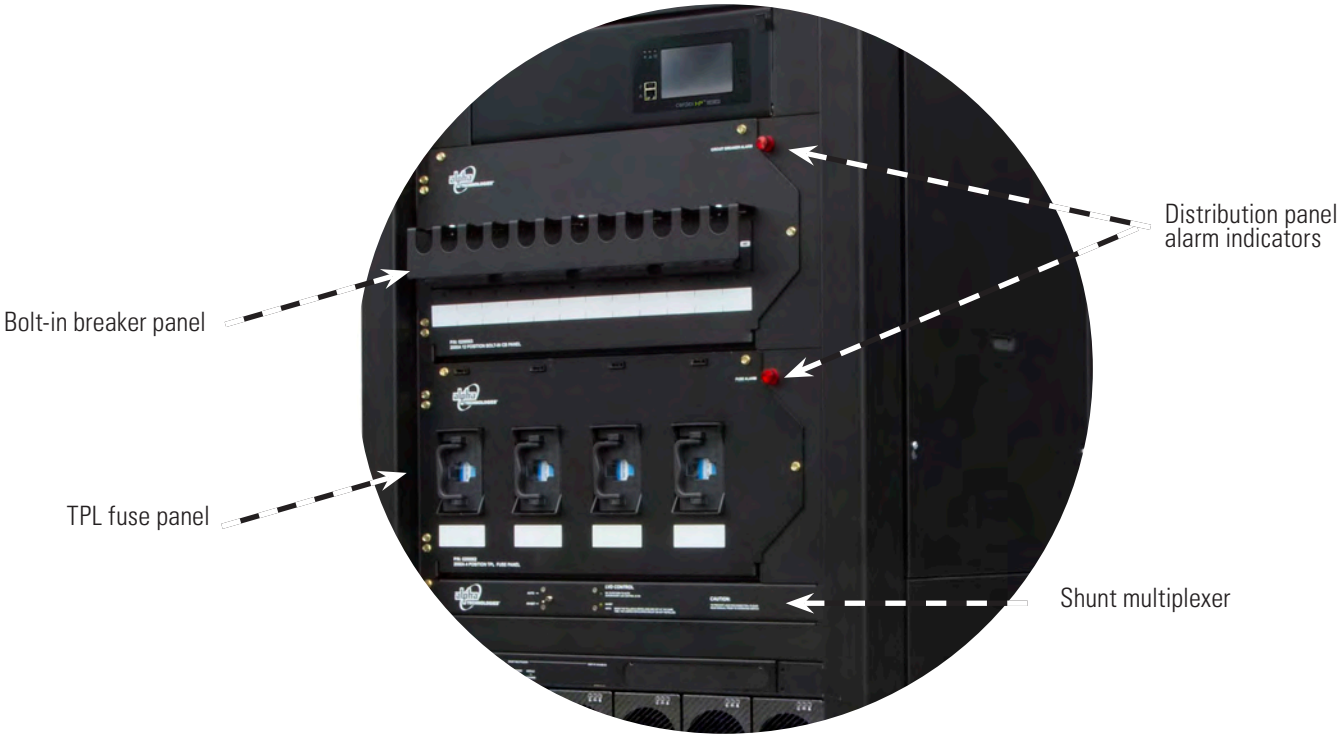


Figure 17: Distribution panel example

NOTICE

Front access systems have LED alarm indicators for each TPL fuse position. There are no lamps for the high capacity breaker option.

4.4.14 Distribution shunts

Each distribution panel has shunts sized according to the breaker or fuse capacity.

A shunt multiplexer panel, located in the top of the bay, monitors the individual branch load currents within the shelves of the individual distribution bay. The current measurements are sent to the system controller, using CAN communications, for data logging and display.

NOTICE

Front access system shunt multiplexers are located on the left side wall and the front door.

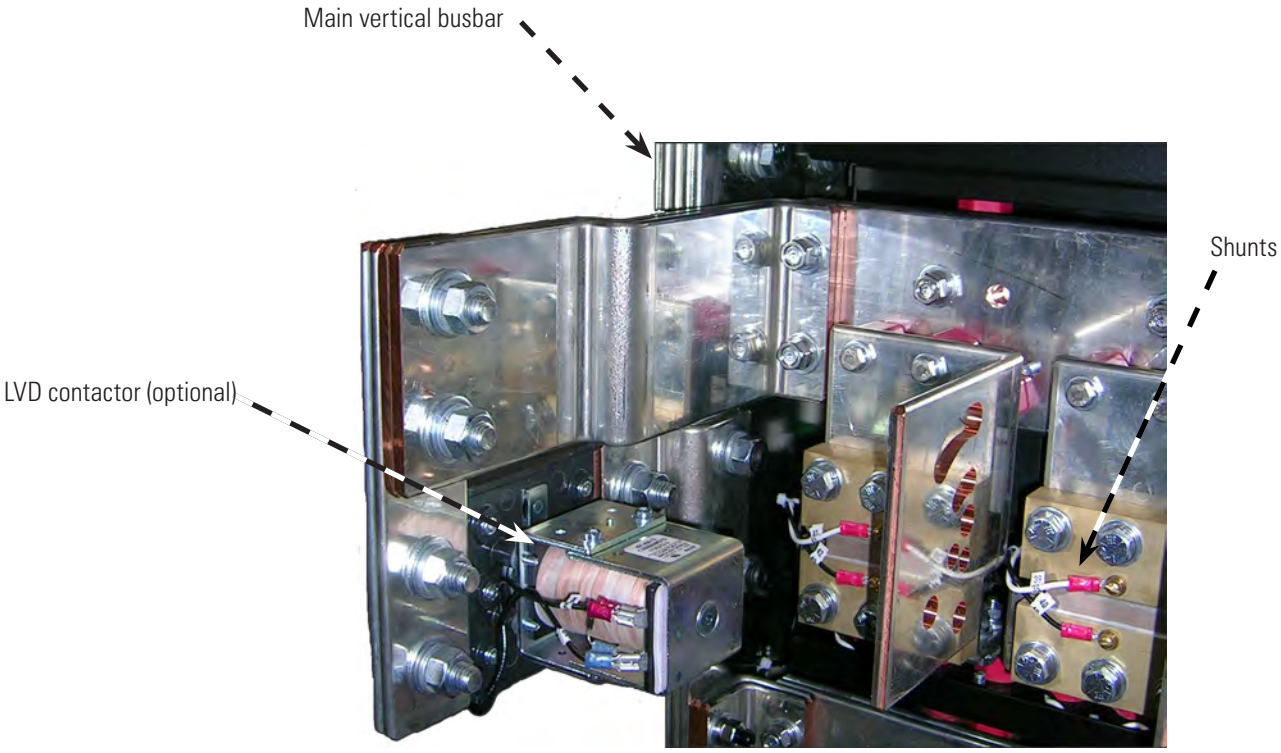


Figure 18: Distribution shunts

4.4.15 Low voltage load disconnect option

The low voltage load disconnect (LVLD) feature provides automatic disconnect of the system loads after a prolonged power failure when the batteries have been fully discharged to a preset battery voltage. Contactors are installed in series with the load. The system loads are automatically reconnected once AC is restored and battery voltage has risen above a preset value. The system controller is activated and is triggered by the battery voltage.

Each distribution panel can be ordered with its own disconnect contactor. The LVLD option can be configured at time of order for group control. Contactor ratings are 2,000 A for TPL bolt-in breaker and 600 A for plug-in bullet panel.

Systems with LVLDs are equipped with a manual override switch. The purpose of this switch is to allow the user to manually bypass the system controller control of the LVLDs during maintenance procedures or during software upgrades.

The system controller will record an alarm when the switch is placed in the inhibit position.

NOTICE

Front access systems do not support the low voltage load disconnect option.

4.5 Cordex® HP System Controller

The Cordex® CXC HP 2RU touchscreen system controller provides centralized setup, control and monitoring of power systems. This ranges from simple monitoring and threshold alarms for temperature, voltage and current, to advanced battery charging and diagnostic features.

The system controller includes dual Ethernet ports and a 4.3-inch LCD panel to allow simultaneous network.

The system controller supports to dual CAN ports to allow up to 256 power and ADIO modules to be controlled and monitored. The system controller uses external analog and digital input and output (ADIO) peripherals to monitor electrical signals (current, voltage, and temperature) and generate electrical signals through relays.

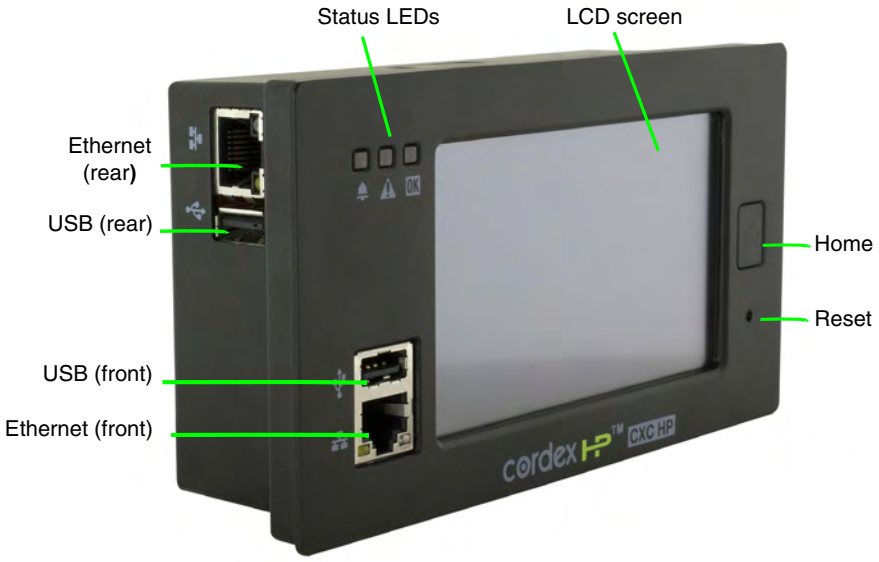


Figure 19: Cordex® CXC HP 2RU touchscreen system controller

4.5.1 System controller features

The Cordex® CXC HP 2RU touchscreen system controller has the following features:

- **Display panel:** Full color touchscreen LCD panel, to access controls and menu items by using fingertip touch or a stylus.
- **Home button:** Provides the ability to go directly back to the home screen from any menu.
- **Reset button:** For emergency use only to restart the system controller if the touchscreen or home button are not responding.
- **LED indicators:** For alarms, progress, and status indication. See the Troubleshooting section for LED states and meanings.
- **Speaker:** Built-in audio tones during active alarms, and can be disabled if required.
- **Ethernet:** Dual ports 10/100 BASE-T Ethernet connection on both the front and right side of the system controller for remote or local communication.
- **USB:** Dual ports, on each on the front and right side of the system controller for upgrades and file management via a standard USB drive.
- **CAN:** Dual independent CAN bus ports on the left side of the system controller for communication with EnerSys® systems, modules, and peripherals.
- **Real-time clock with field replaceable lithium battery:** Allows for timestamps on alarms and events.
- **System fail alarm/relay:** Activates when there is a major internal failure. During such a condition the system controller attempts to reset.

4.6 External peripherals

The external peripherals described here are only for use with the system controller.

4.6.1 Cordex® HP L-ADIO Low Voltage Smart Peripheral

The Cordex® HP L-ADIO low voltage smart peripheral is the standard analog and digital I/O peripheral for low voltage (<60 VDC) systems. The peripheral communicates on CAN bus to the system controller and provides user access to I/O management via the system controller.

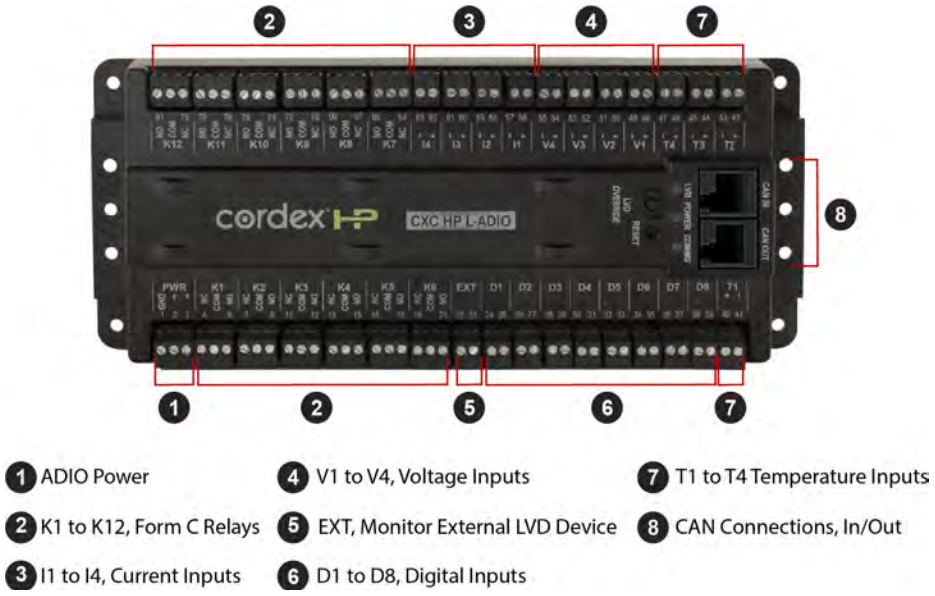


Figure 20: Cordex® HP L-ADIO low voltage smart peripheral

Analog inputs

Four voltage inputs, V1 to V4, are provided for a variety of voltage monitoring requirements. The input channels can measure a signal between –60 to 60 VDC.

Four current input channels, I1 to I4, provide monitoring of current; for example, discharge (load) and charge (battery). The system controller is capable of monitoring standard shunts of 25, 50, and 100 mV as well as application specifications of up to 250 mV. The shunt current rating can be configured via the system controller and is set by default to 800 A/25 mV. The input range for this signal is –250 to 250 mV.

Four temperature input channels, T1 to T4, provide monitoring of temperature probes (thermistors). These are typically used for either ambient temperature, or for battery post monitoring to enable battery temperature compensation. The temperature sensor is provided by Alpha® in various lengths. The input range for this signal is 0 V to 5 V and is powered internally from the ADIO peripheral.

Digital inputs

The peripheral accommodates up to eight digital input channels, D1 to D8. Each channel responds to a zero or system voltage potential at the input to activate or deactivate the appropriate condition.

These channels can monitor digital alarm and control signals from rectifier modules, converter modules and many other types of equipment.

An additional digital input, EXT is reserved for monitoring an external LVD override.

Alarm and control output relays

Each smart peripheral contains 12 Form C alarm output relays to extend alarms and to control external apparatus. Each internally generated alarm or control signal may be mapped to any one of the 12 relays, several signals may be mapped to just one relay or none at all.

LEDs

Each low voltage smart peripheral contains three LEDs for status indication. See the Troubleshooting section for LED states and meanings.

Front panel reset button

A reset button is located on the front panel. It takes approximately 15 seconds before the unit is reacquired after pressing the reset button.

During a reset condition, the smart peripheral will keep relays in their last known state to prevent false alarm notifications and possible changing system LVD states.

Note: Pressing the reset button will cause the Cordex® HP L-ADIO smart peripheral to lose communication with the system controller.

LVD override

An **LVD Override** button is provided to keep any relays assigned to LVD function in a static state. The override function should be used whenever performing system controller maintenance such as test relay functions, or when replacing a system controller.

To engage the LVD override function, select and hold the button for three seconds. A yellow indicator LED will signal that the override is engaged. To restore back to normal LVD operation, select and hold the LVD button again for three seconds.

4.6.2 Cordex® HP 6i-ADIO Six Input Smart Peripheral

The Cordex® HP 6i-ADIO smart peripheral is an analog input peripheral providing six isolated shunt inputs. The peripheral communicates on CAN bus to the system controller and provides access to shunt inputs via the system controller.

Six current input channels, I1 to I6, provide monitoring of current; for example, discharge (load) and charge (battery). The system controller is capable of monitoring standard shunts of 25, 50, and 100 mV as well as application specifications of up to 250 mV. The shunt current rating can be configured via the system controller and is set by default to 800 A/25 mV. The input range for this signal is –250 to 250 mV.

LEDs

Each six input smart peripheral contains two LEDs for status indication. See the Troubleshooting section for LED states and meanings.

Figure 21: Cordex® HP 6i-ADIO six input smart peripheral

4.7 Cordex® HP Redundant Input Power Module

The Cordex® HP redundant input power module (RIPM) provides multiple power inputs to power the Cordex® HP system controller and any I/O peripherals such as the Cordex® HP L-ADIO low voltage smart peripheral. The unit enables users to wire system power into the control devices from multiple locations and provides diode-Or protection between power inputs.

Figure 22: Cordex® HP redundant input power module (RIPM)

4.8 Cordex® HP Shelf/Bay ID Peripheral

The Cordex® HP shelf/bay ID peripheral enables users to identify individual modules by their specific bay and shelf location within the system. This peripheral is an independent module which broadcasts information directly to the rectifier modules. Rectifier modules can then communicate the specific bay, shelf, and slot identification back to the master system controller. The controller LCD panel and web interface provide details on the physical location via each module within the system.

The peripheral requires the user to manually select the bay ID from the front panel. Shelf location is determined by factory installed internal system wiring, and the rectifier modules determine their slot position automatically within a shelf.

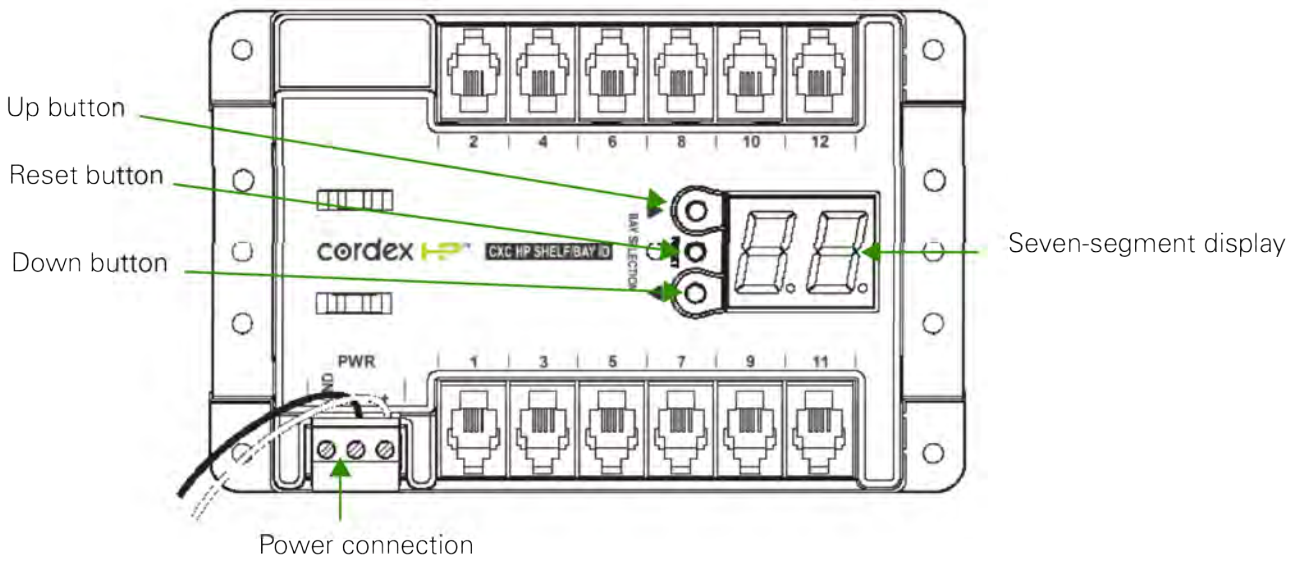


Figure 23: Cordex® HP shelf/bay ID peripheral

NOTICE

Front access systems do not include the Cordex® HP shelf/bay ID peripheral.

5. Pre-installation preparation

NOTICE

This power system is suitable for installation in network telecommunication facilities and locations where the NEC® applies.

5.1 Site selection

The power system must be mounted in a clean and dry environment.

Consider both the floor loading and the physical space required for the power system and the batteries:

- Dimensions for the bay, see the Specifications section for more information.
- Avoid areas that may be subjected to hot air exhaust from nearby equipment.
- Provide adequate space for safe installation and maintenance personnel:
  - **Rear:** 3 feet (1 meter); space not required if front or top access is provided for power bay.
  - **Front:** 3 feet (1 meter)
  - **Sides:** No clearance required
  - **Top:** Clearance required for cables and external return bar (optional).

5.1.1 Floor plan layout

Sufficient free space must be provided at the front of the power system to meet the cooling requirements of the rectifier modules in the power system and to allow easy access to the power system components.

Consider the following before selecting a location for the power system:

- Structure of building able to support the additional weight
- Enough space to meet requirements for access
- Enough space to meet cooling requirements of the rectifier modules
- Adequate space to do the install
- Route that equipment will take through the building to reach the site
- Check and record distances to load
- Check and record distances to AC power source
- Check and record distances to batteries and DC power source
- Understand the full load on the DC system
- Window for working hours and other similar restrictions
- How much and what kind of prep work can be done in advance:
  - Reinforce floors
  - Install distribution panels
  - Install cable racks
  - Run wiring
  - Minimize cable lengths
  - Minimize cable flow and congestion

5.1.2 Installation component requirements

Not supplied

- Concrete mounting hardware
- AC electrical conduit, cable, and fittings
- External DC conduit, cable, and fittings
- Auxiliary frame (2-inch × 9/16 inch) for optional external battery return busbar kit

5.2 Tools and test equipment

Various insulated tools are essential for the installation. Use this list as a guide:

- Battery lifting apparatus if required
- Electric drill with hammer action, ½ inch capacity
- Various crimping tools and dies to match lugs used in installation
- Load bank of sufficient capacity to load largest rectifier module to its current limit
- Digital voltmeter equipped with test leads
- Cable cutters
- Torque wrench: ¼ inch drive, 0 to 150 in-lb (0 to 17 Nm)
- Torque wrench: ⅜ inch drive, 0 to 100 ft-lb (0 to 135 Nm)
- Insulating canvases as required
- Various insulated hand tools including:
  - Combination wrenches
  - Ratchet and socket set
  - Various screwdrivers
  - Electricians knife
- Battery safety spill kit required for wet cells only
- Cutters and wire strippers 14 to 22 AWG (2.5 to 0.34 mm²)

5.3 Floor loading

5.3.1 Concrete floors (for reference only)

Concrete floor installation requiring seismic compliance requires approval by the appropriate engineering discipline, for example, civil and structural. The thickness of the concrete should be evaluated to ensure that its weight carrying capabilities meet the requirements.

Check the building floor plans for the presence of pipes, conduits, beams or any other obstructions in the concrete slab that could interfere with the drilling.

Figure 24 and Figure 25 show the dimensions and bolt locations of a single bay. An anchoring kit is provided with hardware for the slots as well as the four additional bolt holes required for seismic.

6. Inspection

6.1 Packaging materials

Alpha Technologies Ltd. is committed to providing products and services that meet our customers' needs and expectations in a sustainable manner, while complying with all relevant regulatory requirements. As such we strive to follow quality and environmental objectives from product supply and development through to the packaging for our products.

Power modules and batteries are shipped on individual pallets and are packaged according to the manufacturer's guidelines.

Almost all packaging material is from sustainable resources and or is recyclable.

6.2 Returns for service

NOTICE

Alpha Technologies Ltd. is not responsible for damage caused by improper packaging of returned products.

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is unavailable, make sure that the product is packed with at least three inches of shock-absorbing material to prevent shipping damage.

6.3 Check for damage

Before unpacking the product, note any damage to the shipping container. Unpack the product and inspect the exterior for damage. If any damage is observed, contact the carrier immediately. Continue the inspection for any internal damage. In the unlikely event of internal damage, inform the carrier and contact us for advice on the impact of any damage.

6.4 General receipt of shipment

The inventory included with your shipment depends on the options you have ordered. The options are clearly marked on the shipping container labels and bill of materials.

6.5 Miscellaneous small parts

Review the packing slip and bill of materials to determine the part number of the configuration kits included with your system. Review the bill of materials to verify that all the small parts are included. Contact us if you have any questions before you proceed.

7. Installation

NOTICE

No rectifier modules should be installed at this time. Do not install rectifier modules until instructed later in the installation procedure.

The power system must be mounted in a clean and dry environment. Provide sufficient free space at the front of the power system to meet the cooling requirements of the rectifier modules in the power system and to allow easy access to the power system components.

7.1 Floor drilling for standard anchoring

NOTICE

Earthquake anchoring is the type used in earthquake areas up to Zone 4. The power system frame is earthquake qualified when properly anchored to a 3,000 psi (211 kg/cm²) concrete floor.

The anchoring kit and procedures in this section are for a seismic installation, but apply equally well to a non-seismic installation.

7.1.1 Drilling the holes for the anchor bolts

1. If you are installing more than one bay, snap a chalk line on the floor to align the bays for mounting.
2. Use a rebar locator to plan for the anchor positions.
3. Refer to the figure and mark the anchor hole positions. This figure also shows the preferred location for the anchor holes within the slots.

Front Access

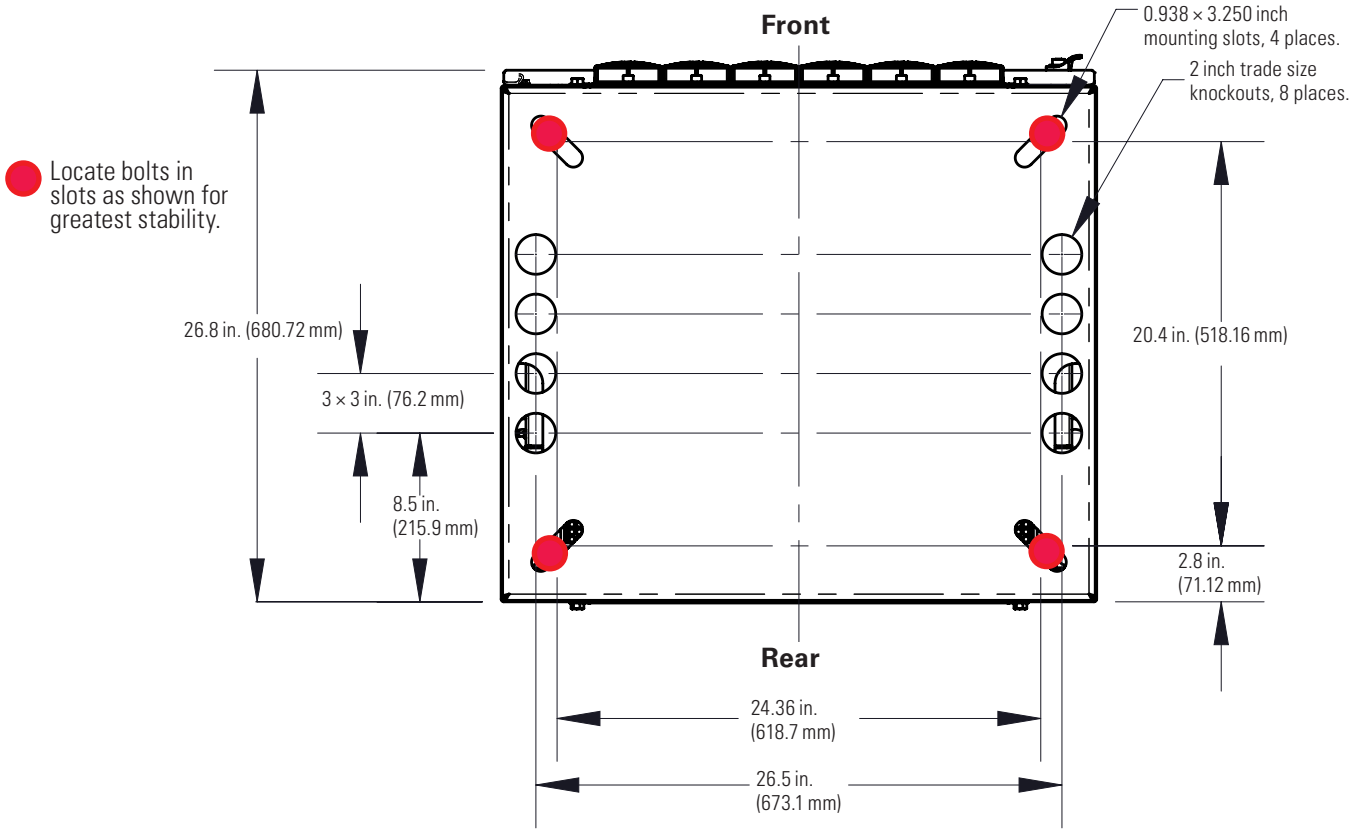


Figure 24: Base dimensions and mounting holes for front access systems

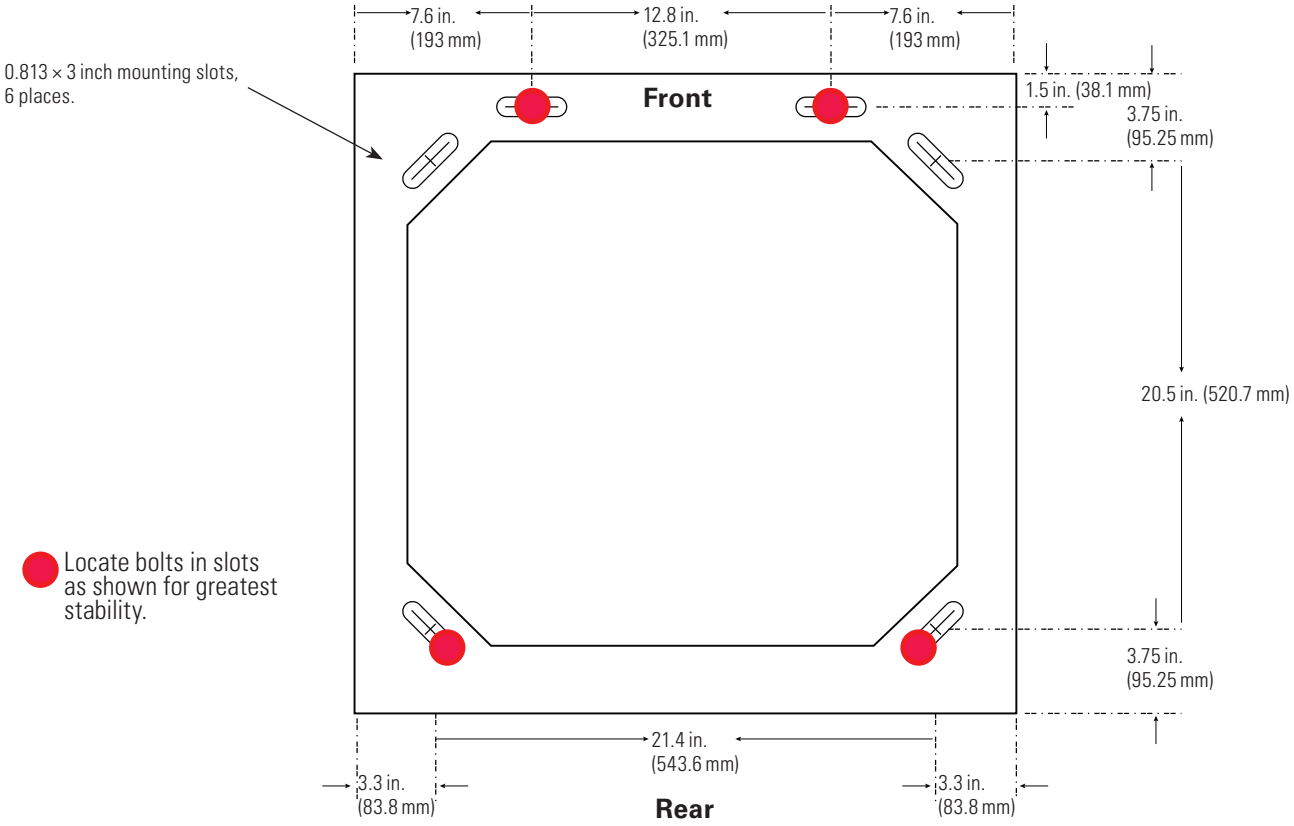


Figure 25: Base dimensions and mounting holes for standard systems

7.1.2 Setting the anchors

First, review manufacturer's instructions before setting the anchor.

1. Drop the anchor into the drilled hole.
2. Insert the anchor setting tool and hit it with a hammer to expand the anchor until the collar of the setting tool rests against the shoulder of the anchor.

7.2 Placing and securing the bays

7.2.1 Securing the bays to the floor

1. Place the bay in position over the anchoring holes (and the isolation pad if applicable).
2. Install the anchoring hardware for each anchor finger tight.
3. Check that the bay is level front-to-back and side-to-side.

ATTENTION

It is extremely important that the bay be properly shimmed in order to prevent any frame distortion. If the floor is not level, shims may be required.

Shims should be installed as close as possible to the anchoring hardware underneath the bay. Shims can be installed on two corners, to level left to right and front to back.

Standard slotted square shims are recommended.

NOTICE

When installing two or more adjacent bays, install the inter-bay DC components per section 7.4 before completing the final torquing of the anchor bolts.

4. Once the bay is level, tighten all bolts to the appropriate torque, supplied by the anchor manufacturer.

Figure 26: Securing power system to concrete floor

7.2.2 Battery low voltage disconnects (purchased separately)

If battery disconnect contactors are used:

1. Connect a secondary power source, from either side of the LVBD, to the system controller.
2. Connect battery disconnect panels to the system controller battery fuse alarm input and LVBD control.

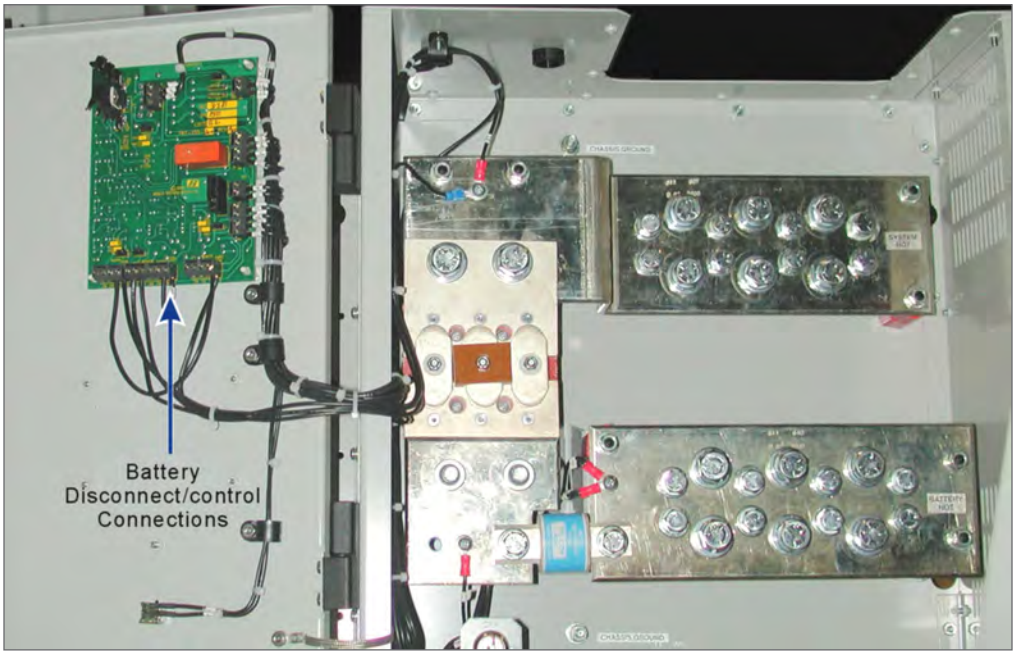


Figure 27: Battery disconnect connections

NOTICE

Front access systems do not support battery low voltage disconnect.

Front Access

7.3 Tandem system busbar installation for front access systems

When installing a tandem system (secondary bay) the tandem busbars can be slid from the sides and bolted onto the rear busbars.

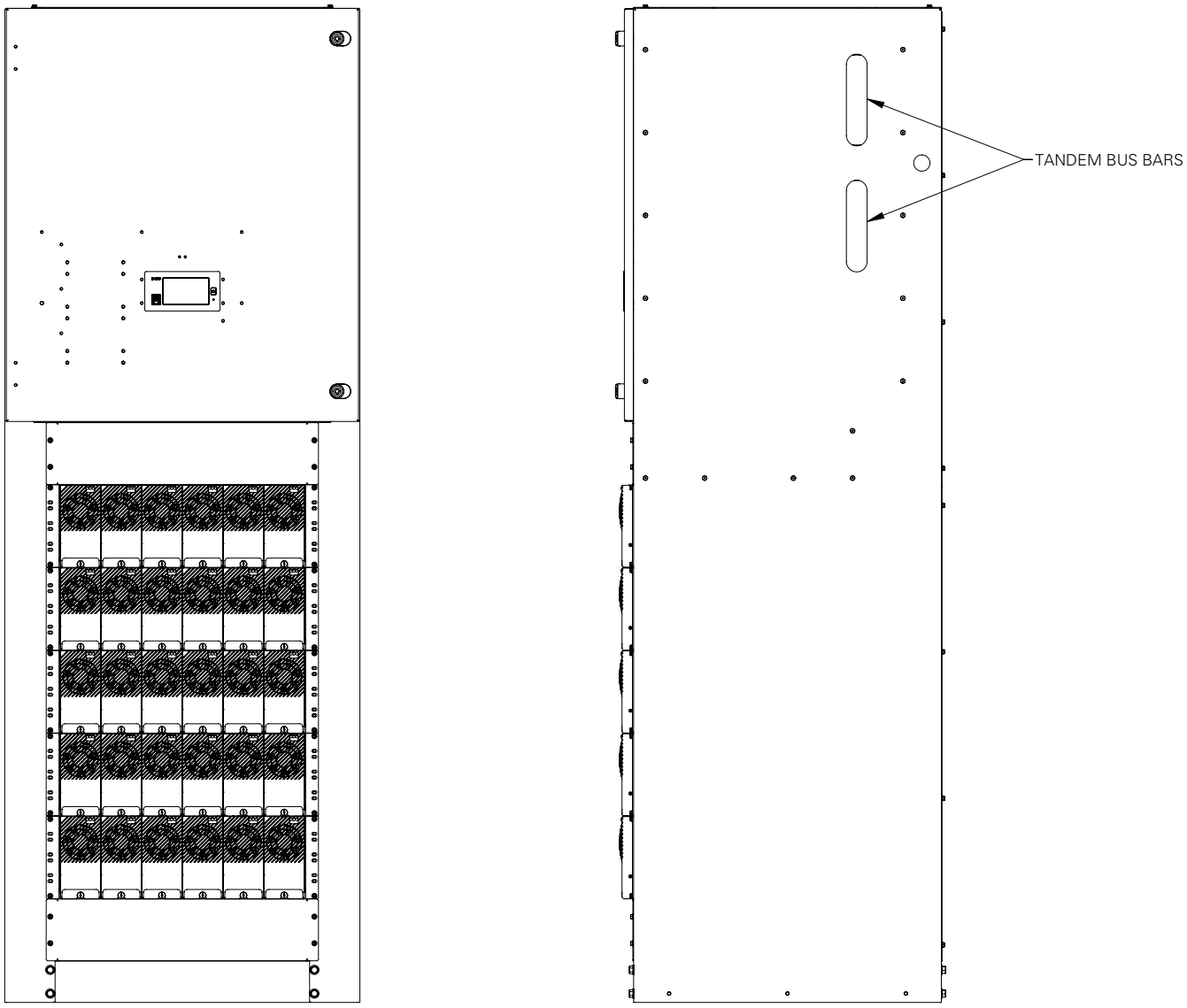


Figure 28: Tandem system busbar installation for front access systems

7.4 Tandem system busbar installation for standard systems

When installing a tandem system (secondary bay) the side panels of the bay need to be removed, and then the tandem busbars can be slid from the sides and bolted onto the rear busbars.

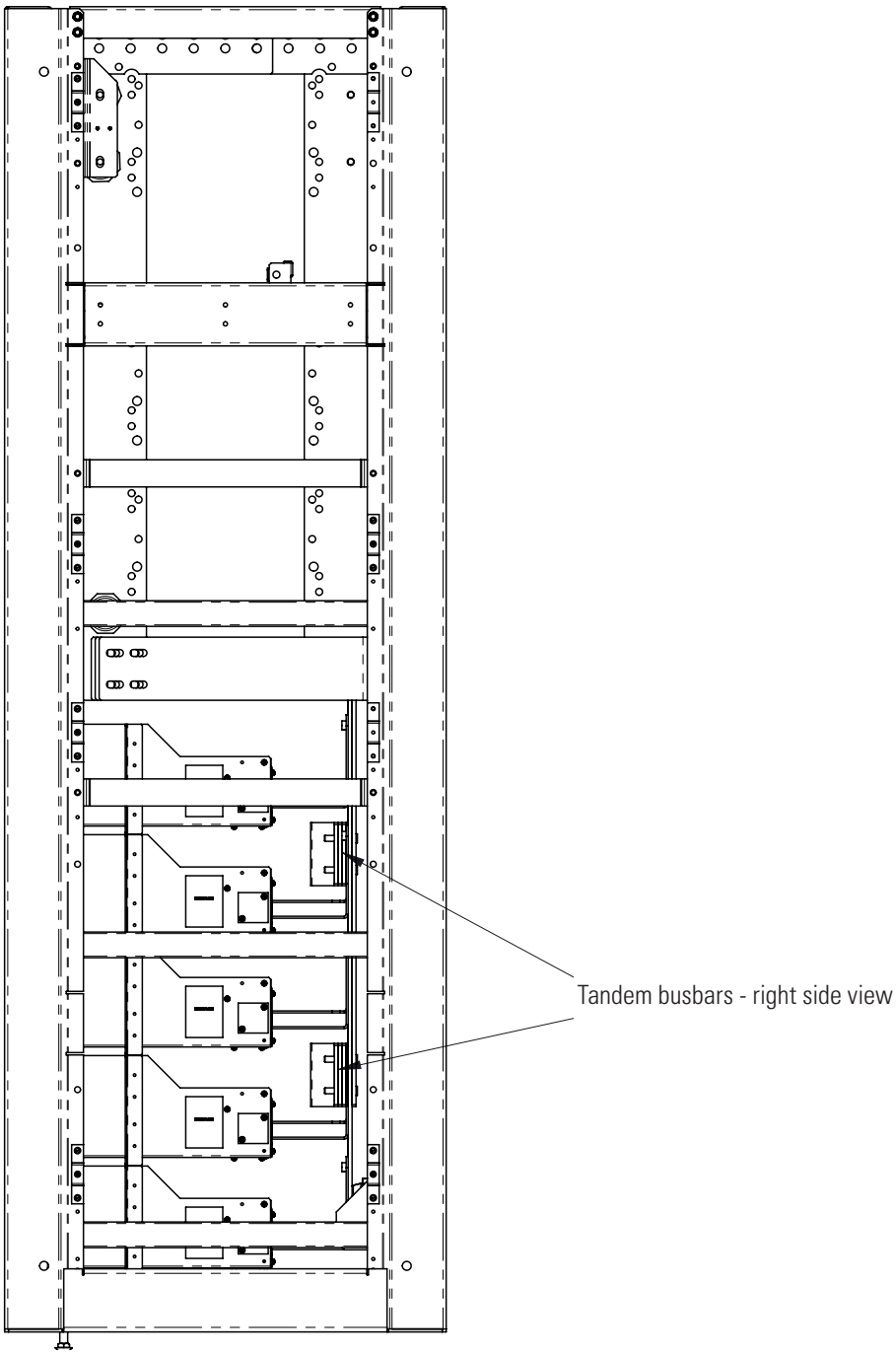


Figure 29: Tandem system busbar installation (bay shown with panels removed)

7.5 Battery installation

This information is provided as a guideline and is not meant to imply that batteries are part of this power system.

WARNING

Follow battery manufacturer's safety recommendations when working around battery systems and review the safety instructions provided in this document.

Figure 30: Battery installation

7.5.1 Preparation and mounting

Batteries should be located in a temperature-controlled environment. The temperature should be regulated at approximately 77°F (25°C). Significantly lower temperatures reduce performance and higher temperatures decrease life expectancy.

Before assembly, clean cells (where applicable) as per the battery manufacturer's recommendations. First neutralize any acid with a baking soda and water solution. Then wipe the cells with clean water.

7.5.2 Installation of external batteries

Verify that all battery breakers, DC circuit breakers, and fuses on the distribution panels are either in the **OFF** position or removed.

Apply a corrosion-inhibiting agent, such as Sanchem Inc. NO-OX-ID® A-SPECIAL electrical grease on all battery terminal connections.

1. If required, assemble the battery rack and the cells or mono-blocks as per the installation instructions supplied with the batteries.
2. Ensure that the battery output cabling will reach the positive [+] and negative [–] terminals of the series battery string and that the batteries are oriented correctly for easy installation of the interunit series connectors.
3. Remove any electrical grease from battery terminals.
4. Burnish terminal posts with a non-metallic brush, polishing pad or 3M Company Scotch-Brite® scouring pad.
5. Apply a light coating of electrical grease to the terminal posts.
6. If lead plated interunit connectors are used, they should also be burnished and electrical grease applied. Install the interunit connectors.
7. After all battery connections are completed, torque per battery specifications; typically 100 in-lb (11.3 Nm).

Refer to the system startup procedure before connecting the batteries online.

7.5.3 Temperature probe for monitoring battery temperature

1. Locate the battery temperature probes coiled up in the power bay that has a system controller.
2. Connect temperature probes from system controller to battery termination post negative.
3. Pick a location at mid-height on one or more battery strings, which will provide a good average temperature reading; that is, away from heating or cooling sources.

NOTICE

Connect both temperature probes to separate battery posts for a better average reading of the battery.

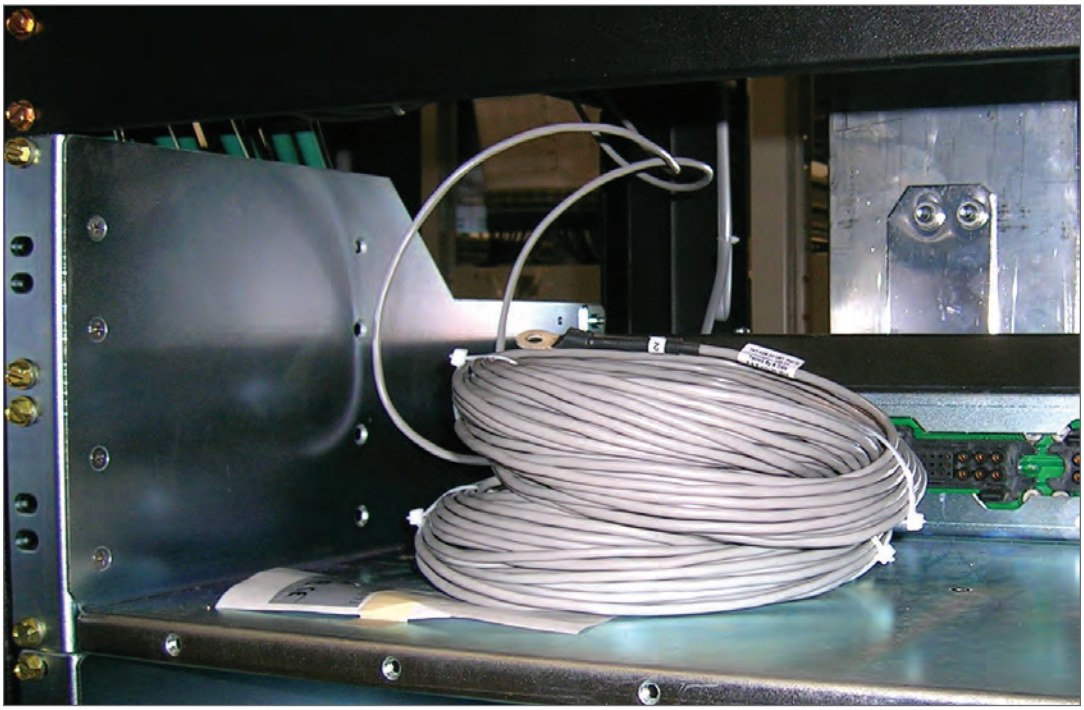


Figure 31: Battery temperature probes

7.6 Battery maintenance report

After assembly, number the batteries and take as received readings, including specific gravity, cell voltage, and temperature. Designate one cell as the pilot cell. This is usually the cell with either the lowest specific gravity or voltage. Refer to the manufacturer's documentation for guidelines. See the following table for typical maintenance report:

Company:	**Date:**	
Address:		
Battery location and number:		
Number of cells:	**Type:**	**Date new:**
Date installed:	**Float voltage:**	**Ambient temperature:**

Table G: Typical VRLA battery maintenance report

Cell number	Serial number	Voltage	Specific	Ohms	Mhos	Observations

Remarks and recommendations:

Readings taken by:

8. Wiring

This section provides cabling details and notes on cable sizing for DC applications with respect to the power system.

- Only qualified personnel should install and connect the power components within the power system.
- All wiring must be in accordance with applicable electrical codes.
- Use of an LVBD is recommended to automatically disconnect the batteries after a complete discharge to prevent possible permanent damage to the batteries.
- Electrical codes require that conductors carrying AC current be installed separately from conductors carrying DC current and signals.

8.1 Installation notes

8.1.1 Installer responsibility

The system arrives pre-wired, and the installer is responsible for connecting the following:

- Utility input to the system
- Battery strings
- System to the load
- Chassis and battery return to the reference ground

All signaling wires (for example, alarms from the system controller) interfacing with the outside world exit the frame through the top or bottom.

8.1.2 Calculating input and output wire size requirements

Although DC power wiring and cabling in telecommunication applications tend to exceed electrical code requirements, mostly due to the voltage drop requirements, all applicable electrical codes take precedence over the guidelines and procedures in the present chapter, wherever applicable.

Wire size is calculated by first determining the appropriate maximum voltage drop requirement. Use the formula below to calculate the circular mil area (CMA) wire size requirement. Determine the size and number of conductors required to satisfy the CMA requirement.

$$CMA = (A \times LF \times K) / AVD$$

A = Ultimate drain in amps.

LF = Conductor loop feet.

K = 11.1 constant factor for commercial (TW type) copper wire.

AVD = Allowable voltage drop.

Check again that the ampacity rating of the cable meets the requirement for the installation application. Consult local electrical codes (for example, NEC® and CEC®) for guidelines. If required, increase the size of the cable to meet the code.

Refer to Table G for cable size equivalents.

Table H: Cable size equivalents (imperial to metric)			
American Wire Gauge	**Circular mils**	**Square millimeters**	**Equivalent metric cable**
20 AWG	1,020	0.519	1
18 AWG	1,624	0.8232	1
16 AWG	2,583	1.309	1.5
14 AWG	4,107	2.081	2.5
12 AWG	6,530	3.309	4
10 AWG	10,380	5.261	6
8 AWG	16,510	8.368	10
6 AWG	26,250	13.3	16
4 AWG	41,740	21.15	25
2 AWG	66,370	33.63	35
0 AWG (1/0)	105,600	53.48	50 or 70
00 AWG (2/0)	133,100	67.42	70
0000 AWG (4/0)	211,600	107.2	120
313 MCM (kcmil)	313,600	159	150 or 185
350 MCM (kcmil)	350,000	177.36	185
373 MCM (kcmil)	373,700	189	185 or 240
500 MCM (kcmil)	500,000	253.36	300
535 MCM (kcmil)	535,300	271	300
750 MCM (kcmil)	750,000	380	400
777 MCM (kcmil)	777,700	394	400

8.1.3 Recommended torque values

Recommended torque values for connection to the power system:

- Clear hole connections (nut and bolt)
- PEM studs
- PEM threaded inserts
- Thread formed connections (in copper busbar)

Table I: Recommended torque values	
Size	**Specification**
¼ inch	8.8 ft-lb (11.93 Nm)
⅜ inch	32.5 ft-lb (44.1 Nm)
½ inch	73 ft-lb (98.9 Nm)

SAE Grade 5 rated hardware is required for these torque values. Use factory provided hardware. Stainless or other metals have a different torque specification.

8.2 Connecting the frame and reference grounds

ATTENTION

The grounding methods described in this section are generic. Follow local requirements and electrical code.

This power system is suitable for installation as part of a common bonding network (CBN) and is intended to be used in a DC-C configuration (common DC return).

Internal battery return bus

Connect the power system internal battery return bus (BRB) to the building master ground bus (MGB) or floor ground bus (FGB) in larger buildings. This acts as a system reference and a low impedance ground path for surges, transients, and noise. The MGB or FGB should have a direct low impedance path to the building grounding system.

Size the cable between the power system and the MGB or FGB so that there is sufficient ampacity to clear the largest fuse or breaker on the power system, excluding the battery protection fuse or circuit breaker; 750 MCM (400 mm²) is recommended. This is the minimum requirement. Other factors, including length of cable and special grounding requirements of the load, must be factored in. Use two-hole crimp type lugs and insulated cable that does not have any tight bends or kinks.

Optional external battery return bar

Unless specifically instructed otherwise, the battery return reference (BRR) lead is usually connected at the external battery return busbar shown in the following figure.

Frame ground

Connect a cable; typically a 2/0 AWG (70 mm²) cable; between the frame of each bay and MGB or FGB. This electrical continuity requirement can be met by the use of thread-forming type unit mounting screws and star washers that remove any paint or non-conductive coatings and establish metal-to-metal contact.

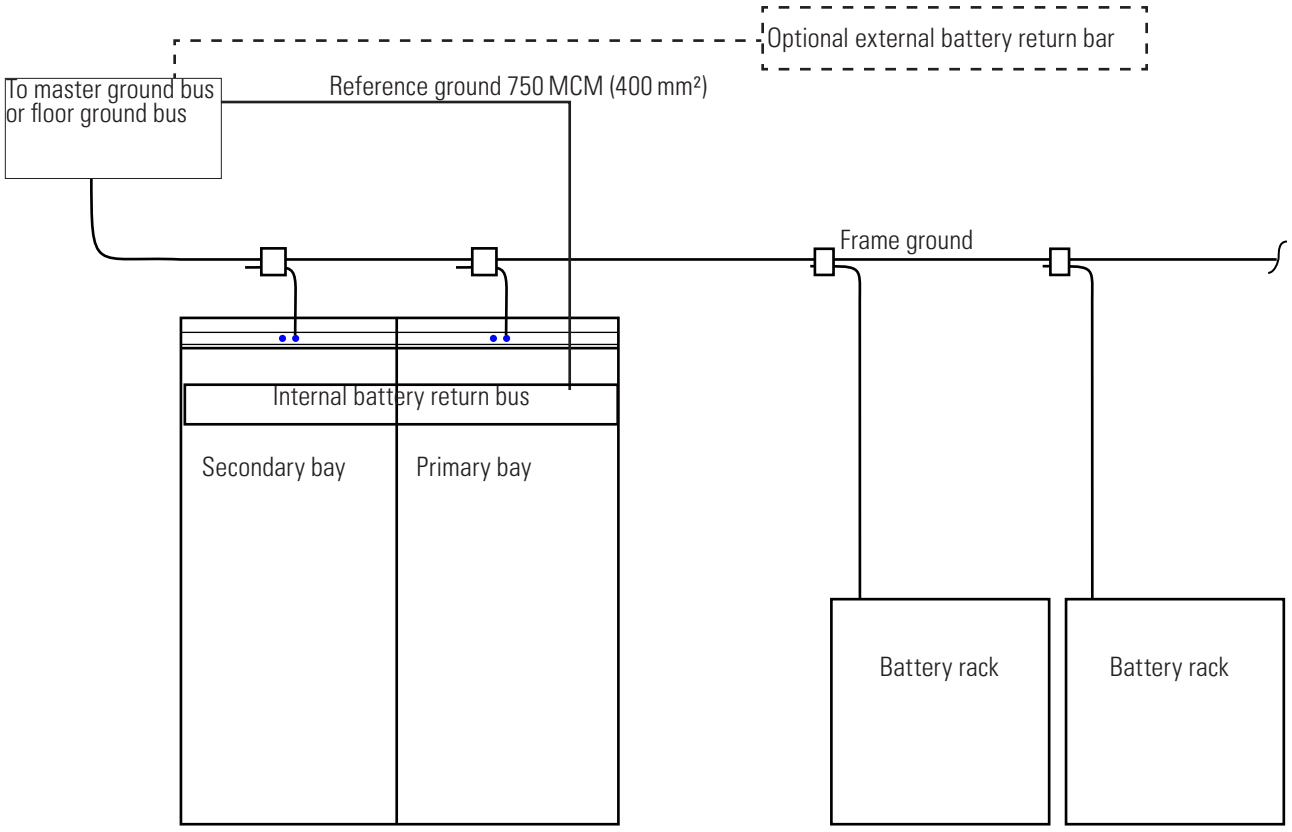


Figure 32: Battery return busbars, frame ground, and battery return reference

8.3 AC supply for the rectifier modules

Rectifier modules can be wired through an optional AC distribution panel, which is internally wired to the individual rectifier shelves, or directly to each rectifier shelf.

For both options refer to the AC input specification in the Specifications section.

NOTICE

Any recommendations for input breakers and wire sizes are for reference only. A registered professional engineer must review and approve or modify these recommendations in compliance with applicable national and local electrical and building codes.

8.3.1 Wiring the AC distribution panel

NOTICE

Verify no rectifier modules are installed in the power bays at this time.

NOTICE

Wire one side at a time with only one door open. Working with both doors open may make it difficult to close both doors when the wiring is complete.

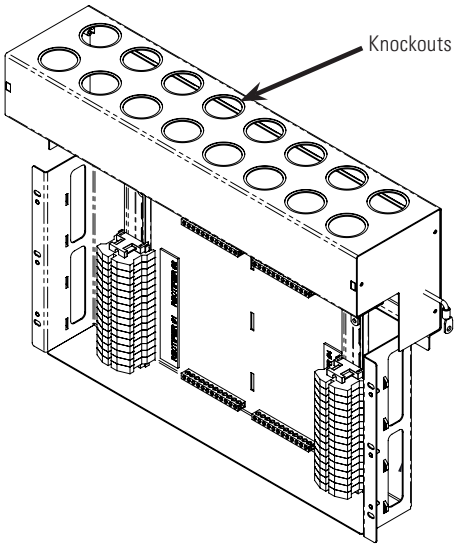


Figure 33: AC panel 5-feed, 3-wire 208 VAC shown

NOTICE

Verify that AC breakers are off and locked out at the AC input panel.

Wire one side at a time with only one door open

1. Route AC wires through the knockouts in the top of the assembly.
2. Connect to the terminal blocks as shown in Figure 34. (Also clearly labeled on the panel.)
3. Neatly group cables with tie wraps.

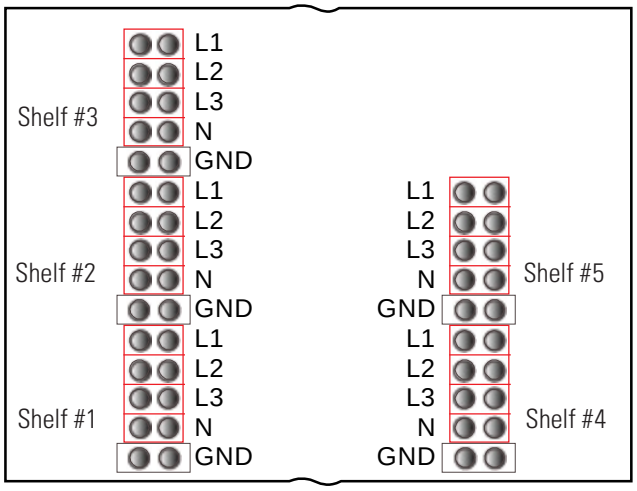


Figure 34: Terminal blocks for 5-feed, 3-wire 208 VAC input

Front Access

8.4 Front access system: AC supply wiring

To avoid future accessibility issues, connect the AC circuits to all rectifier shelves at the time of installation

NOTICE

Verify no rectifier modules are installed in the rectifier shelves at this time.

8.4.1 AC input terminal block assembly

To access the AC input terminal block assembly, loosen and remove the four front screws on the AC terminal block top front cover. Lift up and slide out the cover completely.

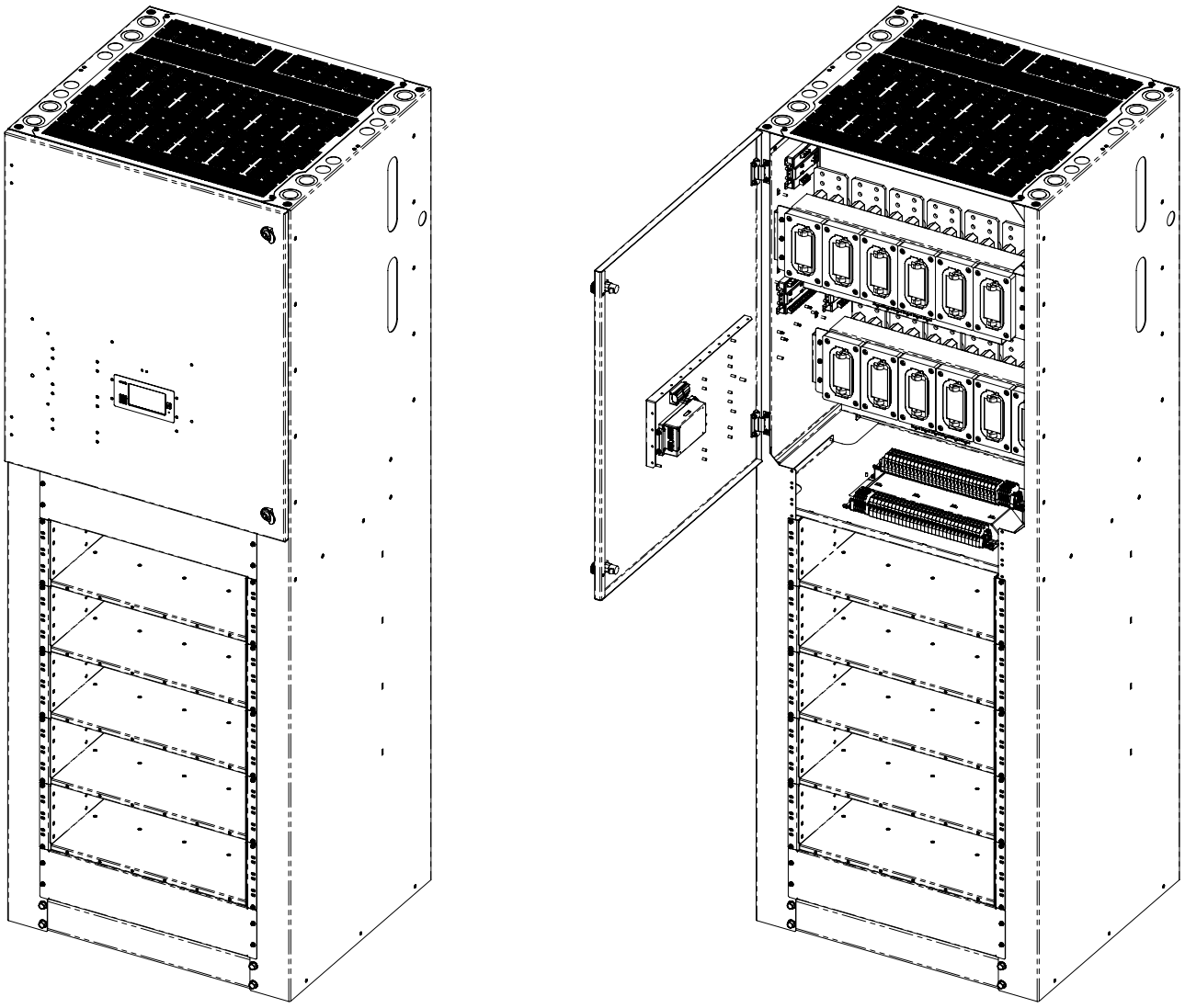


Figure 35: AC input terminal block location

8.4.2 Top chassis conduit entry plate

Two sizes of conduit knockouts are available on the top chassis conduit entry plate. Select and install the appropriate size conduit fitting and quantity for your application. Refer to conduit size tables in the previous AC wiring front access system section. A grounding conductor must be provided with each conduit run. Check your specific rectifier shelf AC input voltage configuration for wiring requirements in section 7.3.5, which shows the different rectifier shelf terminal block wiring configurations.

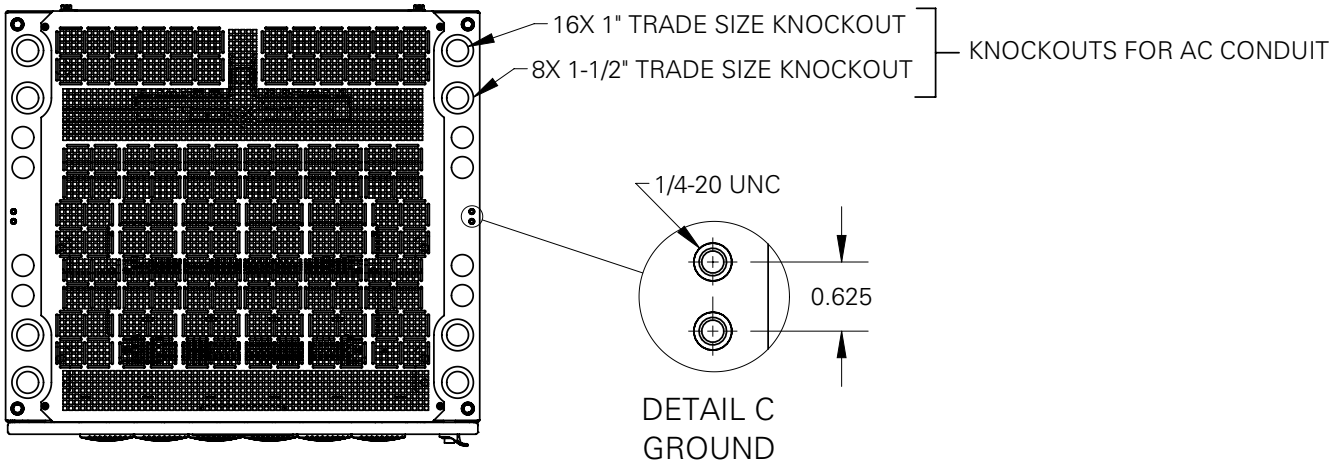


Figure 36: Top chassis conduit entry plate

8.4.3 AC input wire duct and covers

Remove the two AC input inner wire duct covers (on left and right sides) by removing the fasteners that secure each of them in place. Install conduit and fittings as required in the top chassis conduit entry plate.

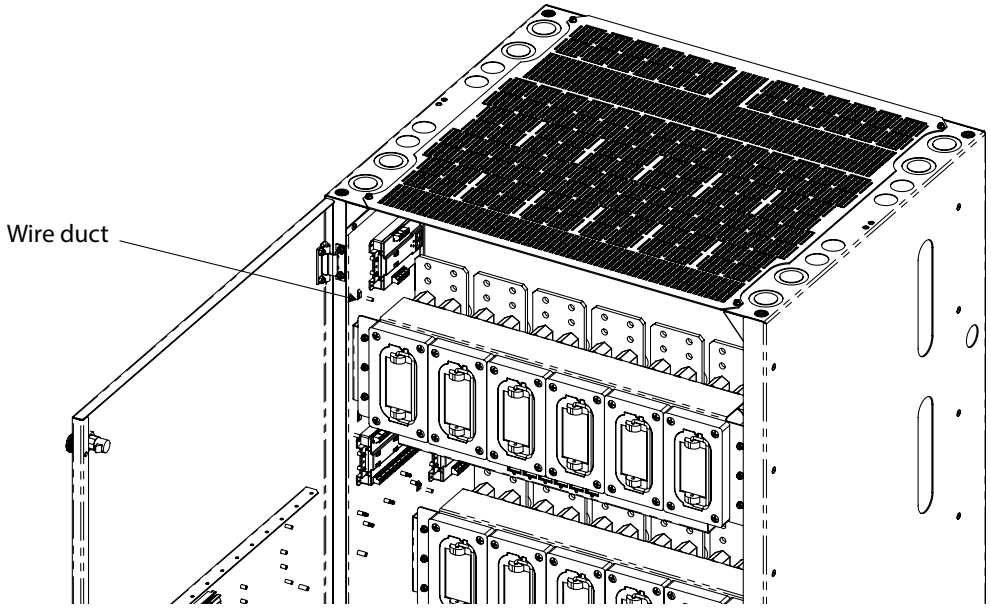


Figure 37: AC input wire ducts and covers

8.4.4 Making AC input wire connections

Route wiring through the previously installed conduit fittings, down through the wiring ducts and into the AC input terminal block assembly area. Connect input power and ground wires to the terminal blocks as per markings shown on labels matching your specific rectifier shelf configuration. Recommended torque is 14 in-lb (1.58 Nm) for power (gray) and grounding (green/yellow) terminal block screws.

After all AC input power and grounding wire connections have been made and properly checked, reinstall the two AC input wire duct covers and the AC input terminal block assembly top front cover. Secure covers by reinstalling the fasteners previously removed.

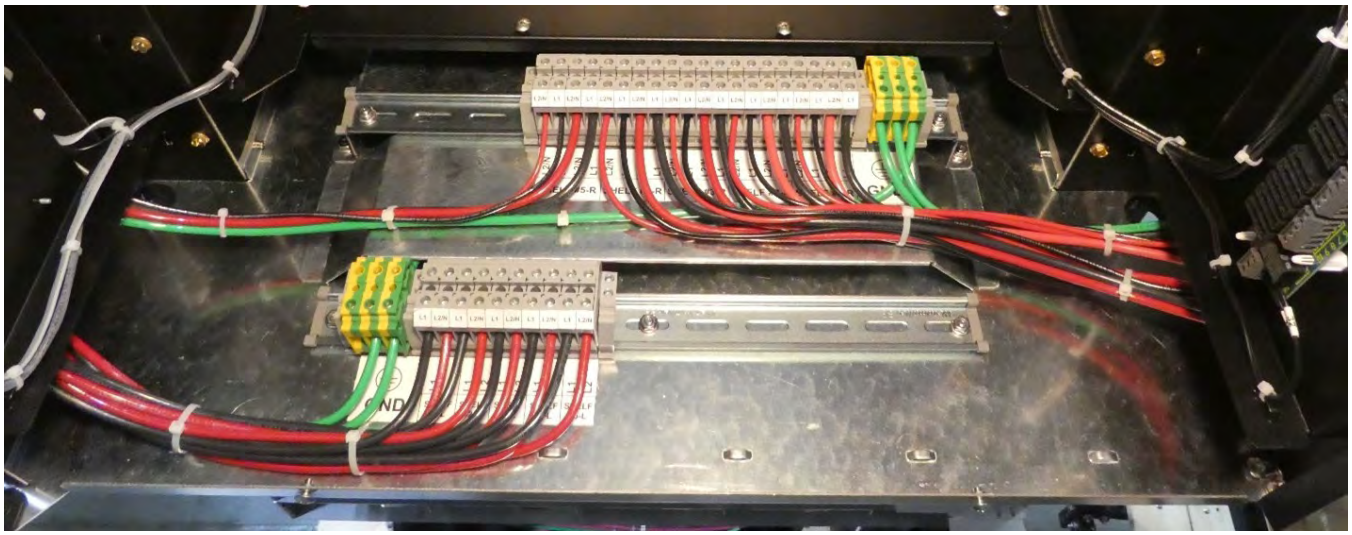


Figure 38: Typical customer AC input wiring

8.4.5 AC terminal block wiring diagrams

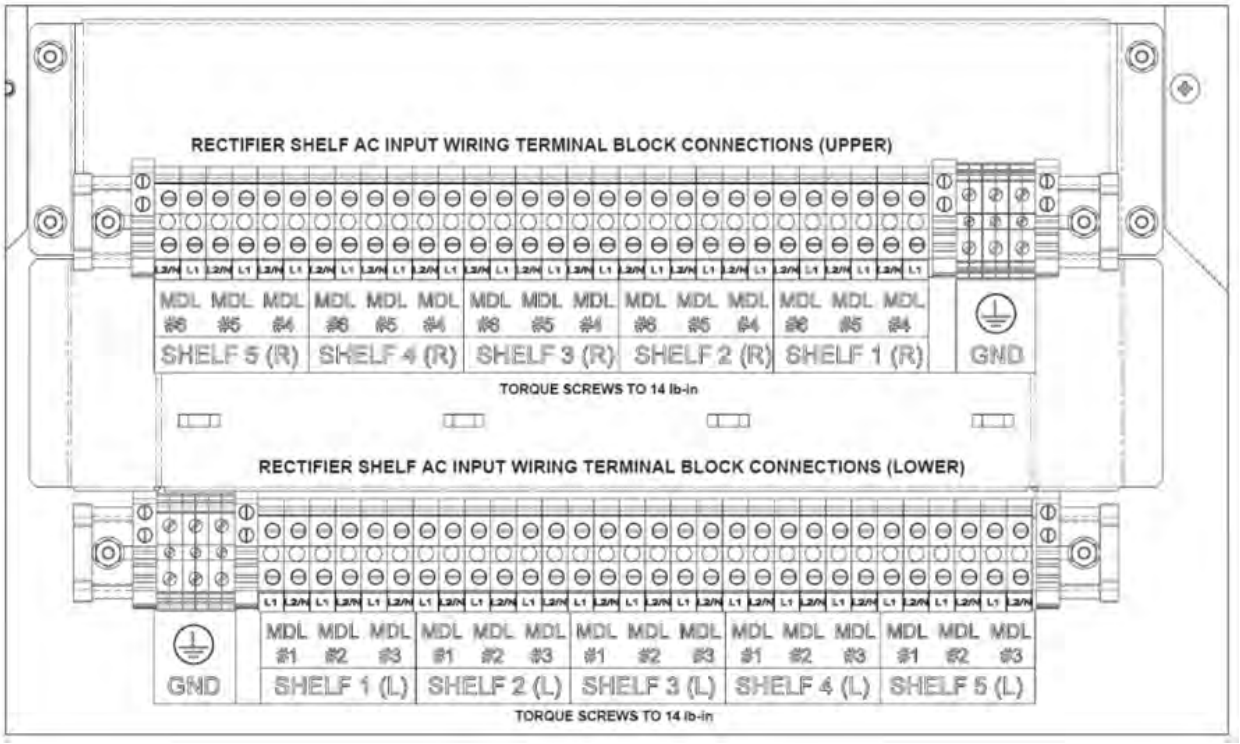


Figure 39: 4.0/4.6 kW rectifier shelf AC terminal block connections for 1-phase 208 to 240 VAC (2W+PE) option

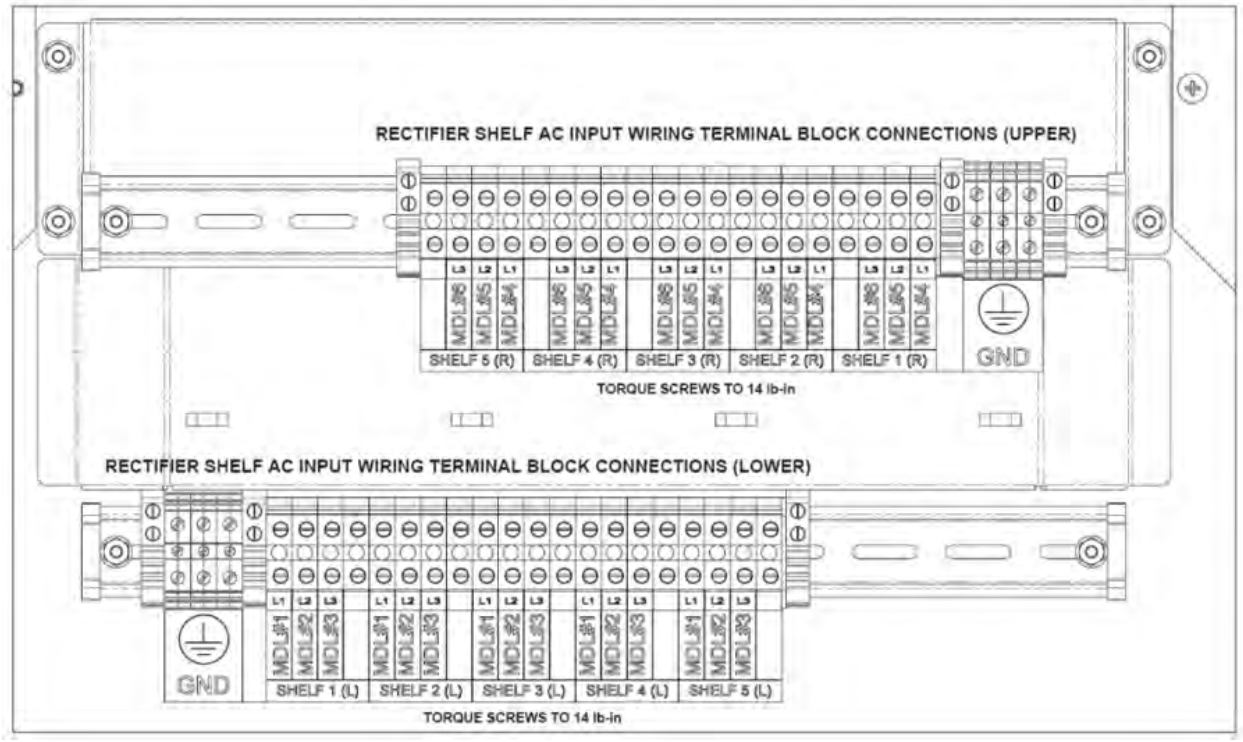


Figure 40: 4.0/4.6 kW rectifier shelf AC terminal block connections for 3-phase 208 to 240 VAC (3W+PE) option

8.5 Distribution

8.5.1 External battery return bar wiring

Connect the external battery return bars to the associated power bay positive return detail as shown in Figure 41.

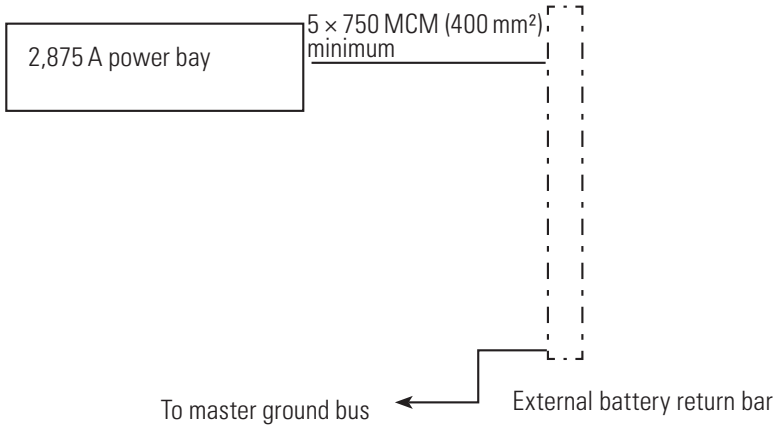


Figure 41: External battery return bar wiring

8.5.2 Battery return and load return cables

ATTENTION

Do note make final connection to battery live. Insulate and leave disconnected or remove the battery fuses. Switch battery contactors off (if used).

Battery cables should be sized for a 0.25 V drop from battery to the power system at full load including anticipated growth. The cables should also meet ampacity requirements.

Connect the battery return cables and the load return cables to the common return bus or to the external battery return bus bar if that option is in place.

Both busbars are designed for the following connection options:

- ½ inch holes on 1-¾ inch centers (standard systems only)
- ⅜ inch holes on 1 inch centers

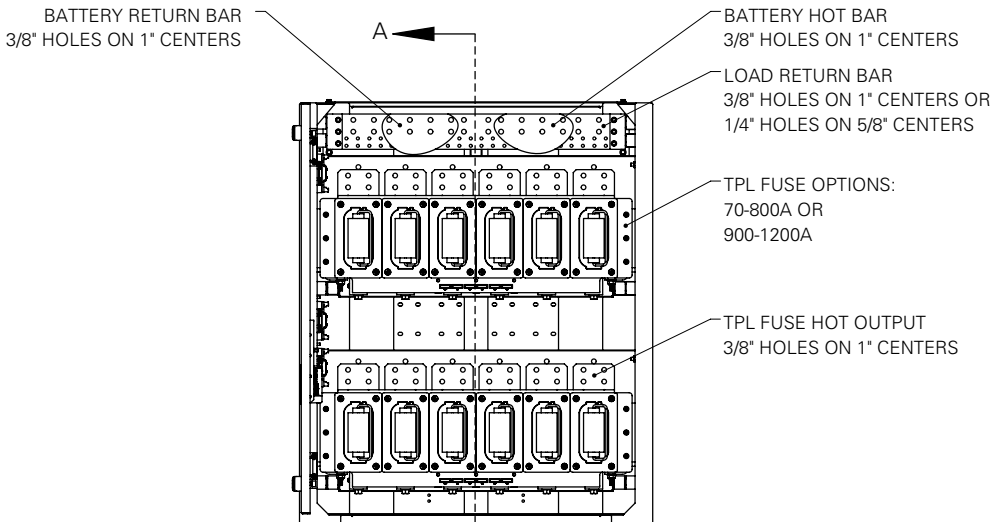


Figure 42: Customer connections

8.6 DC connections

NOTICE

DC connections described in this sections are not applicable to front access systems.

8.6.1 DC landing hot and battery landing without top AC termination panel

There are six positions (12 cables back-to-back) to land the battery HOT [–] cables. The dimensions for the holes are ½ inch on 1-¾ inch centers and ⅜ inch on 1 inch centers.

There are four positions (eight cables back-to-back) to land the DC RETURN [+] cables. The dimensions for holes are ½ inch on 1-¾ inch centers and ⅜ inch on 1 inch centers.

NOTICE

While landing the DC return cables, start installing from the rear-most holes and move your way towards the front as shown in the following figure.

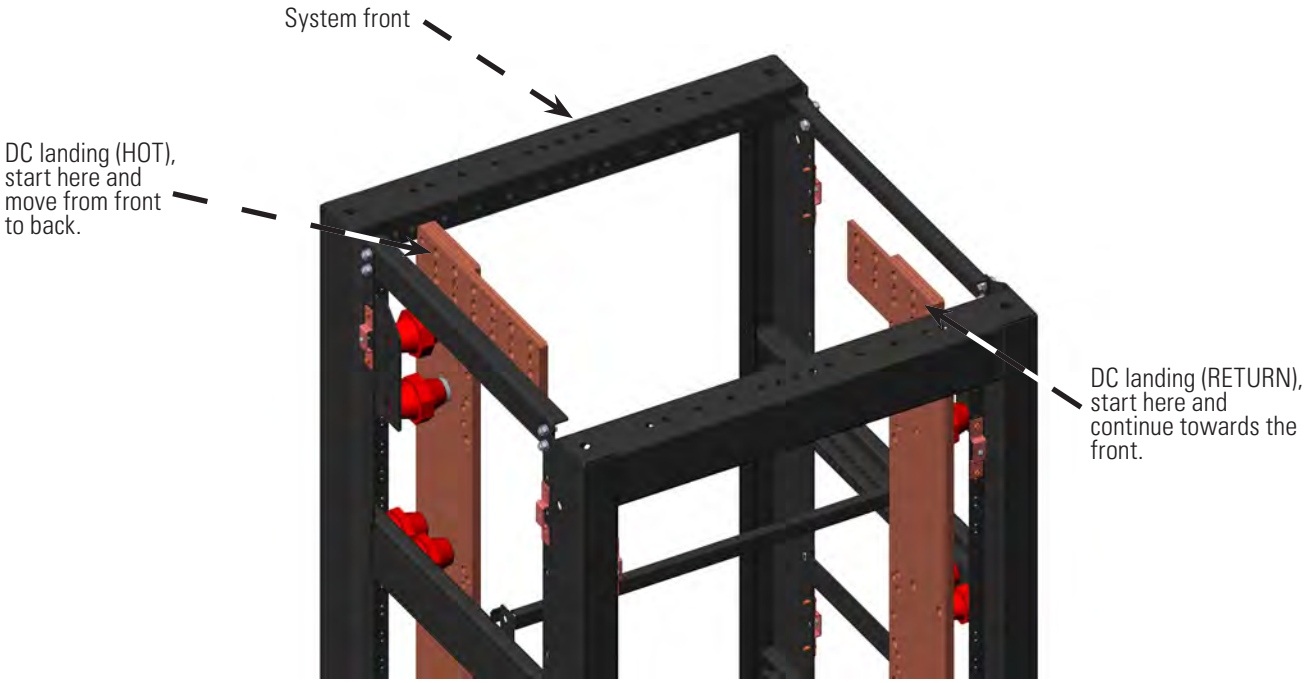


Figure 43: DC connection without AC panel option

8.6.2 DC landing return and battery landing with top AC termination panel

NOTICE

The DC landing return and battery landing with top AC termination panel is not applicable to front access systems.

There are five positions (10 cables back-to-back) to land the battery HOT [–] cables when the AC panel is used. When an AC panel is installed, the left most holes do not go all the way through and only the back four are accessible. See the following figure. The dimensions for holes are ½ inch on 1-¾ inch centers and ⅜ inch on 1 inch centers.

There are four positions (eight cables back-to-back) to land the DC return cables. The dimensions for holes are ½ inch on 1-¾ inch centers and ⅜ inch on 1 inch centers.

NOTICE

While landing the DC return cables, start installing from the rear-most holes and move your way towards the front as shown in the following figure.

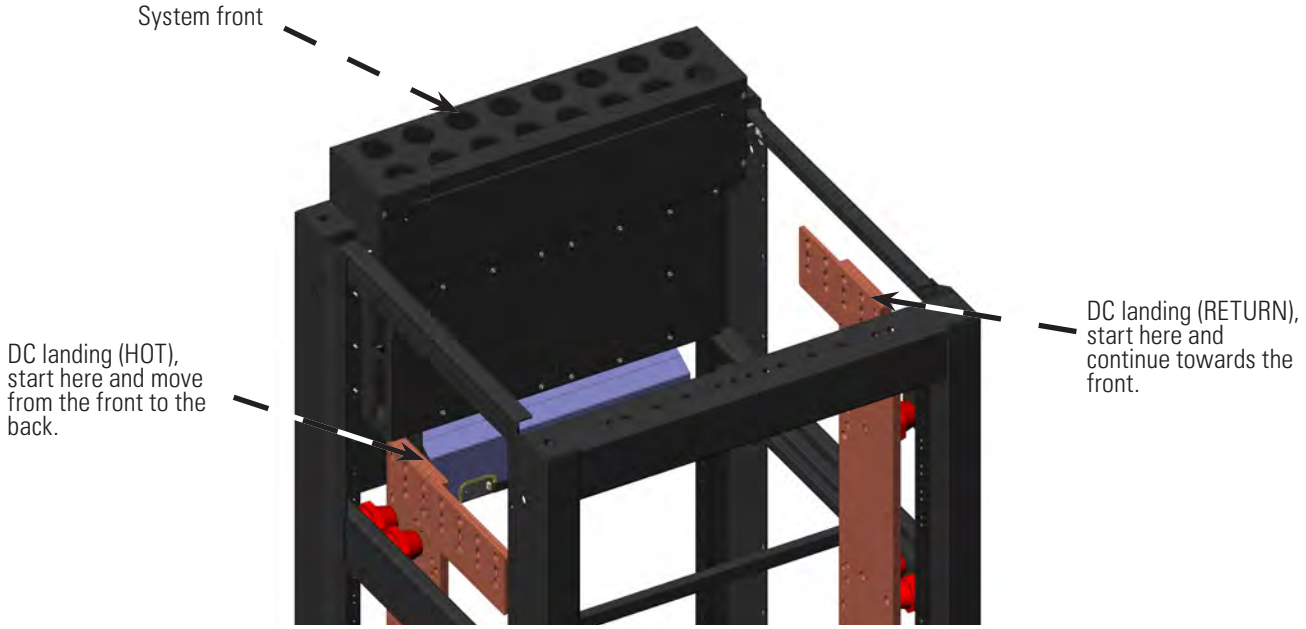


Figure 44: DC connection with AC panel option

8.6.3 Internal return bar (optional)

NOTICE

The internal return bar is standard on front access systems.

The internal return bar eliminates the need to mount external bars to land the DC return cables. There are 30 × ¼ inch holes on ⅝ inch centers, 40 × ⅜ inch holes on 1 inch centers and 10 × ½ inch holes on 1-¾ inch centers.

Start landing the DC RETURN [+] cables on the vertical riser first. In addition there are four ⅜ inch holes on 1-¾ inch centers on the vertical riser bar.

Once the four positions on the vertical riser are populated, start to land cables on the internal return bar.

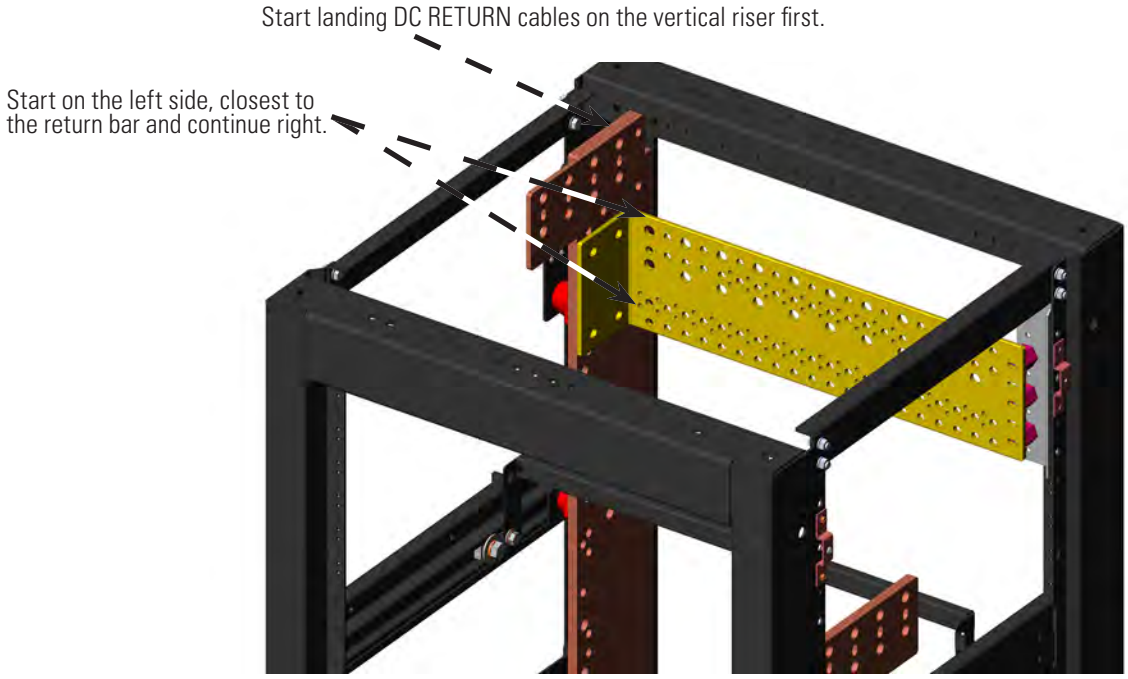


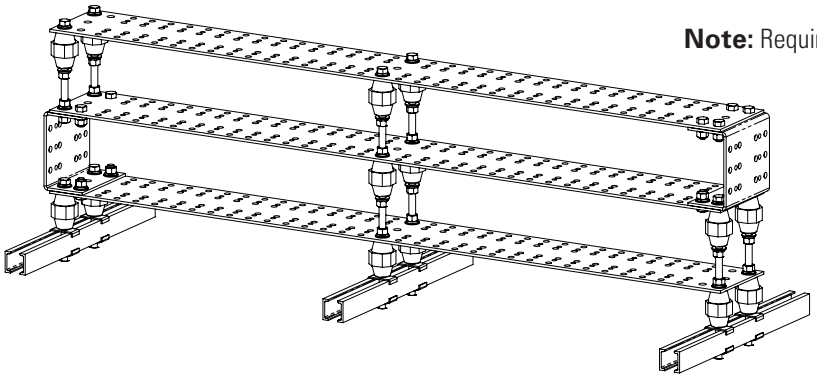
Figure 45: Internal return bar

8.6.4 Mounting the external remote return bar (optional)

The external return bar kit is an option for return connections for the loads. It serves as the common connecting point for the positive side of the power section and the batteries.

The base remote return bar kit (PN: 0380214-001) has a capacity of 2,875 A per kit. Adder kits can be installed onto the base kit to increase its total capacity. A maximum of one base kit and three adder kits can be installed to provide a system with the total capacity of 10,000 A. The kits can be ordered with or without optional covers.

1. Before joining return bar components together, ensure that all contact surfaces on the busbars are clean and coated with a thin coat of Sanchem Inc. NO-OX-ID® A-SPECIAL electrical grease (or approved equivalent).
2. Follow the instructions included with the kit, to assemble and mount the kit on a customer-supplied auxiliary framing superstructure away from the system.



Note: Requires customer supplied auxiliary frame (2 × 9⁄16 inch)

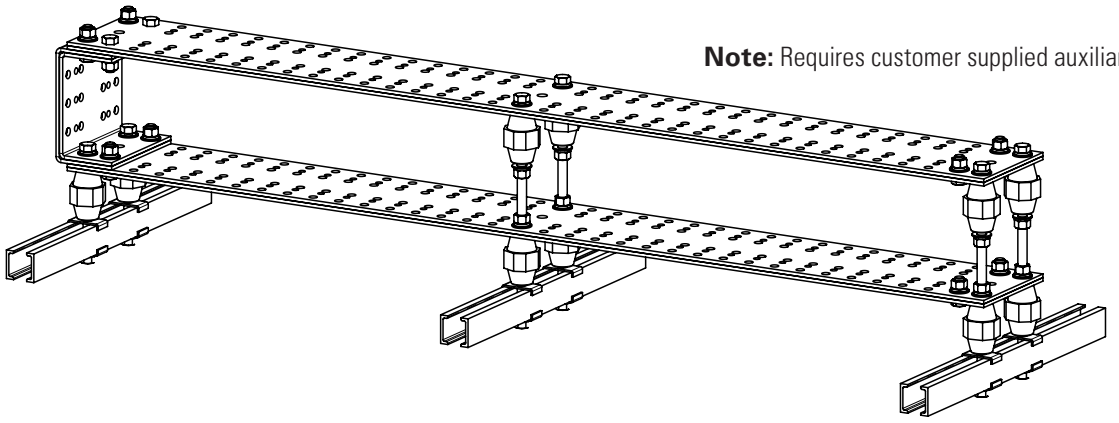
Figure 47: External battery return bar kit (one base and one add-on kit shown)

8.6.5 Mounting the external remote hot bar (optional)

The external remote hot bar kit option provides a central location to land all the 'hot' cables from the power plant and the batteries.

The base remote hot bar kit (PN: 0380213-001) has a capacity of 5,000 A per kit. An adder kit can be installed on the existing base kit which increases the total system capacity to 10,000 A. The kits can be ordered with or without optional covers.

1. Before joining busbar components together, ensure that all contact surfaces on the busbars are clean and coated with a thin coat of Sanchem Inc. NO-OX-ID® A-SPECIAL electrical grease (or approved equivalent).
2. Follow the instructions included with the kit to assemble and mount the busbar on a customer-supplied auxiliary framing superstructure away from the system.



Note: Requires customer supplied auxiliary frame (2 × 9⁄16 inch)

Figure 46: External hot bar (one base kit and one add-on kit)

8.6.6 Landing cables on external return and external hot bar

When landing cables on the busbar for both optional external return bar and for the external hot bar follow the instructions in Figure 48. For full details refer to drawings included with the kit.

8.6.7 Return/hot bar to loads wiring

Always start system and load wiring from the same side. When wiring the system always space the input and output cables evenly across the entire length of the bar to ensure the load current is evenly distributed.

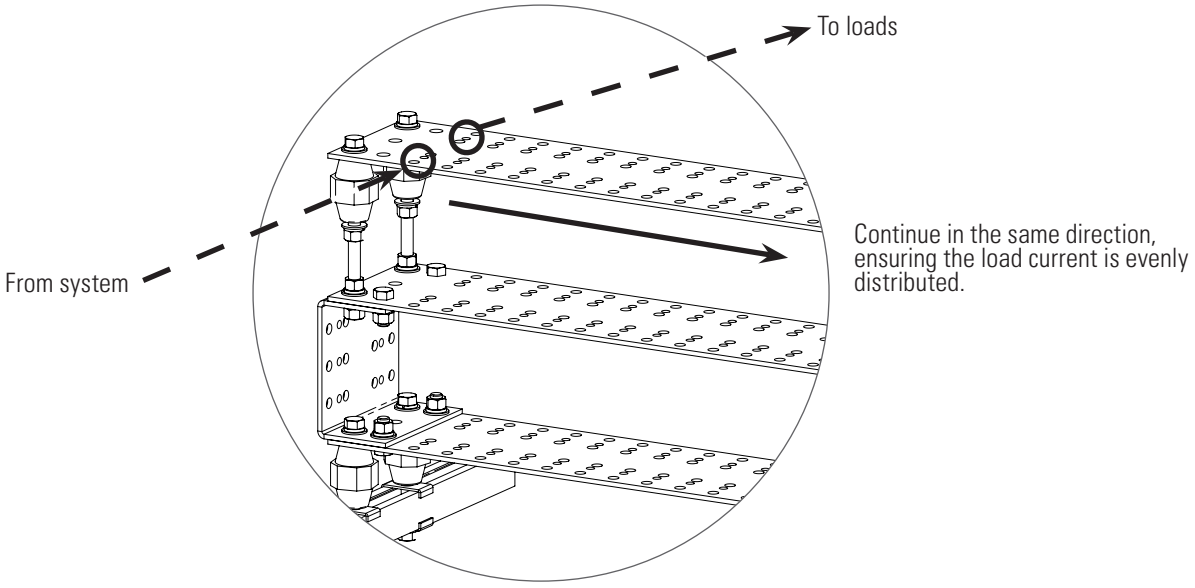


Figure 48: Landing the cables

8.6.8 –48 V battery cables

Connect directly to the –48V busbar at the top of the rack (see Figure 42 and Figure 43) or the external hot bar (Figure 45).

8.6.9 DC cables between the power system and the loads

Refer to guidelines supplied with the load equipment. Typically distribution cables are sized to provide a 0.5V loop drop at full load as well as meeting ampacity requirements of the protection fuse or circuit breaker.

Procedure

1. Cut cables to length cable and terminate with a two-hole lug.
2. Identify each cable with a label that indicates its location within the distribution modules.
3. Connect the load returns to the overhead busbar in the area of the distribution bays.
4. Neatly group cables with tie wraps.

8.6.10 External alarms

All applicable alarms should be connected to the local alarm-sending unit from the power system. The system controller provides Form C relay contacts for interconnection.

8.7 High capacity breaker alarm and shunt wiring

1. Connect the alarm wire HOT [–] from the normally closed (NC) position on the breaker, to one of the available digital inputs on the Cordex® HP L-ADIO smart peripheral.
2. Connect the jumper from the I/P hot bus to the common (C) position on the breaker
3. Add a RETURN [+] jumper from the digital input if required.
4. Connect the shunt wire black and white (or red) to HOT [–] and RETURN [+] current input respectively to a nearest Cordex® HP L-ADIO smart peripheral or Cordex® HP 6i-ADIO smart peripheral.

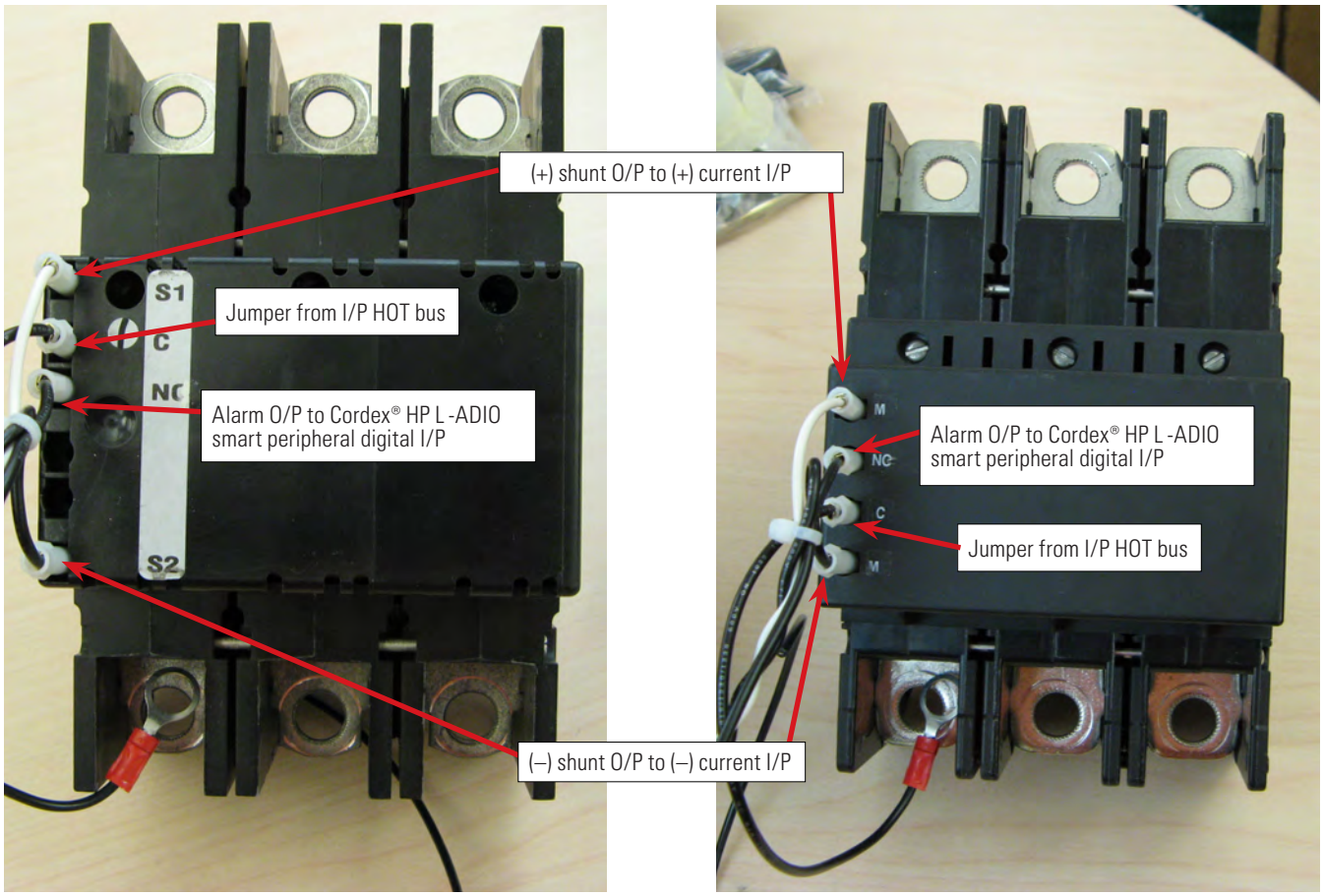


Figure 49: Optional high capacity breaker alarm and shunt wiring

9. System startup

Visually inspect the installation thoroughly. After completing the system installation and power system wiring, perform the following startup and test procedure to ensure proper operation:

9.1 Check system connections

1. Make sure that the AC input power is switched off, the batteries are disconnected, and all the power modules are removed from the shelf.
2. Triple-check the polarity of all connections.

9.2 Verify AC input voltage and power the rectifier shelf

1. Install one power module.
2. Verify that the AC input voltage is correct and switch on the corresponding feeder breaker. The power module OK LED will illuminate after a preset start delay.

9.3 Check battery polarity and connect

1. Use a voltmeter to verify that the battery polarity is correct. Ensure that no cells or batteries are reversed.
2. Connect the batteries or switch on the battery circuits.
3. Install the remaining power modules.
4. In the adjustments menu of the system controller, set the battery parameters: float and equalize voltages to the capacity, Peukert exponent, and open circuit voltage levels specified by the battery manufacturer.

9.4 Final configuration and test

1. Configure other system parameters as required—changing the low and high voltage AC and DC warning and cutout limits, for example.
2. At this point there should be no alarms present. Investigate and correct any alarm issues.
3. Test the functionality of various alarms and controls as follows:

Alarm	Test
Minor alarm	Pull one rectifier module (leave in the shelf) and then reinsert to clear the alarm.
Major alarm	Pull two rectifier modules (leave in the shelf) and then reinsert to clear the alarm.
AC fail alarm	Turn off all AC breakers and run on batteries.
Supervisory fail	At the system controller, select the **Home** icon at the lower left of the home page and select **Reset** from the pop-up menu.

4. Perform a system load test using a resistive load box.
5. Turn off the AC input breaker to perform a full load test from DC power.
6. Enable the temperature compensation feature in the batteries menu. Program the settings for slope and breakpoints (upper and lower) according to the specific batteries used.

9.5 Shelf ID connection (standard systems only)

The Cordex® HP shelf/bay ID peripheral comes factory installed. If shelves are installed in more than one bay, then set the bay ID sequentially on each shelf ID module.

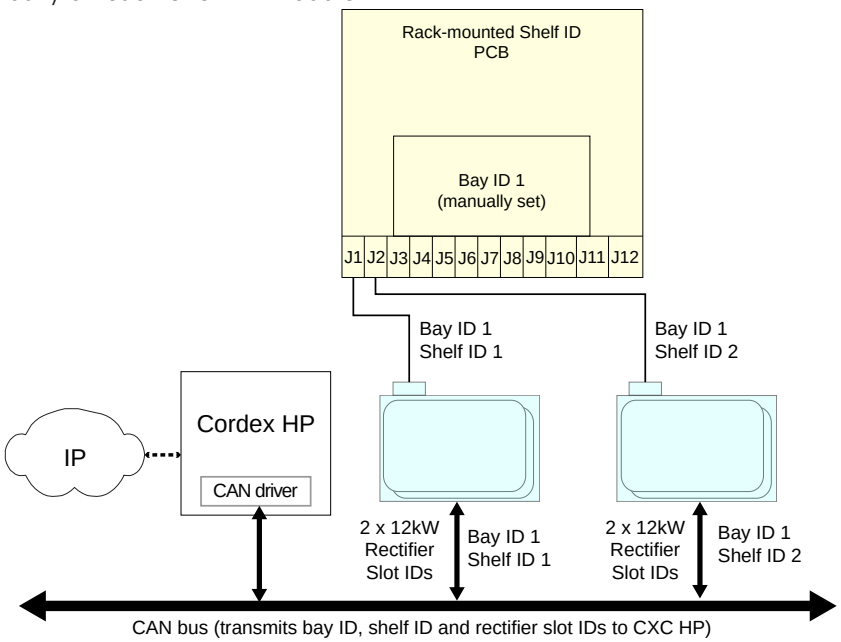


Figure 50: Example of a single bay with two rectifier shelves

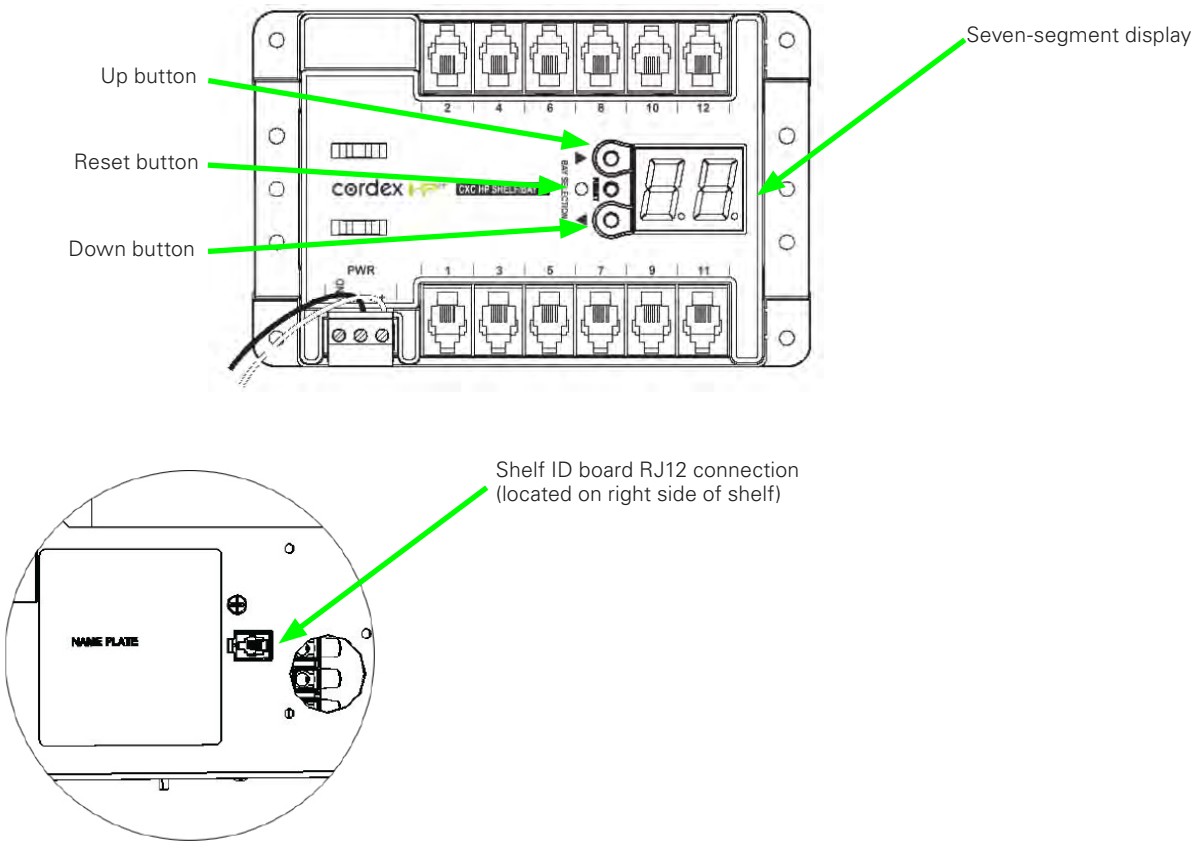


Figure 51: Cordex® HP shelf/bay ID peripheral overview

9.5.1 Factory ranges and default values

The following table shows the rectifier module settings, ranges, and default values. Changes are made through the system controller interface.

Table J: Rectifier module factory ranges and defaults

Setting	Range (minimum to maximum)	Default value
Float (FL) Voltage	47.5 to 58.2 V	54 V
Equalize (EQ) Voltage	49.8 to 60.2 V	55 V
Battery Test (BT) Voltage	44 to 52 V	46 V
Overvoltage Protection (OVP)[1]	63 V	63 V
Current Limit (CL)	23 to 100%	100%
Power Limit (PL)	0 to 100%	100%
Module Start Delay	0 to 250 s	1 s
System Start Delay	0 to 600 s	0 s
Low Voltage Alarm (LVA)	42 to 52 V	44 V
High Voltage Alarm (HVA)	52 to 63 V	55.5 V
EQ Timeout	1 to 2399 h	30 h
BT Timeout	1 to 250 h	8 h
Softstart Ramp-rate	Normal/fast	Normal
CL/PL Alarm	Enable/disable	Enable
Remote Shutdown	Enable/disable	Enable
Ramp Test	Enable/disable	Enable

[1] The overvoltage protection value cannot be set below the present system FL, EQ, and BT voltage setting or the safe mode voltage of 51.4 V.

10. Test and commissioning overview

10.1 System

All Cordex® power system components undergo thorough factory testing. All levels and alarms are set to predetermined values as detailed in their individual component documents except where custom levels are specified. Good installation practice is to check the operation of all features and alarms and to set the power system levels in accordance with the specific requirements of your system.

The individual system component documents detail the methodology for testing and calibration of all components.

10.2 Battery

After installation of batteries it is usually necessary to initial charge the batteries to ensure proper operation and to eliminate plate sulfation. Follow guidelines supplied with the battery and record initial charge readings:

- Specific gravity
- Cell voltage
- Charge current
- Temperature.

Battery warranty may be void if batteries are not initially charged following the manufacture's guidelines – with proper records maintained.

Some VRLA batteries do not require initial charging if placed on charge within three to six months of manufacture, check with the manufacturer.

After the equalization period battery voltage should be reduced to the recommended float level.

Once the batteries have been initial charged it is suggested to perform a short duration high rate discharge test on the batteries to verify the connections on the batteries and also to verify that there are no open or failed cells. Cell voltages should be monitored during this process:

- Discharge for 15 minutes at the C/8 rate.
- Record cell voltages every five minutes.
- Check for overheating connections.

10.3 Documentation

Complete all necessary documentation; for example, battery reports, DC wiring lists, AC distribution tables, and floor plans. Tag wires, fill out identification strips, and identify circuit breakers.

11. Maintenance

Although very little maintenance is required with Cordex® power systems, routine checks and adjustments are recommended to ensure optimum system performance. Qualified service personnel should do the repairs. The following table lists a few maintenance procedures for this system. These procedures should be performed at least once a year.

WARNING

Use extreme care when working inside the unit while the system is energized. Do not make contact with live components or parts.

ATTENTION

Circuit cards, including semiconductor devices, can be damaged by static electricity. Always wear a grounded wrist strap when handling or installing circuit cards.

ATTENTION

Ensure redundant modules or batteries are used to eliminate the threat of service interruptions while performing maintenance on the system's alarms and control settings.

Table K: Sample maintenance log

Procedure	Date completed
Clean ventilation openings.	
Inspect all system connections. Re-torque if necessary.	
Verify alarm and control settings.	
Verify alarm relay operation.	

11.1 Rectifier modules

It is recommended that every five years metal oxide varistor (MOV) surge suppressors are replaced (especially in areas of high lightning activity). See the Cordex® HP rectifier module documentation for general maintenance information.

11.2 Batteries

It is recommended that checks are made every six months for battery voltage, conductance, temperature, impedance, and connections. See battery manufacturer's document for general maintenance information.

WARNING

Exercise extreme caution and do not touch any connected equipment.

11.3 System controller lithium battery replacement

NOTICE

If the system controller is powered off when the battery is replaced, time will be lost. Once the system controller is powered on, reset the time.

A removable lithium battery (CR2032) is located near the front panel tilt-down tray on the top of the system controller. The battery life is rated up to three years, but replace earlier if the panel does not maintain date and time during power interruption.

Depress the two front latches and tilt the front panel forward and down. Remove the battery from the slot and replace with the same type of battery observing the correct polarity.

Figure 52: System controller battery replacement

NOTICE

The EnVision™ Elite Touch controller utilizes a supercapacitor for backup of the real-time clock in the event of a transient event or power loss.

12. Troubleshooting

Shelves and modules are designed for simple installation and reliable, trouble-free operation.

In most cases the modules will recover from minor alarms and faults automatically. However under certain conditions the modules may need remote control. And under very rare cases the module may need a manual reset (unplug and reinsert the module). In the unlikely event of a module failure, it may need replacement.

A shelf can accommodate up to four or five modules depending on the shelf. The modules have various LED status indicators that provide information about the system.

When the shelf system is used in conjunction with a system controller, detailed system information and status can be easily obtained. Additional information can be obtained via the web interface using the Ethernet port.

The following tables provide a quick reference of the various LEDs and the corresponding states.

12.1 Cordex® HP Rectifier Module LEDs

Table L: Cordex® HP rectifier module LED states

LED name	Color	State	Meaning
Alarm	**Red**	**Off**	Indicates no failure or fault in the module.
		Solid	Indicates the output has shutdown to protect property or personnel.
		Flashing	Indicates a communication failure persisting for five minutes. Indicates the locate module command is active.
AC	**Green**	**Off**	Indicates output is in an off state.
		Solid	Indicates output is driven.
		Flashing	Indicates the locate module command is active.
DC	**Green**	**Off**	Indicates a failure or fault with input.
		Solid	Indicates that input is functioning correctly.
		Flashing	Indicates the locate module command is active.

12.2 Cordex® CXC HP System Controller LEDs

Table M: Cordex® CXC HP system controller LED states

LED name	Color	State	Meaning
Major/critical alarm (bell icon)	**Red**	**Off**	Indicates no active alarms.
		Solid	Indicates one or more major or critical alarms. There can be minor alarms as well.
		Flashing	All LEDs cycle on initial startup.
Minor alarm (caution icon)	**Yellow**	**Off**	Indicates no active alarms
		Solid	Indicates one or more minor alarms.
		Flashing	All LEDs cycle on initial startup.

OK (OK icon)	**Green**	**Off**	N/A
		Solid	Indicates that there are no alarms.
		Flashing	All LEDs cycle on initial startup.

12.3 Cordex® HP L-ADIO Low Voltage Smart Peripheral LEDs

Table N: Cordex® HP L-ADIO low voltage smart peripheral LED states

LED name	Color	State	Meaning
LVD	**Yellow**	**Off**	Indicates the LVD override feature is disabled.
		Solid	Indicates the LVD override button has been selected and the feature is enabled.
		Flashing	N/A
Power	**Blue**	**Off**	Indicates no power to the device.
		Solid	Indicates power is present.
		Flashing	N/A
COMMS	**Green**	**Off**	Indicates no communication with the system controller.
		Solid	Indicates the peripheral has been acquired by the system controller.
		Flashing	The LED flashes in response to a module locate command from the system controller.

12.4 Cordex® HP 6i-ADIO Six Input Smart Peripheral LEDs

Table O: Cordex® HP 6i-ADIO six input smart peripheral LED states

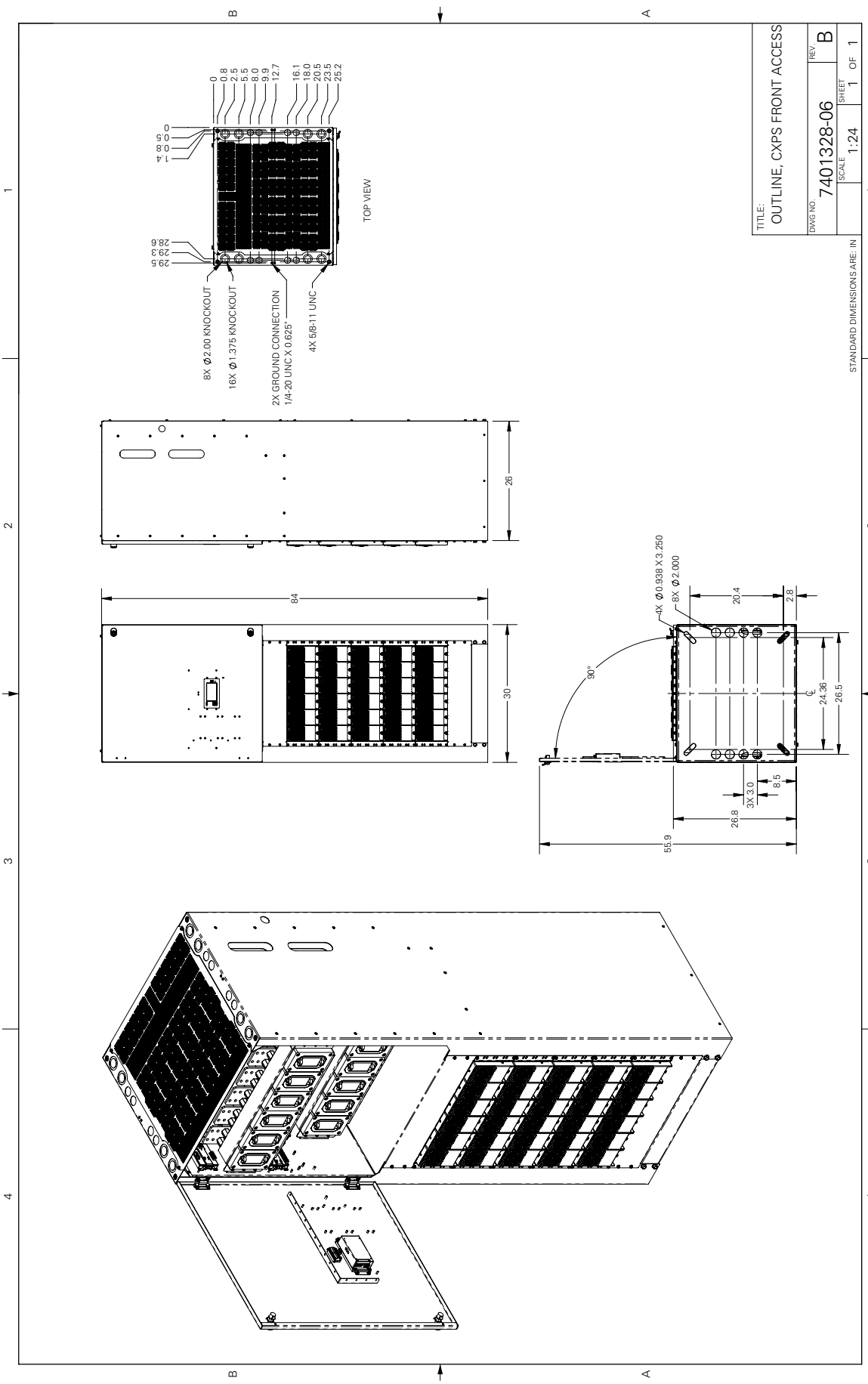
LED name	Color	State	Meaning
Power	**Blue**	**Off**	Indicates no power to the device.
		Solid	Indicates power is present.
		Flashing	N/A
COMMS	**Green**	**Off**	Indicates no communication with the system controller.
		Solid	Indicates the peripheral has been acquired by the system controller.
		Flashing	The LED flashes in response to a module locate command from the system controller.

12.5 Cordex® HP Shelf/Bay ID Peripheral LED

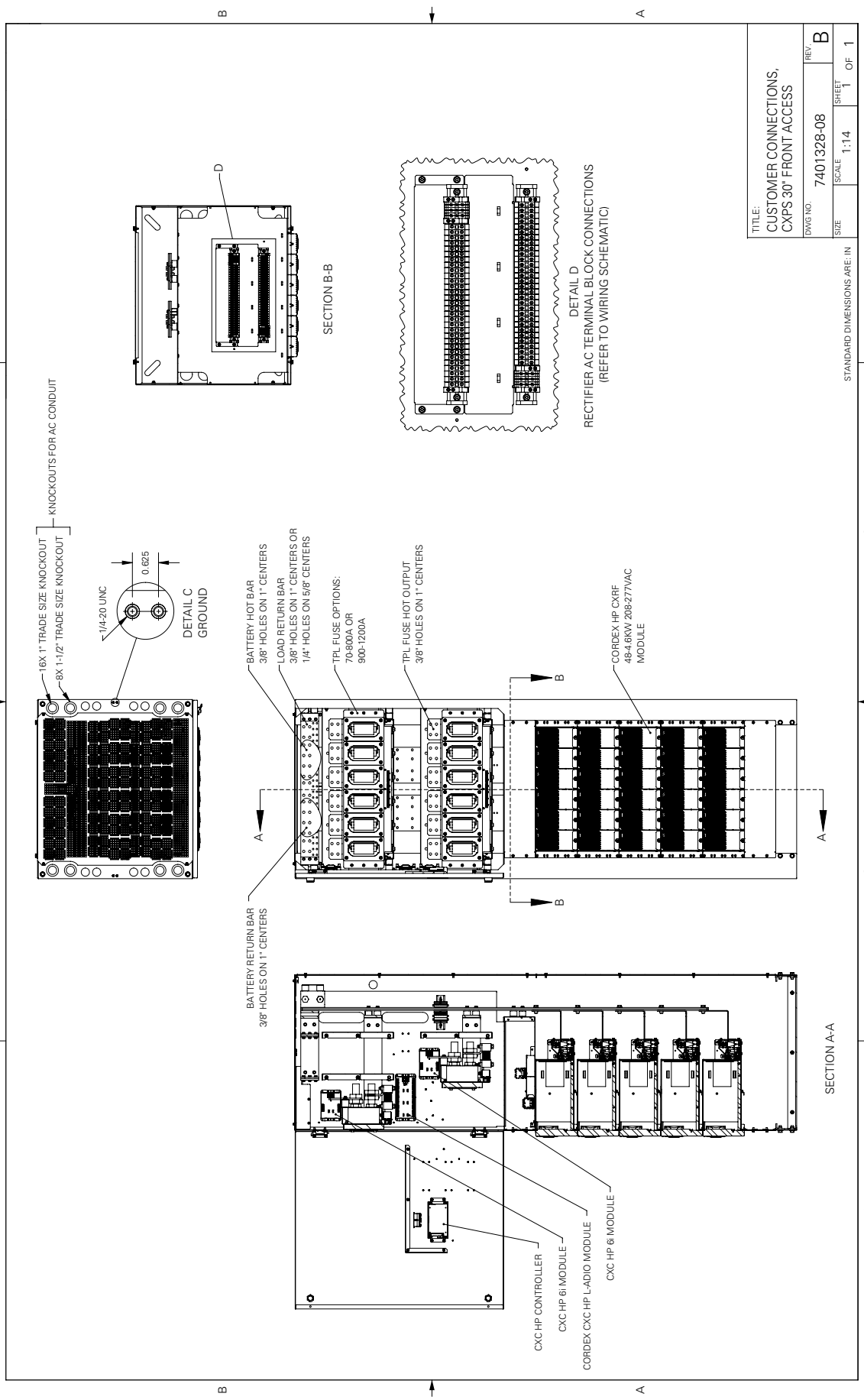
Table P: Cordex® HP shelf/bay ID peripheral LED states

LED name	Color	State	Meaning
Power	**Blue**	**Off**	Indicates no power to the device.
		Solid	Indicates power is present.
		Flashing	N/A

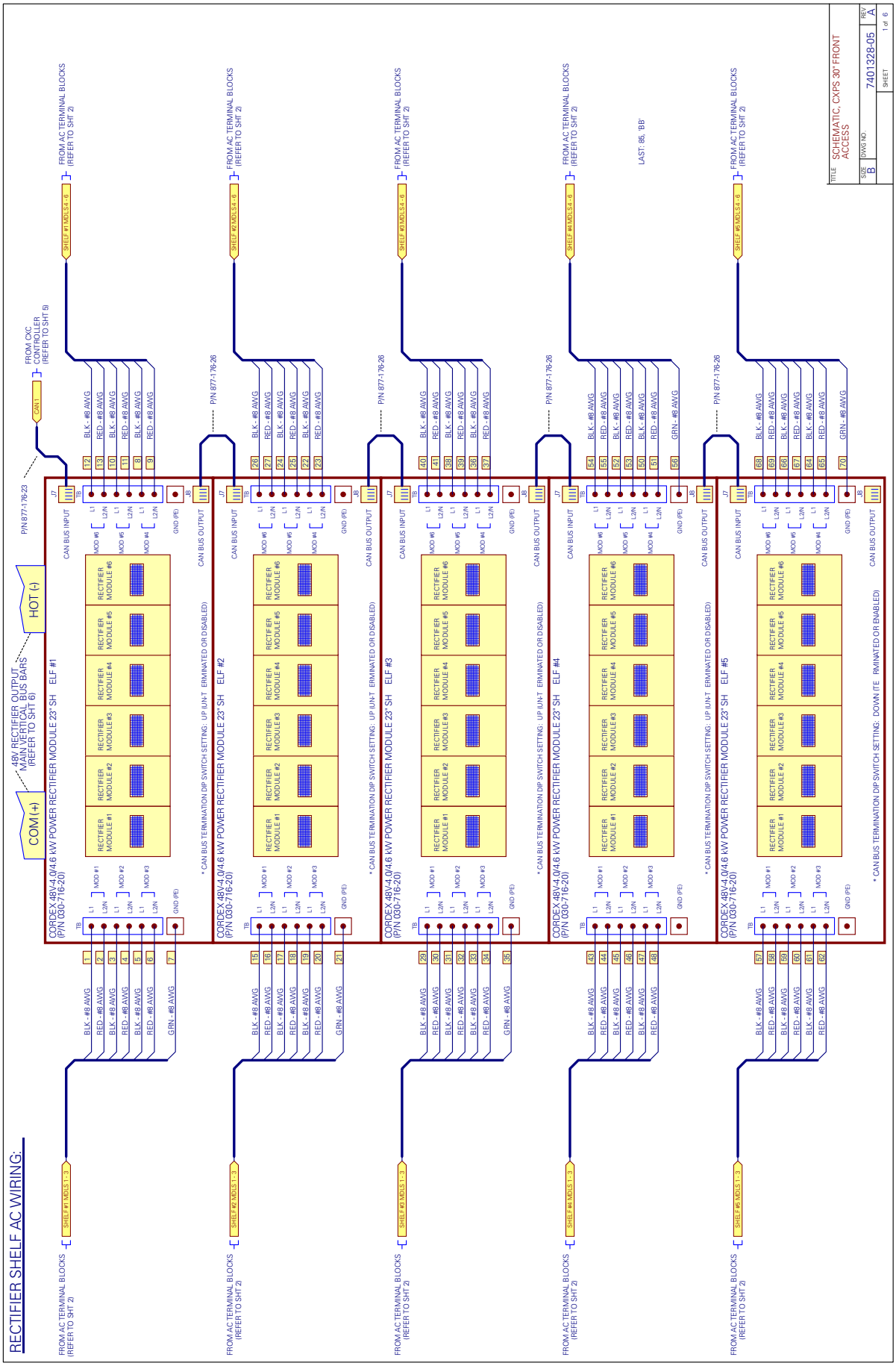
Front Access



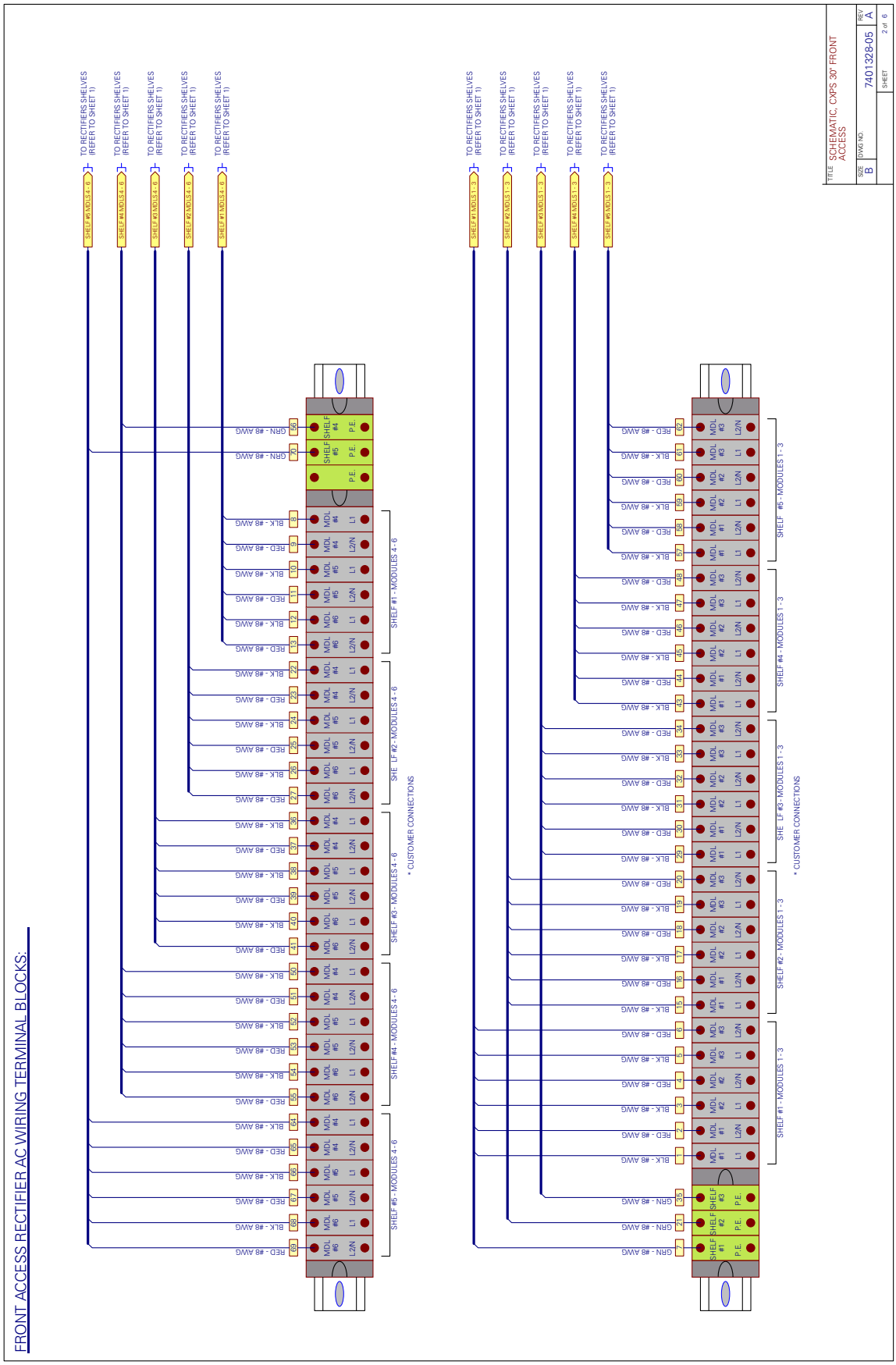
Front Access



Front Access



Front Access



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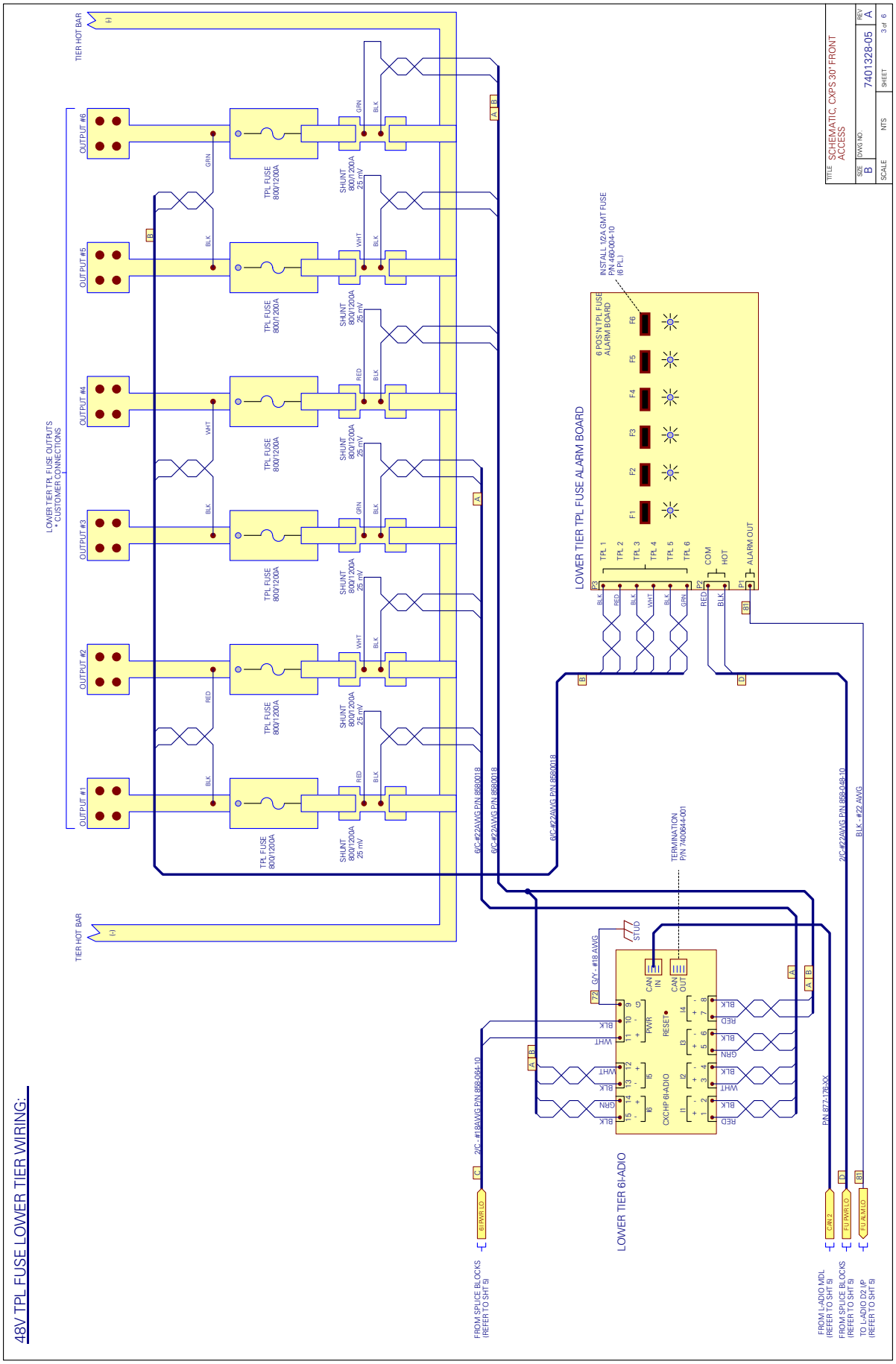

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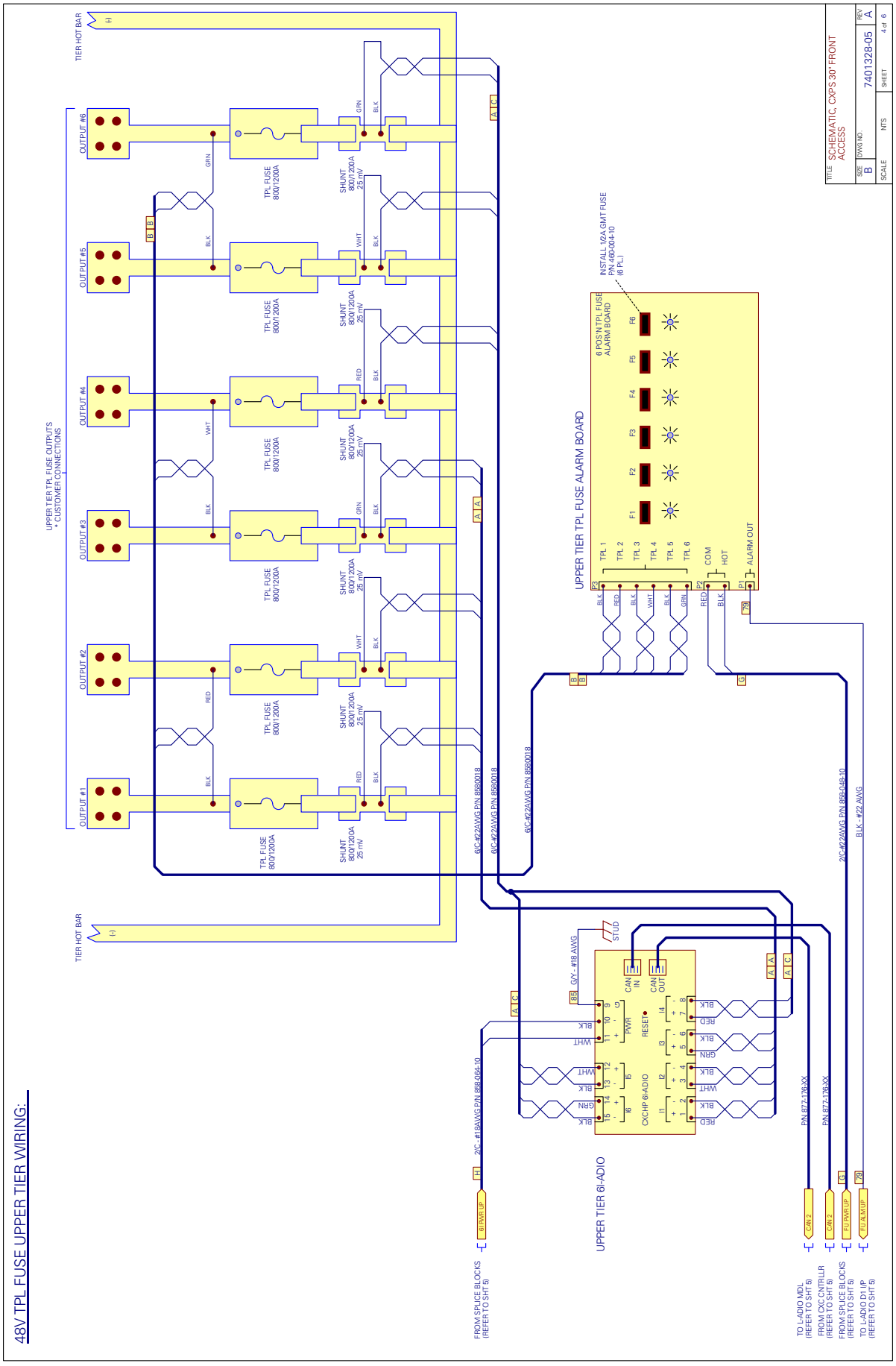

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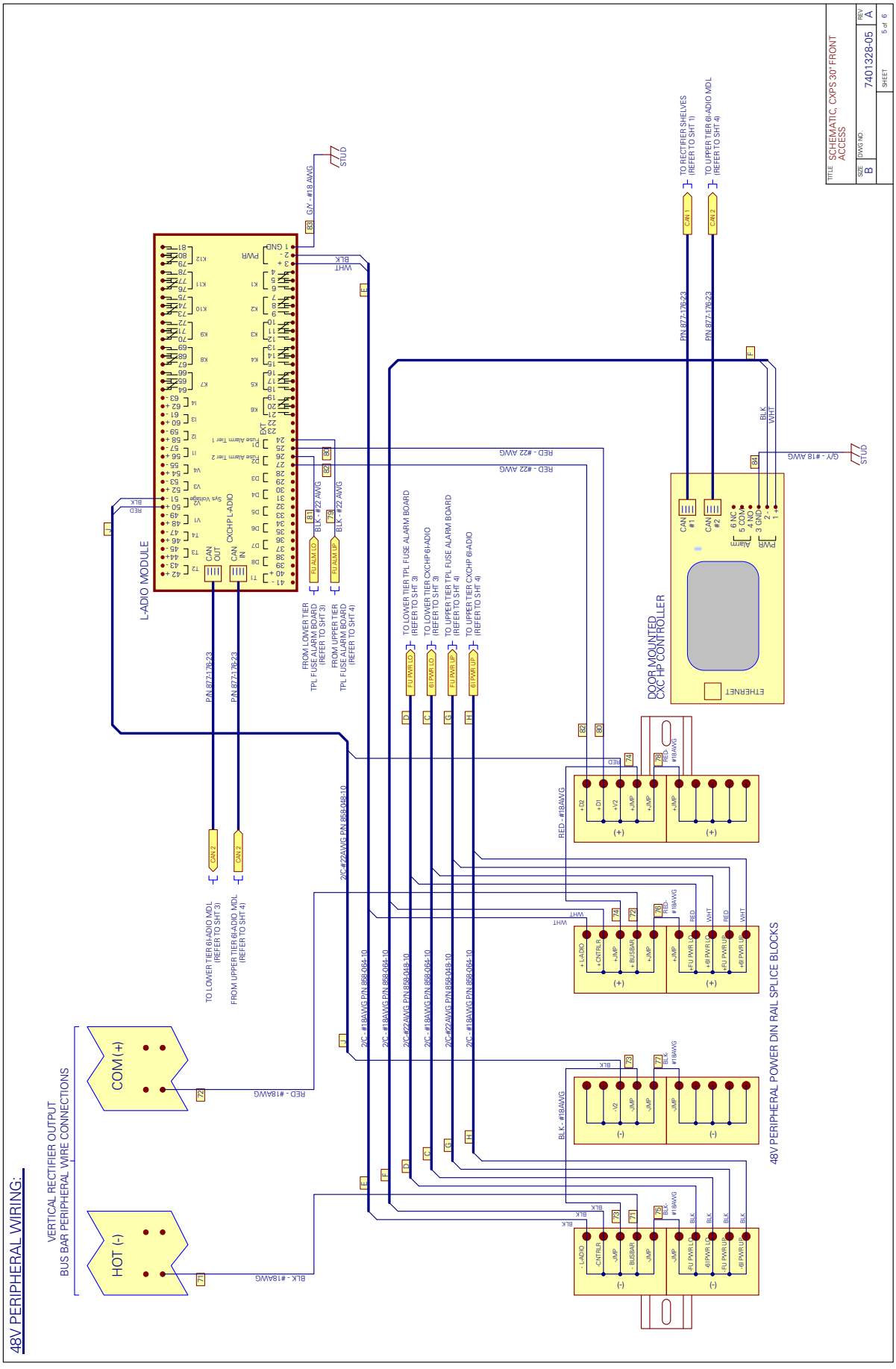

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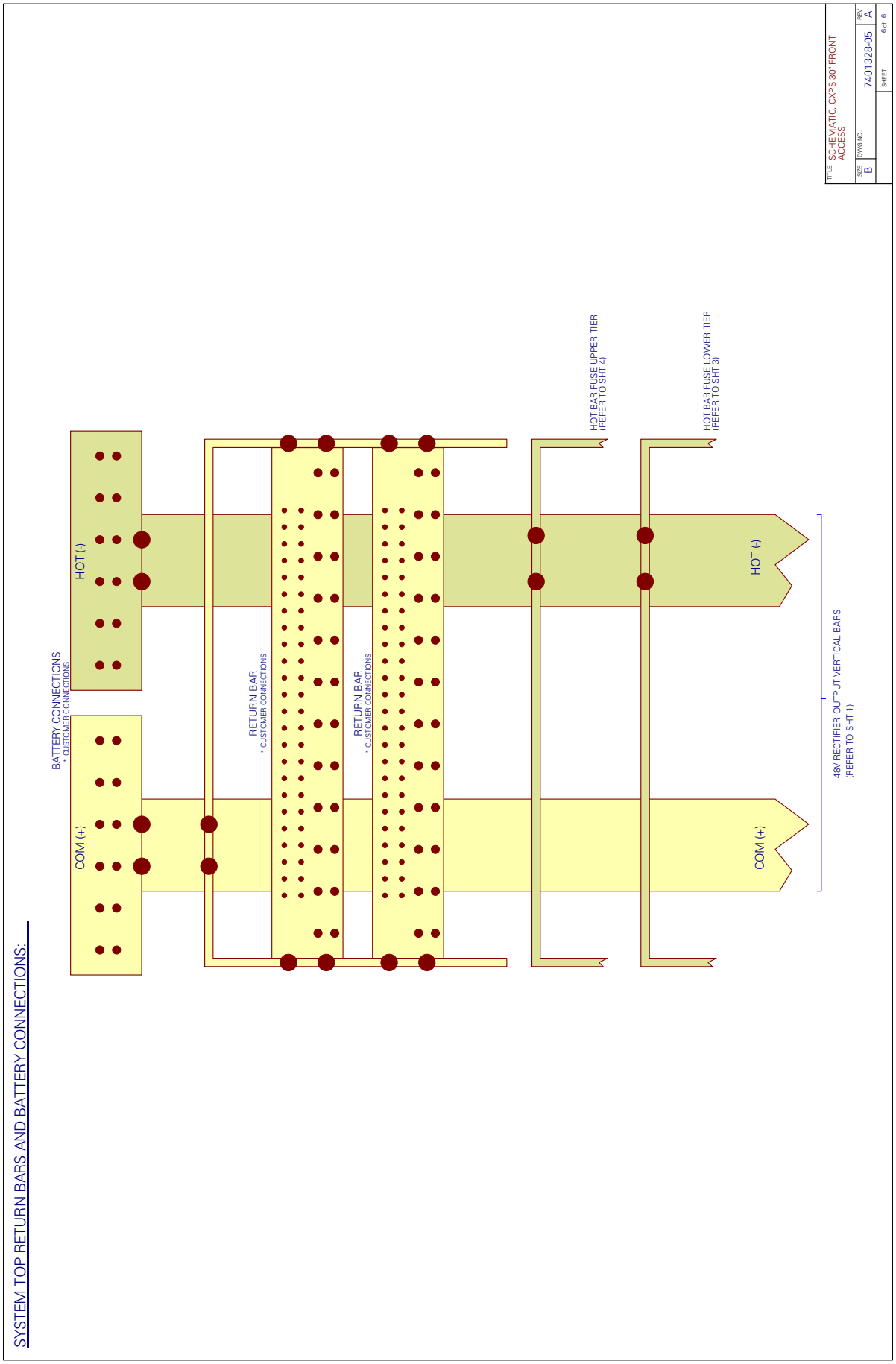
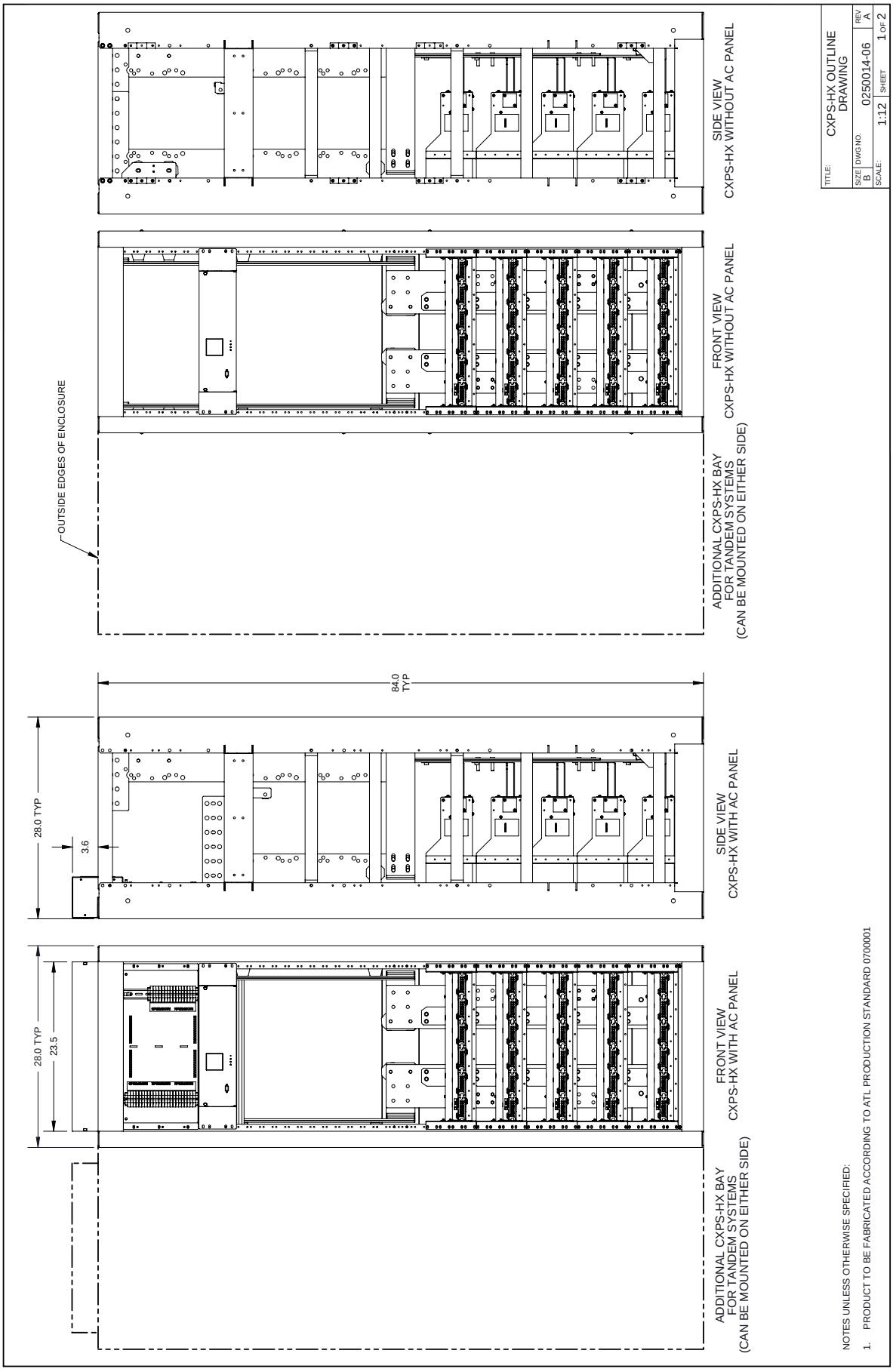
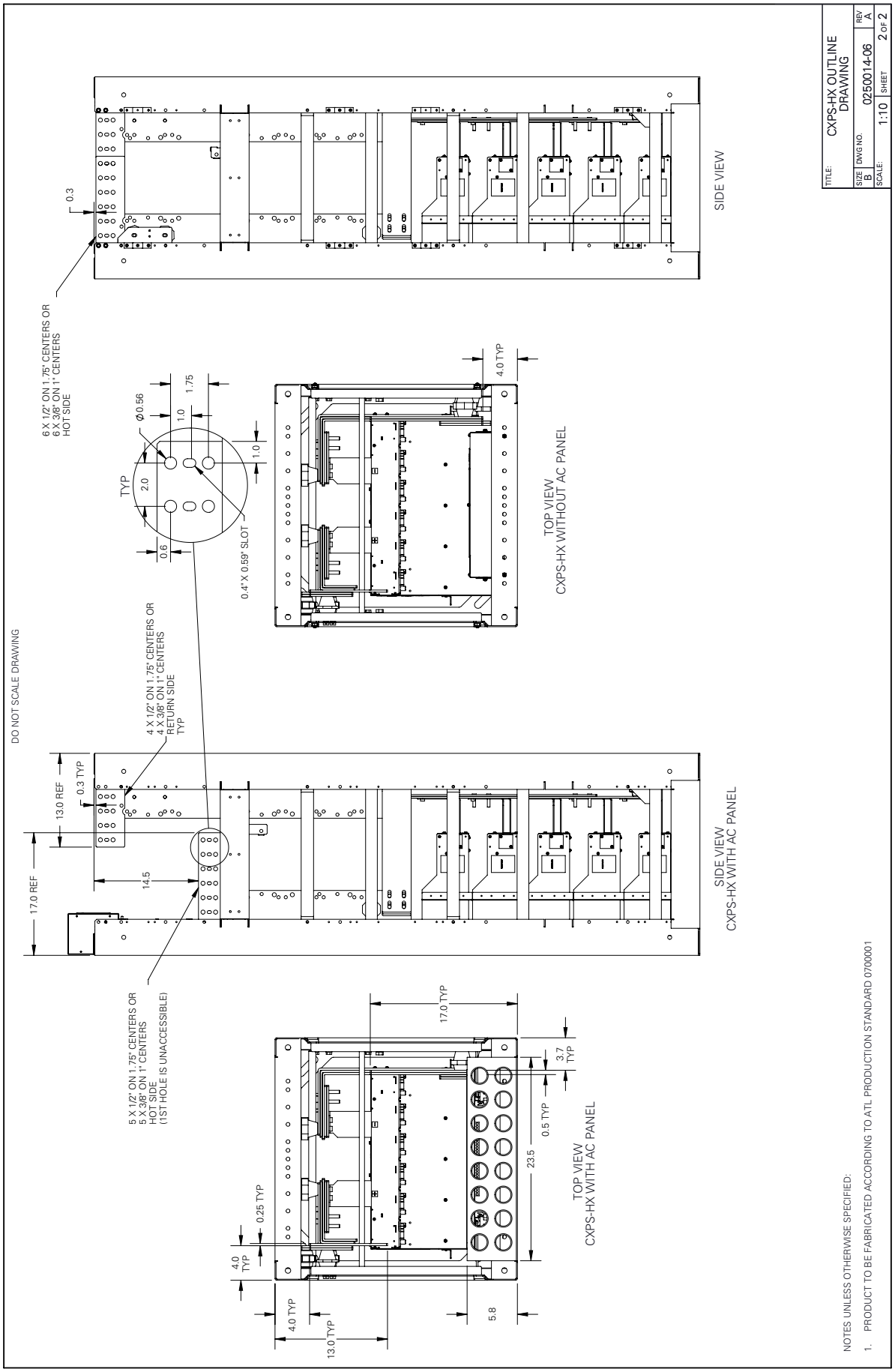
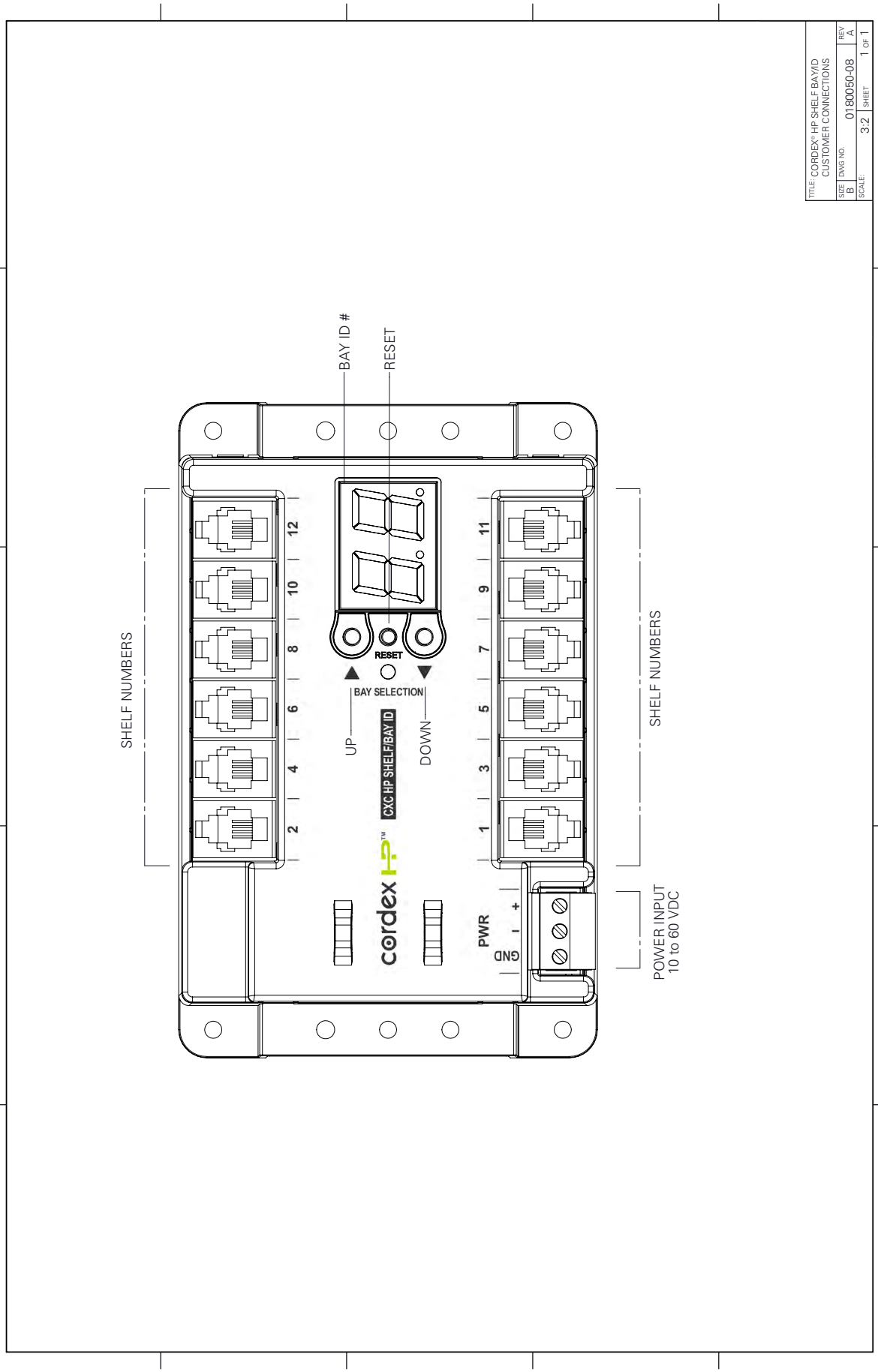



SIDE VIEW
CXPS-HX WITHOUT AC PANEL
FRONT VIEW
CXPS-HX WITHOUT AC PANEL
OUTSIDE EDGES OF ENCLOSURE
ADDITIONAL CXPS-HX BAY
FOR TANDEM SYSTEMS
(CAN BE MOUNTED ON EITHER SIDE)
84.0
TYP
28.0 TYP
3.6
SIDE VIEW
CXPS-HX WITH AC PANEL
28.0 TYP
23.5
FRONT VIEW
CXPS-HX WITH AC PANEL
ADDITIONAL CXPS-HX BAY
FOR TANDEM SYSTEMS
(CAN BE MOUNTED ON EITHER SIDE)
TITLE: CXPS-HX OUTLINE DRAWING
SIZE: B
DWG NO. 0250014-06
REV: A
SCALE: 1:12
SHEET 1 OF 2
NOTES UNLESS OTHERWISE SPECIFIED:
1. PRODUCT TO BE FABRICATED ACCORDING TO ATL PRODUCTION STANDARD 0700001


TITLE: CXPS-HX OUTLINE DRAWING
SIZE B
DWG NO. 0250014-06
REV A
SCALE: 1:10
SHEET 2 OF 2
DO NOT SCALE DRAWING
SIDE VIEW
0.3
6 X 1/2" ON 1.75" CENTERS OR
6 X 3/8" ON 1" CENTERS
HOT SIDE
TOP VIEW
CXPS-HX WITHOUT AC PANEL
4.0 TYP
Ø0.56
1.75
1.0
TYP
2.0
0.6
0.4" X 0.59" SLOT
4 X 1/2" ON 1.75" CENTERS OR
4 X 3/8" ON 1" CENTERS
RETURN SIDE
TYP
SIDE VIEW
CXPS-HX WITH AC PANEL
13.0 REF
0.3 TYP
17.0 REF
14.5
5 X 1/2" ON 1.75" CENTERS OR
5 X 3/8" ON 1" CENTERS
HOT SIDE
(1ST HOLE IS UNACCESSIBLE)
TOP VIEW
CXPS-HX WITH AC PANEL
17.0 TYP
3.7
TYP
0.5 TYP
23.5
0.25 TYP
4.0
TYP
4.0 TYP
13.0 TYP
5.8
NOTES UNLESS OTHERWISE SPECIFIED:
1. PRODUCT TO BE FABRICATED ACCORDING TO ATL PRODUCTION STANDARD 0700001


TITLE: CORDEX® HP SHELF BAY/ID CUSTOMER CONNECTIONS
SIZE B
DWG NO. 0180050-08
REV A
SCALE: 3:2
SHEET 1 OF 1
BAY ID #
RESET
SHELF NUMBERS
SHELF NUMBERS
RESET
BAY SELECTION
UP
DOWN
CXC HP SHELF/BAY ID
cordex HP™
PWR
GND
+
-
POWER INPUT
10 to 60 VDC
1
2
3
4
5
6
7
8
9
10
11
12

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