an EnerSys® company

Cordex® CXPS-C
Centralized Power System

User Guide ID: 9400001-J1
Effective: 07/2025

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 power system.
	**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

WARNING

You must read and understand the following warnings before installing the power system and its components. 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 power 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 rectifiers, though not dangerous in voltage, has a high short-circuit current capacity that can cause severe burns and electrical arcing.

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 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.

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Input voltages can range up to 480 VAC. Ensure 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.

- The enclosure which contains the DC or AC power system must remain locked at all times, except when authorized service personnel are present.
- Always assume electrical connections or conductors are live. Turn off all breakers and double-check with a voltmeter before performing installation or maintenance.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

WARNING

High leakage current

Earth connection is essential before connecting the supply.

CAUTION

Internal DC breakers can be hot surfaces. Use a bullet socket removal tool for removal of breakers.

1.5 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).

1.6 Lifting

CAUTION

Follow all local safety practices and guidelines while lifting the power system. All personnel involved with lifting and positioning the power system 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 all modules are not installed.
- Ensure all doors and panels are firmly affixed.

2. Introduction

2.1 Document scope

This document covers the features, options, installation, and startup of Cordex® CXPS-C centralized power systems.

In addition to this document, the following documents may be included in the documentation package that ships with the power system:

- EnVision™ Elite Controller Software Manual (ID: 0350189-J0)
- Cordex® HP System Controller Software Manual (ID: 0350058-J0)
- Cordex® HP 4.0/4.6 kW Rectifier and Shelf User Guide (ID: 9400000-J0)
- Cordex® HP 12 kW Rectifier User Guide (ID: 0100020-J0)

2.2 Product overview

The Cordex® CXPS-C centralized power system provides high capacity DC power for large communications applications including central office, mobile switching center, data center, and cable headend facilities. The main source of power for the power system is commercial AC power, which is converted to DC by the switched mode rectifier modules. It is a fully automatic system, which provides float and equalize capability for the batteries.

The basic power system consists of two bays and interbay copper busbars. The power bay converts AC to fully regulated and filtered 48 VDC power, which is fed through a load shunt to the distribution bay.

The power system can be expanded from the center out to a full 12,000 A capacity power system using the EnVision™ Elite controller or Cordex® HP system controller.

The power system is configurable to a 4,000, 8,000, or 12,000 A capacity.

The standalone power system bay is available up to 5,000 A capacity.

Figure 1: Cordex® CXPS-C centralized power system

2.3 Part numbers and list options

The power system offers several advanced features with add-on list options. These list options can be included by the customer at time of ordering or can be added in the future; for example, additional rectifier modules. For more information, contact Alpha Technologies Ltd. or the nearest Alpha® power system representative.

3. Specifications

3.1 Cordex® CXPS-C Centralized Power System

Table A: Cordex® CXPS-C Centralized Power System specifications

Electrical	
DC output voltage	48 V
AC input voltage	
6 feeds	**Cordex® HP 4.0/4.6 kW rectifier shelf** 480/277 VAC, 60 Hz (3-phase, 3-wire, N, PE)
	Cordex® HP 12 kW rectifier shelf 480 VAC, 60 Hz (3-phase, 3-wire, PE)
8 feeds	**Cordex® HP 4.0/4.6 kW rectifier shelf** 208 VAC, 60 Hz (3-phase, 3-wire, PE) 480/277 VAC, 60 Hz (3-phase, 3-wire, N, PE)
	Cordex® HP 12 kW rectifier shelf 480 VAC, 60 Hz (3-phase, 3-wire, PE)
16 feeds	**Cordex® HP 4.0/4.6 kW rectifier shelf** 208 VAC, 60 Hz (3-phase, 3-wire, PE) 480/277 VAC, 60 Hz (3-phase, 3-wire, N, PE)
	Cordex® HP 12 kW rectifier shelf 480 VAC, 60 Hz (3-phase, 3-wire, PE)
48 feeds (4,000 A)	**Cordex® HP 4.0/4.6 kW rectifier shelf** 208 to 277 VAC, 60 Hz (1-phase, 2-wire, PE)
54 feeds (5,000 A)	**Cordex® HP 4.0/4.6 kW rectifier shelf** 208 to 277 VAC, 60 Hz (1-phase, 2-wire, PE)
Nominal rectifier module voltage	**Cordex® HP 4.0/4.6 kW rectifier module:** 208 to 277 VAC
	Cordex® HP 12 kW rectifier module: 480 VAC
Maximum bus capacity	4,000, 8,000, or 12,000 A (EnVision™ Elite controller or Cordex® HP system controller)
	2,000 or 4,000 A per power bay
	6,000 A per distribution bay
Number of negative landings for batteries (rectifier side of the shunt)	**Single power bay** 11 × ½ inch holes on 1-¾ inch centers or 24 × ⅜ inch holes on 1 inch centers
	Each additional power bay 14 × ½ inch holes on 1-¾ inch centers or 14 × ⅜ inch holes on 1 inch centers
Number of landings on the load side of the shunt to feed unfused power to remote distribution	**Single distribution bay** 14 × ½ inch holes on 1-¾ inch centers or 11 × ⅜ inch holes on 1 inch centers
	Each additional distribution bay 14 × ½ inch holes on 1-¾ inch centers or 14 × ⅜ inch holes on 1 inch centers

Mechanical	
Dimensions H × W × D	84 × 28 × 28 in. (2133 × 711 × 711 mm)
Net weight	**4,000 A power bay (without rectifier modules):** Approximately 855 lb (388 kg)
	5,000 A power bay (without rectifier modules): Approximately 960 lb (435 kg)
	Distribution bay: 950 lb (432 kg) filled with TPL fuses
	Cordex® HP 4.0/4.6 kW rectifier module: 19 lb (8.5 kg) per module
	Cordex® HP 12 kW rectifier module: 28 lb (12.8 kg) per module
Enclosure	14 gauge (1.095 mm) steel
Mounting	Standard 23-inch relay rack (flush rack mount) in 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 6,562 ft (2,000 m)
Regulatory compliance	
Safety	CAN/CSA C22.2 No. 62368-1
	UL 62368-1
EMC	FCC CFR47 Part 15/B- Class A
	CAN ICES-003(A)/NMB-003(A)
Network Equipment-Building Systems	NEBS Level 3 Certified
	PN: 0910188-602 and 0910189-602 are designed to meet NEBS Level 3
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.	

Table B: Related components

System level alarms and controls	
Alarms and control parameters are user-programmable through built-in controller. See the controller software manual for detailed information on alarms and controls.	
Controller	EnVision™ Elite Touch controller
	Cordex® CXC HP 2RU touchscreen system controller
LEDs	Status and alarm LEDs
Load disconnect	• Panel based • 2,000 A per TPL fuse/bolt-in breaker panel • 600 A per plug-in bullet TLS/TPS fuse/breaker panel
Alarm connections	14 to 22 AWG (0.34 to 2.5 mm^2)
Peripherals	
Shunt multiplexer	6 shunt inputs per module

External return busbar	
Mounting	2 inch auxiliary framing (customer supplied)
Termination	With 3 horizontal busbars: • 202 sets of ½ inch holes on 1-¾ inch centers or • 202 sets of ⅜ inch holes on 1 inch centers
Unit capacity per bay	4,000 A per bar
Ultimate capacity	12,000 A (3 bar limit)

NOTICE

Refer to the rectifier system user guides, converter module user guide, and controller user guides for more information regarding included modules and shelves included in your power system.

Table C: Distribution bay

Panel type	Rating	Max. rating per panel	Output termination
Each distribution bay can be equipped with a variety of different fuse or circuit breaker panels.			
TPL fuses	61 to 800 A	2,000 A	2-hole, ½ inch studs on 1-¾ inch centers **or** 2-hole, ⅜ inch studs on 1 inch centers This allows for dual cable landing back to back.
Bolt-in breakers	• 1-pole 100 to 250 A • 2-pole 300 to 400 A • 3-pole 500 to 700 A • 4-pole 800 A • 5-pole 1,000 A • 6-pole 1,200 A	2,000 A	2-hole, ⅜ inch studs on 1 inch centers and ½ inch studs on 1-¾ inch centers 12 × 1-position 2-hole, ⅜ inch studs on 1 inch centers only
Plug-in bullet breakers	• 1-pole up to 100 A • 2-pole 110 to 200 A • 3-pole 225 to 300 A	600 A	• **1-pole** 2-hole, ¼ inch studs on ⅝ inch centers • **2- and 3-pole** 2-hole, ⅜ inch studs on 1 inch centers 100 A and 125 A breakers/fuses need one breaker space between breakers.
Plug-in bullet TPS/ TLS fuse holders	Up to 125 A	600 A	2-hole, ¼ inch studs on ⅜ inch centers
See Distribution bays for more information.			

Table D: Distribution and busbars	
Number of negative landings for batteries (rectifier side of the shunt)	**Single power bay** 11 × ½ inch holes on 1-¾ inch centers **or** 24 × ⅜ inch holes on 1 inch centers
	Each additional power bay 14 × ½ inch holes on 1-¾ inch centers **or** 14 × ⅜ inch holes on 1 inch centers
Number of landings on the load side of the shunt to feed unfused power to remote distribution	**Single distribution bay** 14 × ½ inch holes on 1-¾ inch centers **or** 11 × ⅜ inch holes on 1 inch centers
	Each additional power bay 14 × ½ inch holes on 1-¾ inch centers **or** 14 × ⅜ inch holes on 1 inch centers
Internal return busbar	Overhead bus ground, 24 sets of 2-hole, ½ inch holes on 1-¾ inch centers **or** ⅜ inch holes on 1 inch centers (basic one power plus one distribution bay); 14 additional sets per additional rectifier **or** distribution bay.

4. Features

The basic power system consists of two bays and interbay copper busbars. The power bay converts AC to fully regulated and filtered DC power, which is fed through a load shunt to the second bay for distribution.

Basic Cordex® CXPS-C Centralized Power System

- One 4,000 A power bay (eight shelves), one 2,000 A power bay (four shelves), or one 5,000 A standalone only power bay (nine shelves)
- One 6,000 A distribution bay
- Controller.

Expandable to include

- One or more additional 4,000 A power bay (8,000 or 12,000 A system capacity)
- One or more additional 2,000 A power bay (4,000, 6,000, 8,000, 10,000, or 12,000 A system capacity)
- One or more additional 6,000 A distribution bays (12,000 A distribution capacity)
- The 5,000 A standalone power bay is not expandable in capacity and does not support the addition of distribution bays.

AC power distribution panel assembly

8 × Cordex® HP 4.0./4.6 kW rectifier shelves

or

8 × Cordex® HP 12 kW rectifier shelves

Figure 2: Basic Cordex® CXPS-C centralized power system

4.1 Power bays

4.1.1 Controller

The controller, mounted in the primary power bay, provides easy access to controls and display status. The controller provides comprehensive setup, control, monitoring, and communication for Alpha® DC power systems.

Controller features include:

- Designed to communicate directly with Cordex® HP rectifier modules
- Includes battery temperature compensation charging
- Battery performance diagnostics
- Provides local and remote communications
- User definable alarms
- Daily logging of power system events and system statistics
- Active low voltage disconnect (LVD)

See the EnVision™ Elite Controller or Cordex® HP system controller software documentation shipped with your order for detailed information.

4.1.2 Cordex® HP Rectifier Shelves

A 4,000 A standard power bay has eight rectifier shelves and a 2,000 A standard power bay has four rectifier shelves. Each rectifier shelf can hold up to six Cordex® HP 4.0/4.6 kW rectifier modules or two Cordex® HP 12 kW rectifier modules.

A 5,000 A standalone power bay has nine Cordex® HP 4.6 kW rectifier shelves and is not expandable in capacity and does not support power distribution bays.

A Cordex® HP 4.0/4.6 kW rectifier module supplies a nominal output of 74 A at 54 VDC and the Cordex® HP 12 kW rectifier module supplies 222 A at 54 VDC nominal. Rectifier module specifications are included in the Cordex® HP rectifier module documentation included with the power system documentation package.

The controller provides central control of the rectifier modules' output level, load sharing, temperature compensation, low voltage disconnect on the distribution bay, and alarm reports. A CAN bus cable is connected or daisy-chained to each rectifier shelf for communication with the controller.

4.1.3 AC distribution panel wiring

The required input voltage depends on the rectifier module options chosen at the time of ordering. The AC distribution panel assembly at the top of each power bay provides front access AC overhead termination.

A split AC distribution panel area terminal allows for feeds from two separate sources. Eight feed is standard; six or 16 feed is an option. 48 or 54 feed is available for single phase rectifier shelf configurations only. For more information, see the Specifications section.

4.1.4 Standard or add-on power bays

A standard power bay can replace multiple bays with less capacity in an existing power system or as an add-on to upgrade the capacity of an installed Cordex® CXPS-C centralized power system.

4.1.5 Power bay DC charge buses

Each standard power bay has two vertical charge busbars connecting all return terminals and all negative terminals of the rectifier shelves; see Figure 3. These busbars are rated for the maximum current supplied by the rectifier shelves.

In a multibay power system, the return vertical busbars connect to an interbay return busbar located across the top of the power and distribution bays. Similarly, the –48 V vertical busbars connect to an interbay –48 V busbar, which terminates at the system shunt located in the distribution bay.

Figure 4 shows a top view of the horizontal busbars between a standard power bay and two distribution bays.

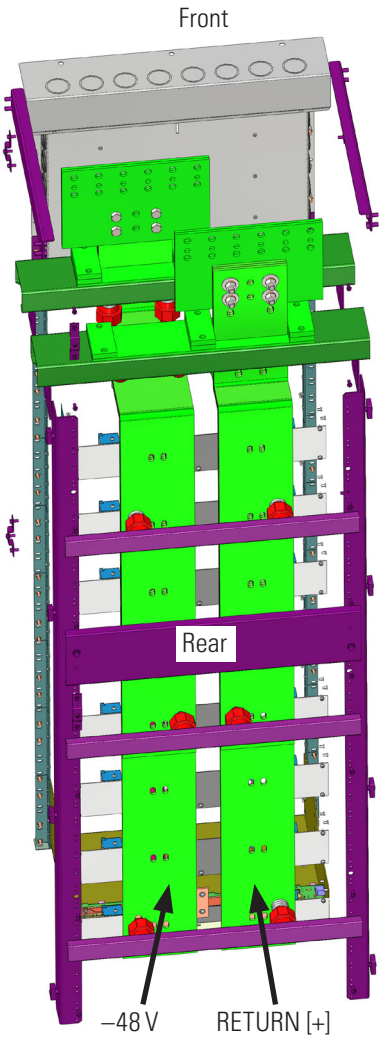


Figure 3: 4,000 A standard power bay showing DC charge buses

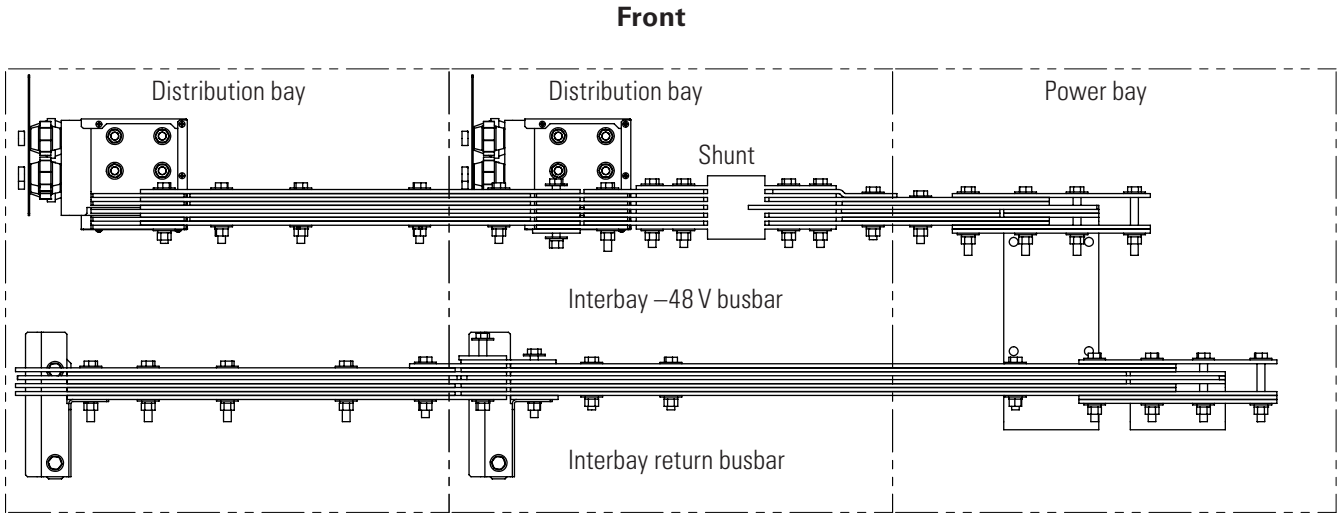


Figure 4: Top view of horizontal interbay busbars

4.2 Rectifier modules

The rectifier modules are hot swappable allowing for quick replacement and easy maintenance of the system. They can be inserted or removed from the shelf without removing AC power or shutting down the entire system.

4.2.1 Rectifier module alarms and LEDs

Rectifier module status, such as mains **OK**, **Minor**, and **Major** alarms display on the rectifier module front panel. A rectifier module **Major** alarm indicates, the module has shut down due to a critical fault. A rectifier module **Minor** alarm indicates the module has a non-critical alarm, however, it has not shut down.

See the Cordex® HP rectifier module user guide included with the system documentation package for detailed information. See the Troubleshooting section for information LED states.

Figure 5: Cordex® HP 4.0/4.6 kW rectifier module front panel LEDs

Figure 6: Cordex® HP 12 kW rectifier module front panel LEDs

4.3 Distribution bays

Distribution bays are designed for high capacity distribution applications. Each distribution bay can be equipped with a variety of different fuse/breaker tier combinations, with or without the LVLD option, as shown in Table E and Figure 7.

Table E: Distribution options per bay

Panel type	Rating	Max. rating per panel	Number of positions per bay
TPL fuses	61 to 800 A	2,000 A	• 4 fuse holders per panel • Maximum 6 fuse panels per bay
Bolt-in high capacity breakers	1-pole 100 to 250 A	2,000 A	• 12 breaker poles per panel • Maximum 6 panels per bay
	2-pole 300 to 400 A		
	3-pole 500 to 700 A		
	4-pole 800 A		
	5-pole 1,000 A		
	6-pole 1,200 A		
Plug-in bullet breakers	1-pole up to 100 A	600 A	• 18 breaker poles per tier • Maximum 12 fuse panels per bay 100 A and 125 A breakers or fuses need one breaker space between breakers and beside it.
	2-pole 110 to 200 A		
	3-pole 225 to 300 A		
Plug-in bullet TPS/TLS fuse holders	Up to 125 A	600 A	• 18 fuse holders per panel • Maximum 12 fuse panel per bay 100 A and 125 A breakers or fuses need one breaker space between breakers and beside it.

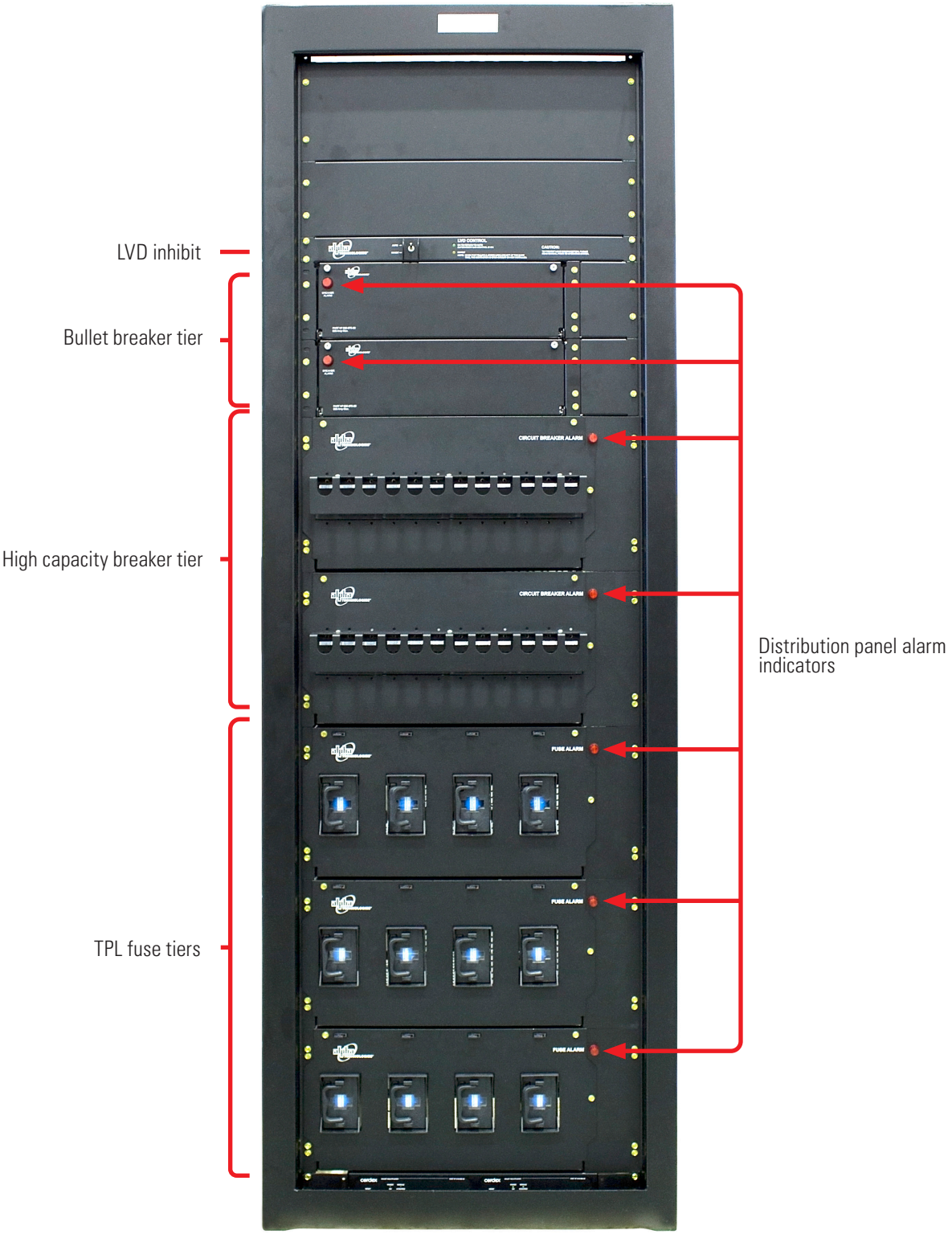


Figure 7: Distribution bay panel options

4.3.1 4-position TPL tier features

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

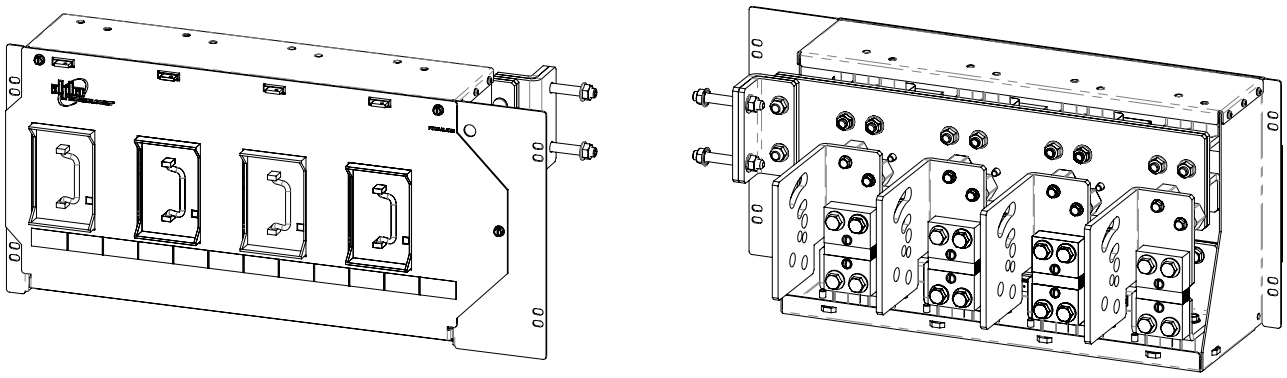


Figure 8: 4-position TPL fuse

4.3.2 12 1-position high capacity breaker tier features

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

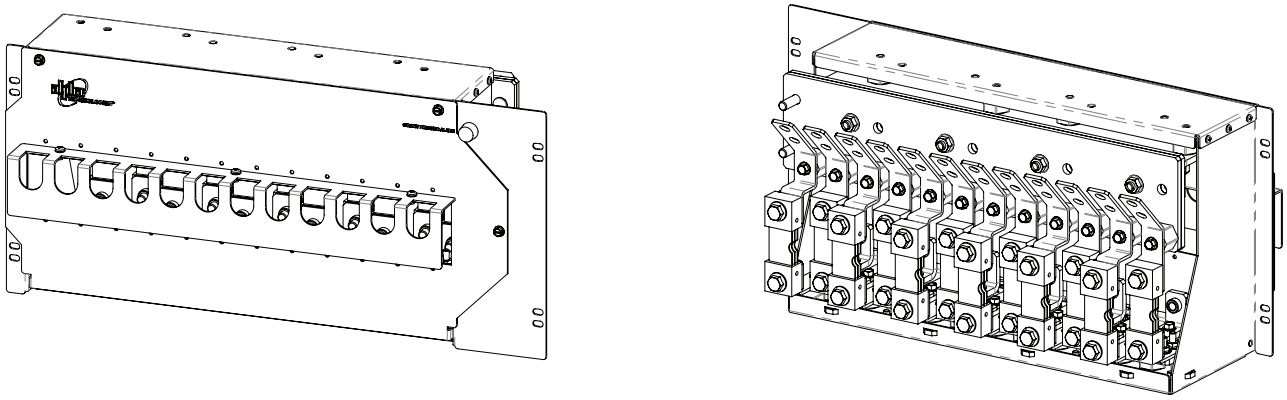


Figure 9: 12 1-position high capacity breaker

4.3.3 Six 2-position high capacity breaker tier features

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

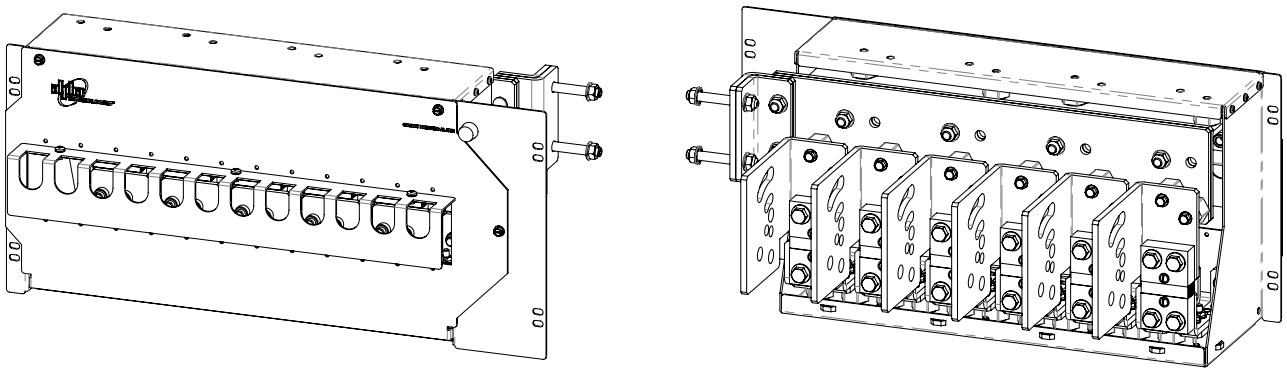


Figure 10: Six 2-position high capacity breaker

4.3.4 Four 3-position high capacity breaker tier features

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

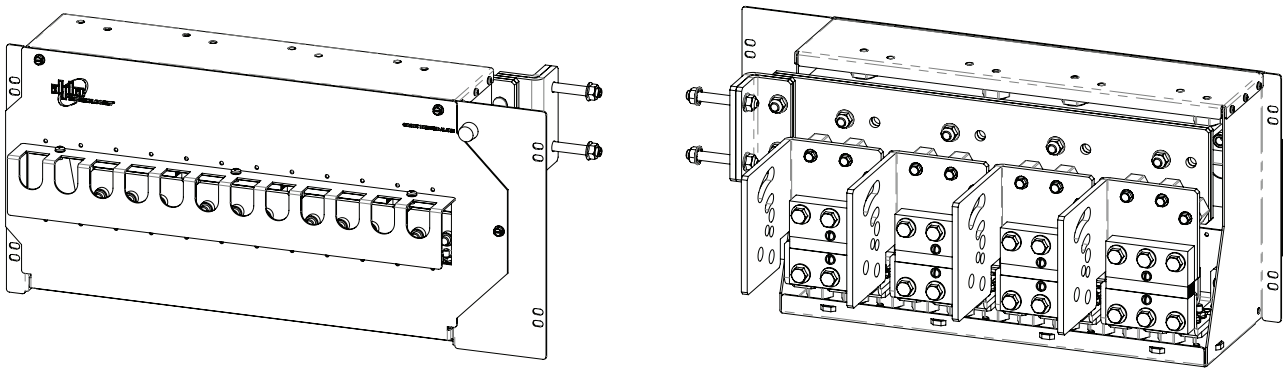


Figure 11: Four 3-position high capacity breaker

4.3.5 Three 4-position high capacity breaker tier features

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

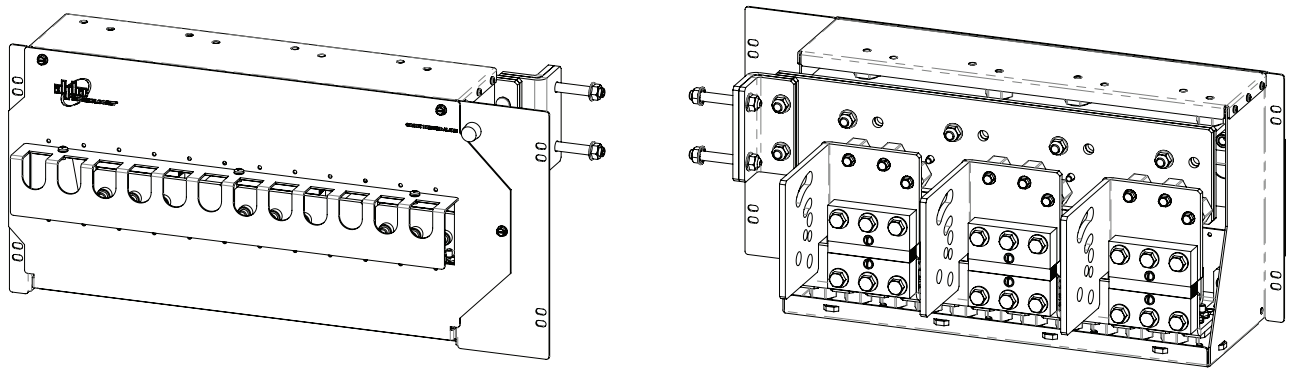


Figure 12: Three 4-position high capacity breaker

4.3.6 Two 5-position high capacity breaker tier features

- Occupies one tier positions
- 2000 A tier rating
- Can accept 5-position (1,000 A) high capacity breaker
- Individually monitored by 1,500 A shunts
- Two landings per position 2-hole, ⅜ inch studs on 1 inch centers and ½ inch studs on 1-¾ inch centers
- Option for whole tier LVD 2,000 A disconnect

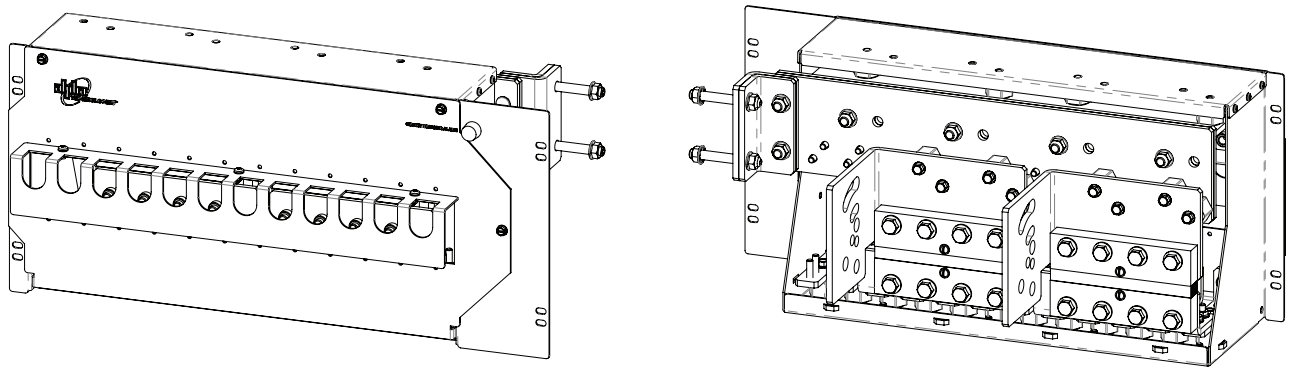


Figure 13: Two 5-position high capacity breaker

4.3.7 Two 6-position high capacity breaker tier features

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

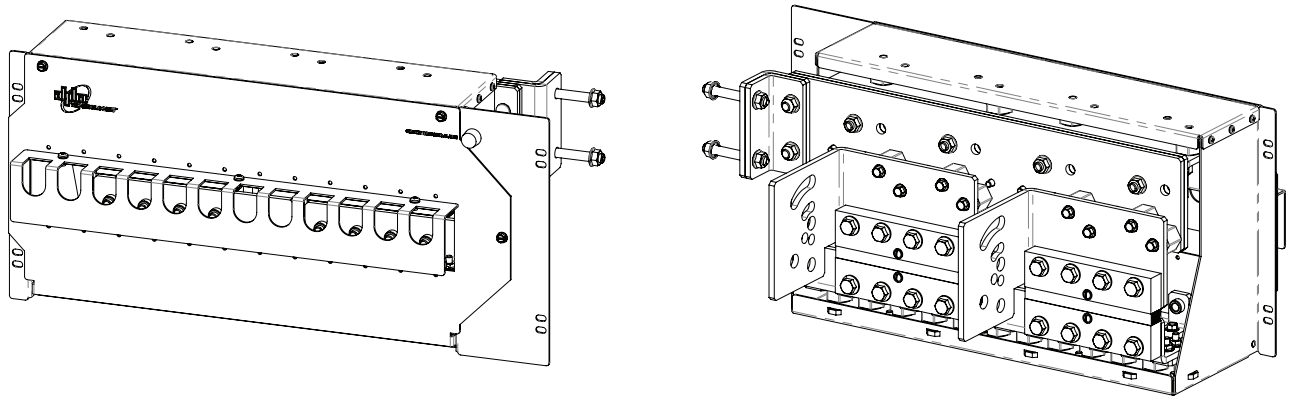


Figure 14: Two 6-position high capacity breaker

4.3.8 Four 2-position and four 1-position high capacity breaker tier features

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

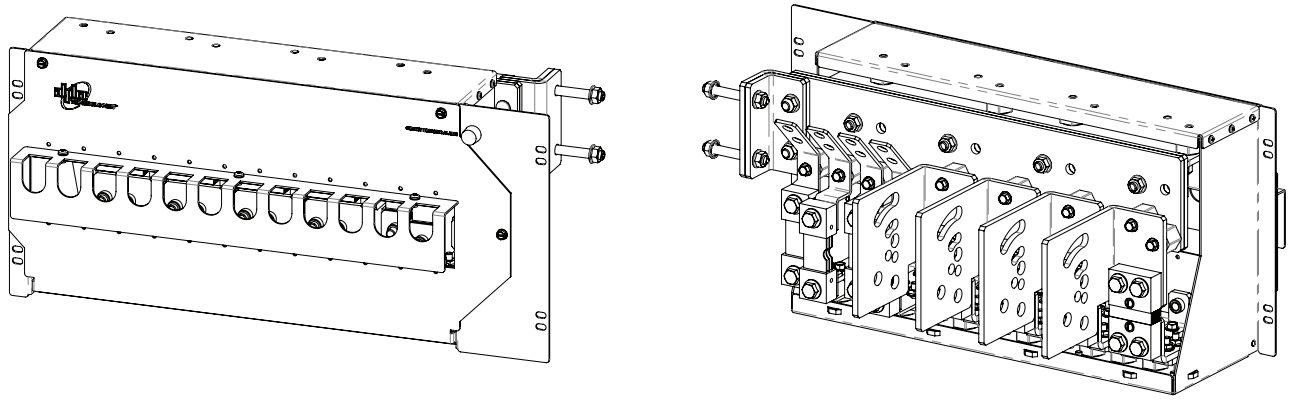


Figure 15: Four 2-position and four 1-position high capacity breaker

4.3.9 18-position bullet breaker tier features

- 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 bullet breakers
- Total shelf monitoring by an 800 A shunt
- 1-pole bullet breaker or fuse (1-pole, 2-hole, ¼ inch studs on ⅝ inch centers)
- 2-pole and 3-pole (2-hole, ⅜ inch studs 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

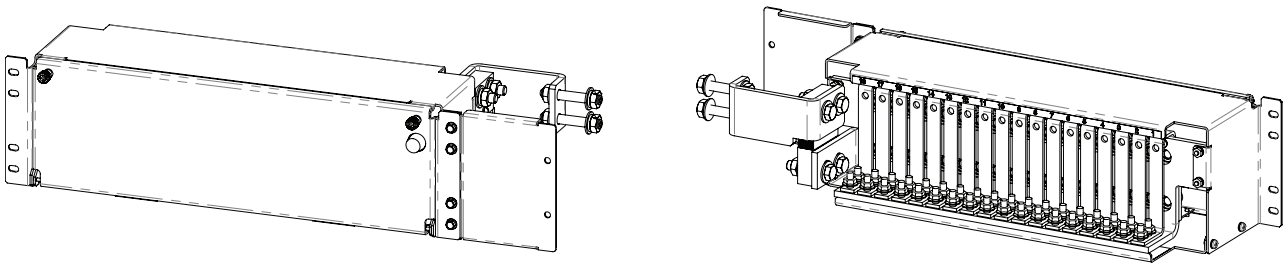


Figure 16: 18-position bullet breaker

4.3.10 18-position bullet breaker return features

- Occupies half tier positions
- 600 A tier rating

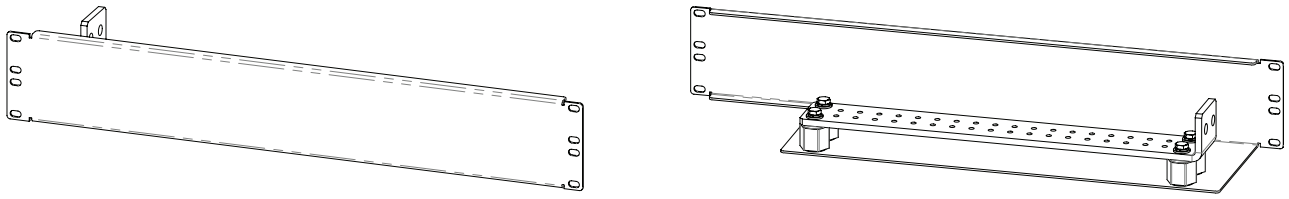


Figure 17: 18-position bullet breaker return

4.3.11 DC distribution buses

Each distribution bay has a vertical distribution bus; see Figure 18; that brings power from the overhead busbars down into the bay. This bus is rated for 6,000 A continuous operation.

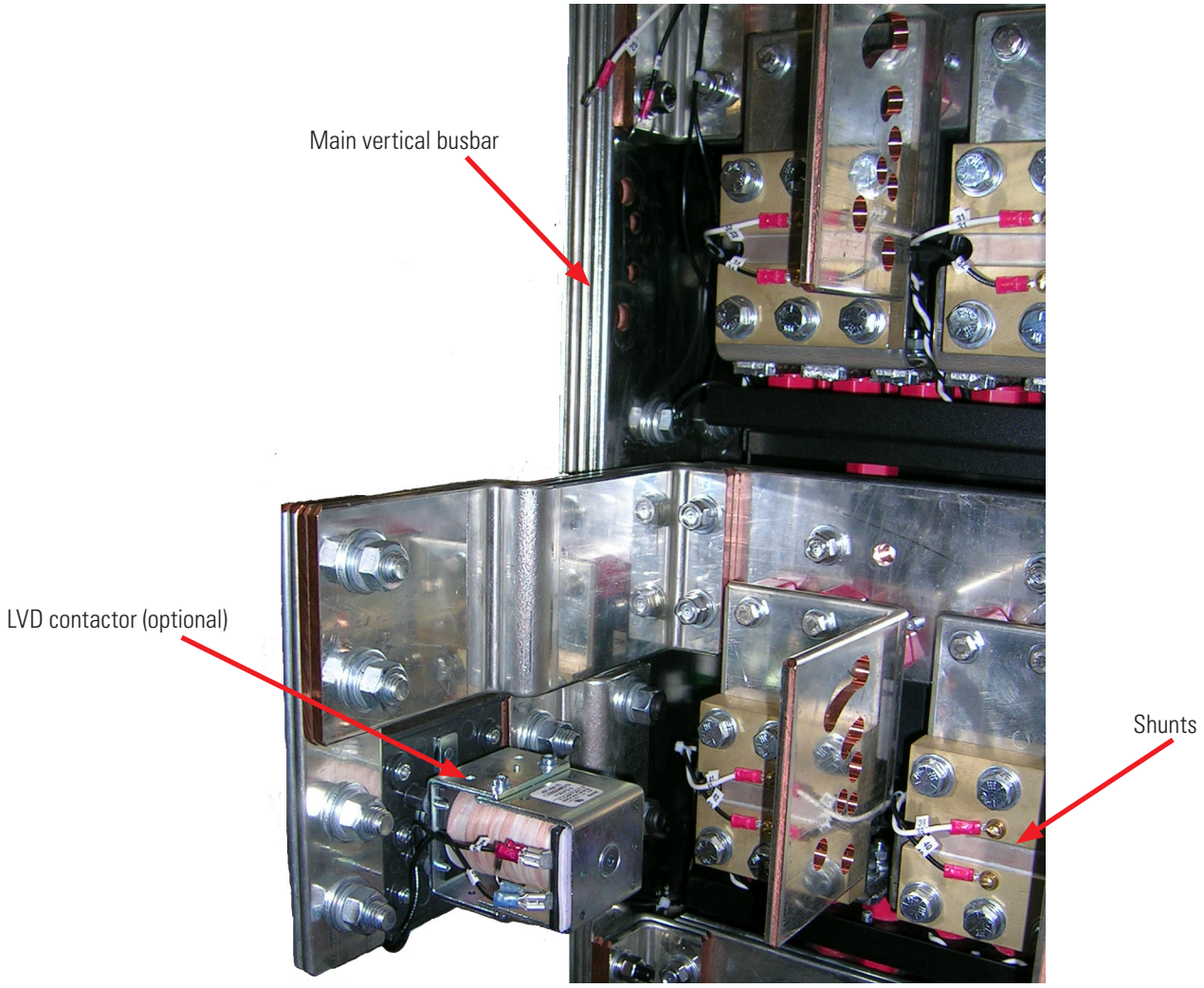


Figure 18: Distribution bay DC distribution bus

4.3.12 Distribution shunts

Each distribution panel has shunts; see Figure 19; 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 tier panels of the individual distribution bay. The current measurements are sent to the controller, using CAN communications, for data logging and display.

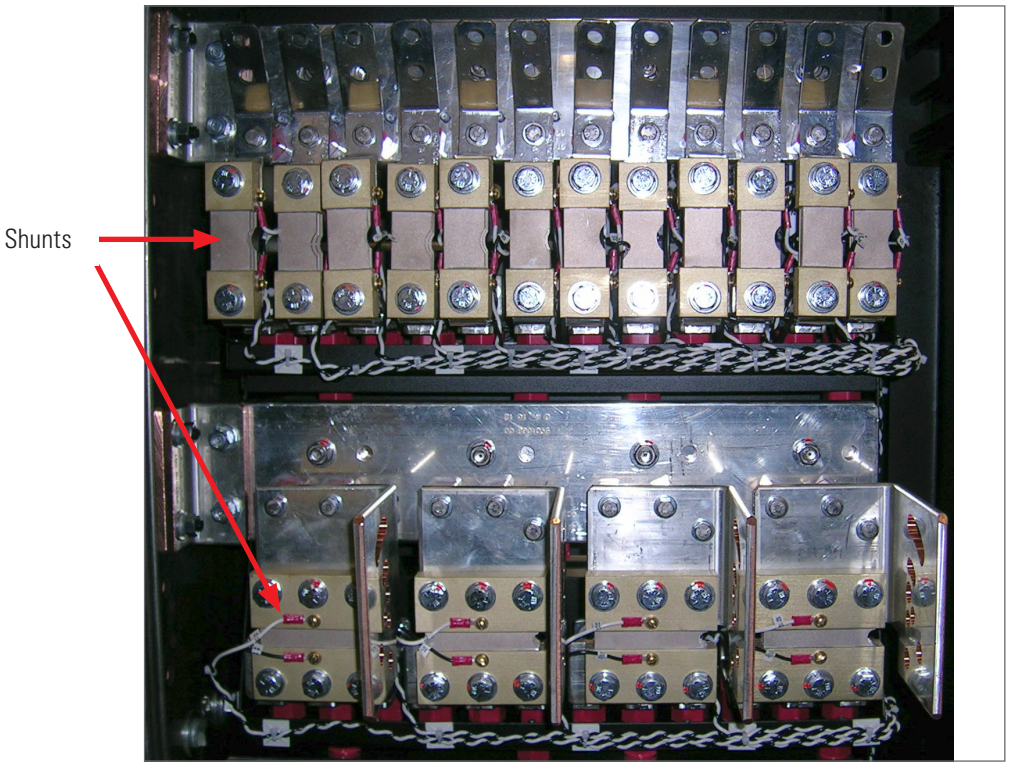


Figure 19: Distribution shunts

4.3.13 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 power is restored and battery voltage has risen above a preset value. The 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 a TPL bolt-in breaker and 600 A for plug-in bullet breaker distribution panel.

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

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

4.3.14 Distribution panel alarms

Breaker and fuse alarms occur when one or more fuse or breaker has opened. Each breaker or fuse distribution panel is equipped with one alarm which is connected to the controller.

Indication of an alarm condition is provided by an illuminated red lamp on each distribution panel; see Figure 7.

4.4 DC interbay copper

The interbay busbar is available in 4,000, 8,000, and 12,000 A nominal sizing as configured. The maximum continuous load busbar current rating is limited to 80 percent of the shunt rating due to its design specifications. All live interbay buswork is contained within the power system bays or cabinets. Return busbars can be factory ordered and internally mounted for smaller power systems with 12 or less large capacity circuits, or externally mounted for power systems with more than 12 large capacity circuits.

Figure 20 shows the typical 12,000 A rated buswork with an internal return, which can be expanded to include one more distribution bay.

Table F on page 37 lists the available busbar kits and the corresponding drawing part numbers. Typically these kit drawing part numbers ship with the pre-packaged individual busbars and hardware for assembly at the customer installation site.

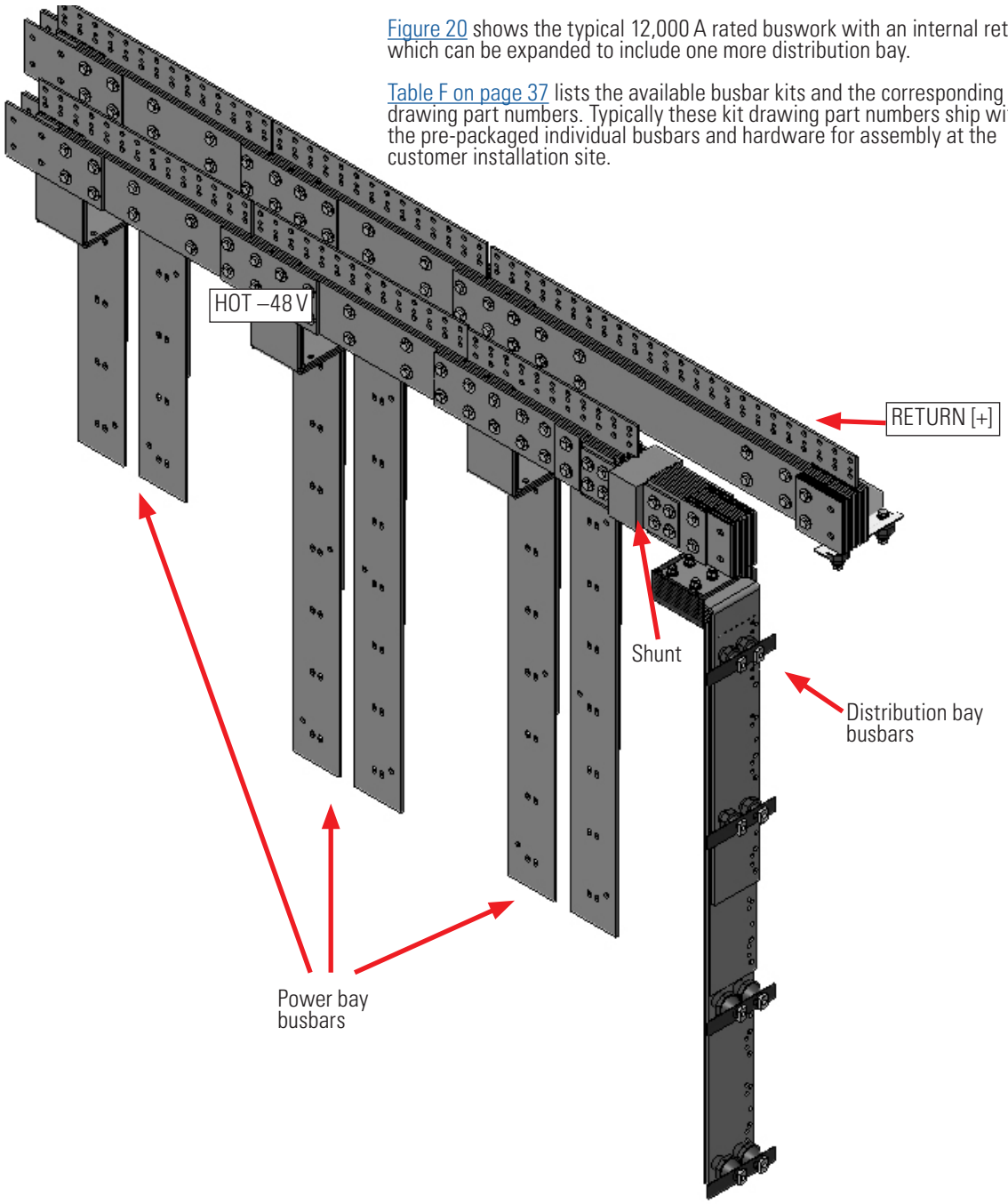


Figure 20: Interbay DC connections (front view)

4.4.1 Live bay expansion

Additional bays can be added to the power system while online without shutting down the DC plant.

4.4.2 Internal return busbar (optional)

The positive DC interbay common return busbar runs horizontally across the top of the distribution and power bays (within the bays). This is the termination point for load returns, battery returns, rectifier module positive, and site reference ground. There are 24 termination points on a basic power systems.

4.4.3 –48 VDC busbar (optional)

The –48 VDC interbay hot busbar also runs horizontally across the top of the distribution and power bays (within the bays), interconnecting the vertical –48 VDC distribution buses in each bay. There are 11 termination points on a basic power system.

4.4.4 External return busbar (optional)

This option is available to facilitate termination of a high quantity of large cables. In addition, relocating the return cables outside the bay frees up space within the bay for load cables. The external return busbar is required for power systems that have more than 12 large capacity circuits in the distribution bays.

It is available with up to three horizontal busbars and:

- 202 sets of ½ inch holes on 1-¾ inch centers **or**
- 202 sets of ⅜ inch holes on 1 inch centers

Maximum current carrying capability is 4,000 A per section. Multiple busbars can be installed for a total of 8,000 A (two busbars) and 12,000 A (three busbars).

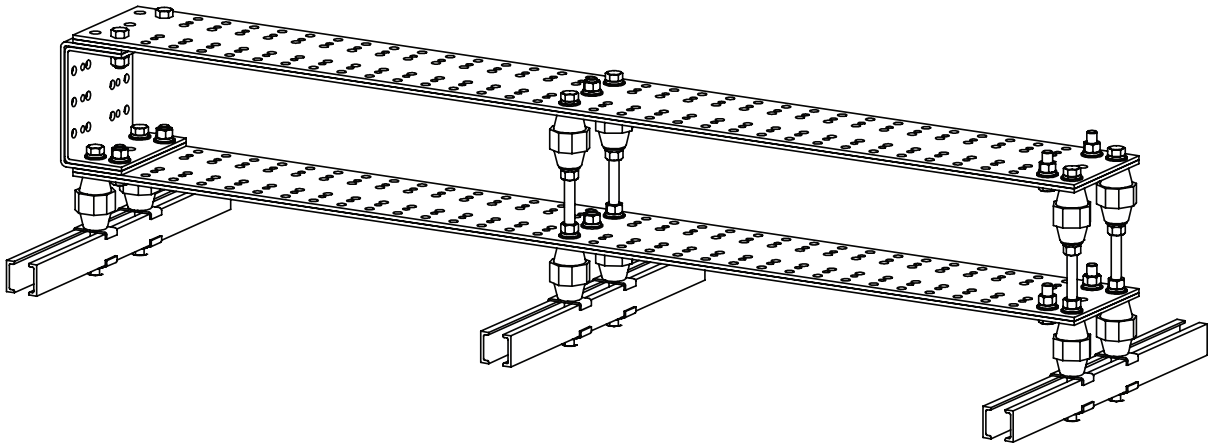


Figure 21: External battery return ground busbar (2 busbars shown)

4.5 EnVision™ Elite Touch Controller

The EnVision™ Elite series controller is a next generation controller for smart networks. It is the cornerstone of the EnVision™ ecosystem which is built on the four pillars; control, sense, react, and explore; empowering your business to predict and prevent issues before they happen.

The EnVision™ Elite series controller offers cutting-edge performance, control, and monitoring while ensuring seamless integration with your current systems. Its backward compatibility with Alpha® power systems and the Cordex® HP controller form factor allows for easy upgrades with minimal disruption.

EnVision™ Elite series controllers are a direct replacement of the current Cordex® HP series controllers. It has enhanced security features, wireless connectivity, increased storage, and expanded capabilities to support a wider range of power equipment and peripherals.

Figure 22: EnVision™ Elite Touch controller ports and connections

1. **USB 2.0 ports**
   Dual ports on both the front and side of the controller for upgrades or file management via a standard USB drive.

2. **Ethernet ports**
   Dual 10/100/1000 BASE-T Ethernet ports for connection on both the front and side of the controller for remote or local communication.

3. **Status LEDs**
   Three front panel LEDs for alarms, progress, and status indication.

4. **2.4 GHz wireless antenna**
   Configure a Wi-Fi access point on the controller and communicate with supported Bluetooth® devices.

5. **Touchscreen LCD display panel**
   Full color touchscreen LCD display panel to access controls and menu items by using fingertip touch or a capacitive touch stylus.

6. **CAN ports**
   CAN is used by the controller to discover, collect data from, control, and configure the power and I/O (ADIO) modules in the power system. The controller has two CAN buses, each of which can control up to 127 power and ADIO modules.

7. **Alarm connection**
   Controller fail alarm relay contacts for extending various alarm and control signals. Each relay output can be wired for: normally open (NO), common (COM), and normally closed (NC) during an alarm or control condition.

8. **Main and redundant power connections**
   Two 12 to 60 VDC input power connections. The EnVision™ Elite controller will operate when either power input is energized.

4.6 Cordex® HP System Controller

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

The controller supports dual Ethernet ports and a 4.3-inch LCD panel to allow simultaneous network, LCD, and local laptop access to the controller including both web and SNMP interfaces.

The controller supports dual CAN ports to allow up to 256 power and ADIO peripherals to be controlled and monitored. The 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.

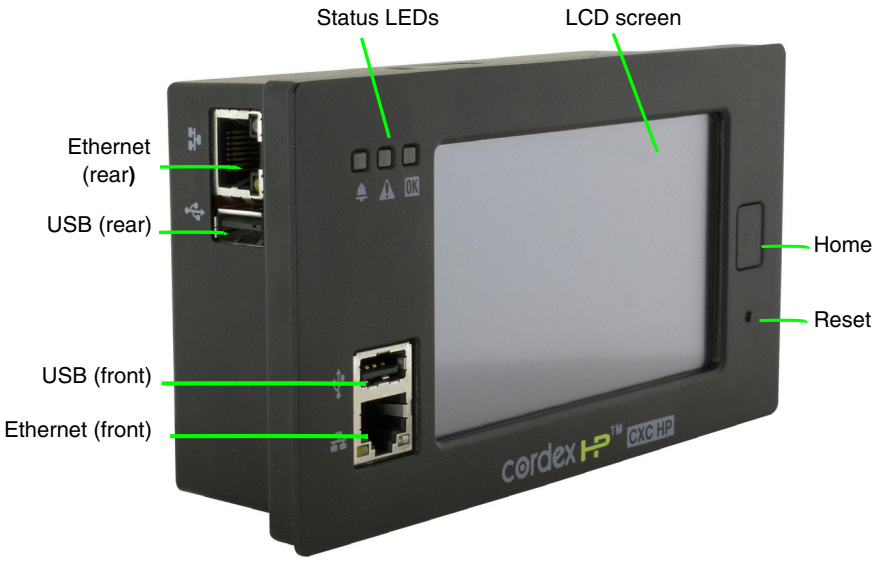


Figure 23: Cordex® CXC HP 2RU touchscreen system controller

4.6.1 Controller features

The controller has the following features:

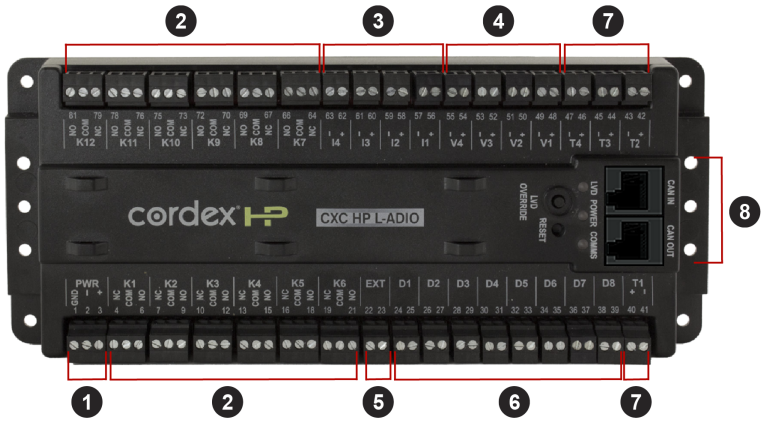
- **Display panel:** Full color touchscreen LCD panel, to access controls and menu items by using fingertip touch or a stylus.
- **Home button:** Provides the ability to go directly back to the home screen from any menu.
- **Reset button:** For emergency use only to restart the controller if the LCD panel or home button are not responding.
- **LEDs:** For alarms, progress, and status indication. See the Troubleshooting section for information LED states.
- **Audio speaker:** Built-in audio tones during active alarms, and can be disabled if required.
- **Ethernet:** Dual port 10/100 BASE-T Ethernet connections on both the front and side of the controller for remote or local communication.
- **USB:** Dual ports on both the front and side of the controller for upgrades and file management via a standard USB flash drive.
- **CAN:** Dual independent CAN bus ports on side of the 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 controller attempts to reset.

4.7 External peripherals

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

4.7.1 Cordex® HP L-ADIO Low Voltage Smart Peripheral

The Cordex® HP L-ADIO 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 controller and provides user access to I/O management via the controller.



1 ADIO Power
2 K1 to K12, Form C Relays
3 I1 to I4, Current Inputs
4 V1 to V4, Voltage Inputs
5 EXT, Monitor External LVD Device
6 D1 to D8, Digital Inputs
7 T1 to T4 Temperature Inputs
8 CAN Connections, In/Out

Figure 24: 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 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 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 to 5 V and is powered internally from the 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 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.

LED indication

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

Front panel reset button

NOTICE

Pressing the reset button will cause the peripheral to lose communication with the controller.

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.

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 controller maintenance such as test relay functions, or when replacing a 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.

4.7.2 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 module communicates on CAN bus to the controller and provides access to shunt inputs via the controller.

Six current input channels, I1 to I6, provide monitoring of current; for example, discharge (load) and charge (battery). The 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 controller and is set by default to 800 A/25 mV. The input range for this signal is –250 to +250 mV.

Figure 25: Cordex® HP 6i-ADIO six input smart peripheral

4.7.3 Cordex® HP Redundant Input Power Module

The Cordex® HP redundant input power module provides multiple power inputs to power the 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 (for example, on battery and load side of the LVD or A and B power systems) and provides diode-or protection between power inputs.

Figure 26: Cordex® HP redundant input power module

4.7.4 Cordex® HP Shelf/Bay ID Peripheral

The Cordex® HP shelf/bay ID peripheral enables users to identify individual supported rectifier 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 controller. The controller's display panel and web interface provide details on the physical location via each module within the system.

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

Figure 27: Cordex® HP shelf/bay ID peripheral

5. Pre-installation preparation

5.1 Site selection

Cordex® CXPS-C centralized power systems 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 of the bays.
- 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 is not required if top access is provided for the power bay.
  - **Front:** 3 feet (1 meter)
  - **Sides:** No clearance required
  - **Top:** Clearance required for cables and external return busbar (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 or DC power source
- Understand the full load on the DC power system
- Window for working hours and other similar restrictions
- How much and what kind of preparation 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

Insulated tools are essential for a DC power system installation. Use the following list as a guide:

- Electric drill with hammer action
- Digital voltmeter equipped with test leads
- Computer with web browser, Ethernet cable for communication with the controller (not required for initial installation and test)
- Various crimping tools and dies, to match lugs used in installation
- Torque wrench: ¼ inch drive, 0 to 150 in-lb (0 to 17 Nm) for battery post connections
- Torque wrench: ⅜ inch drive, 0 to 100 ft-lb (0 to 135 Nm) for power system connections
- Insulating canvases as required
- Cutters and wire strippers 22 to 14 AWG (34 to 2.5 mm²)
- Insulated hand tools:
  - Combination wrenches
  - Ratchet and socket set
  - Various screwdrivers
  - Electricians knife
  - Fine tipped slot screwdriver
  - Cable cutters

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 28 shows 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 compliance.

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 Alpha® strives to follow our quality and environmental objectives from product supply and development through to the packaging for our products.

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

Almost all Alpha® 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 Alpha Technologies Ltd. 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.

7. Frame 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 Figure 28 and mark the anchor hole positions. This figure also shows the preferred location for the anchor holes within the slots.

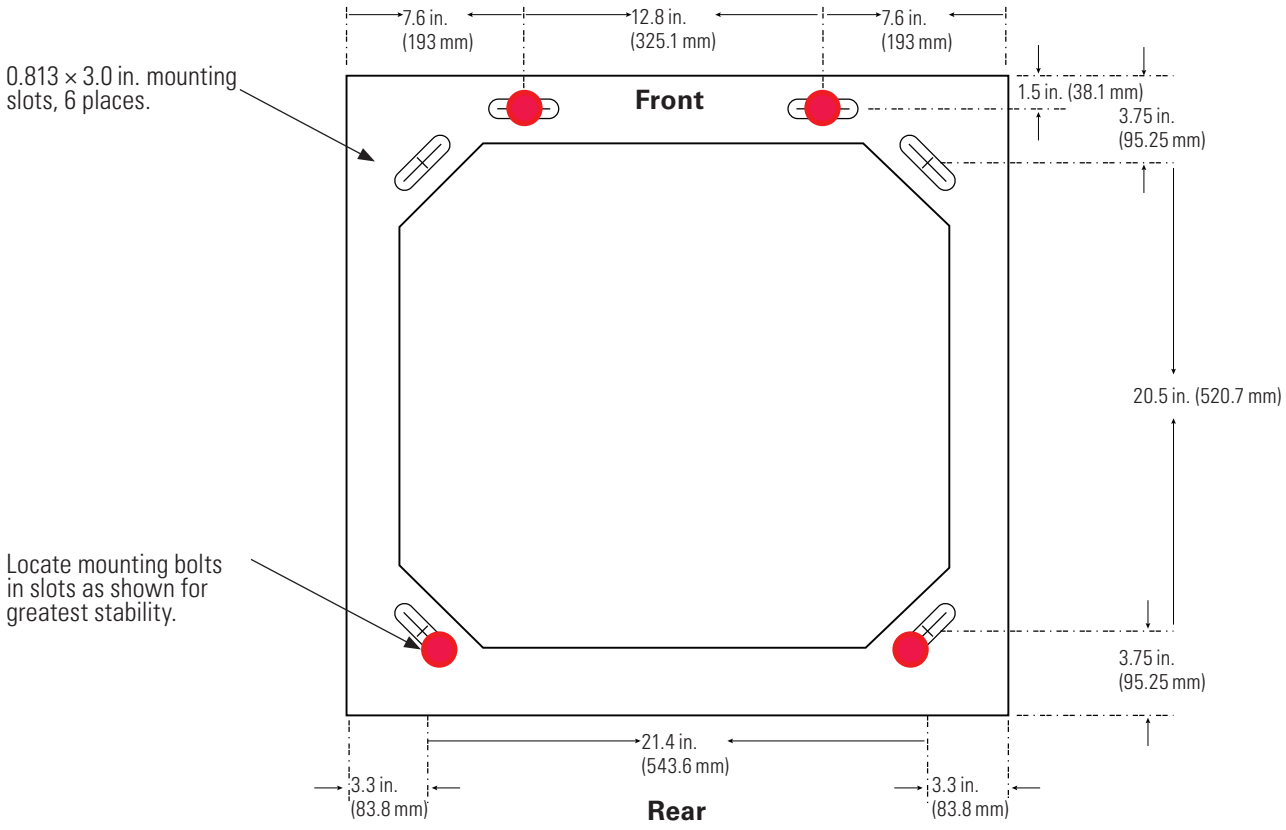


Figure 28: Base dimensions and mounting holes

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.

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 interbay DC components per section 7.4 before completing the final torquing of the anchor bolts.

3. Check that the bay is level front-to-back and side-to-side.
4. Once the bay is level, tighten all bolts to the appropriate torque, supplied by the anchor manufacturer.

Figure 29: Securing the power system to a concrete floor

7.3 Securing adjacent bays

Locate the bay-to-bay bolting kits that ship with the equipment.

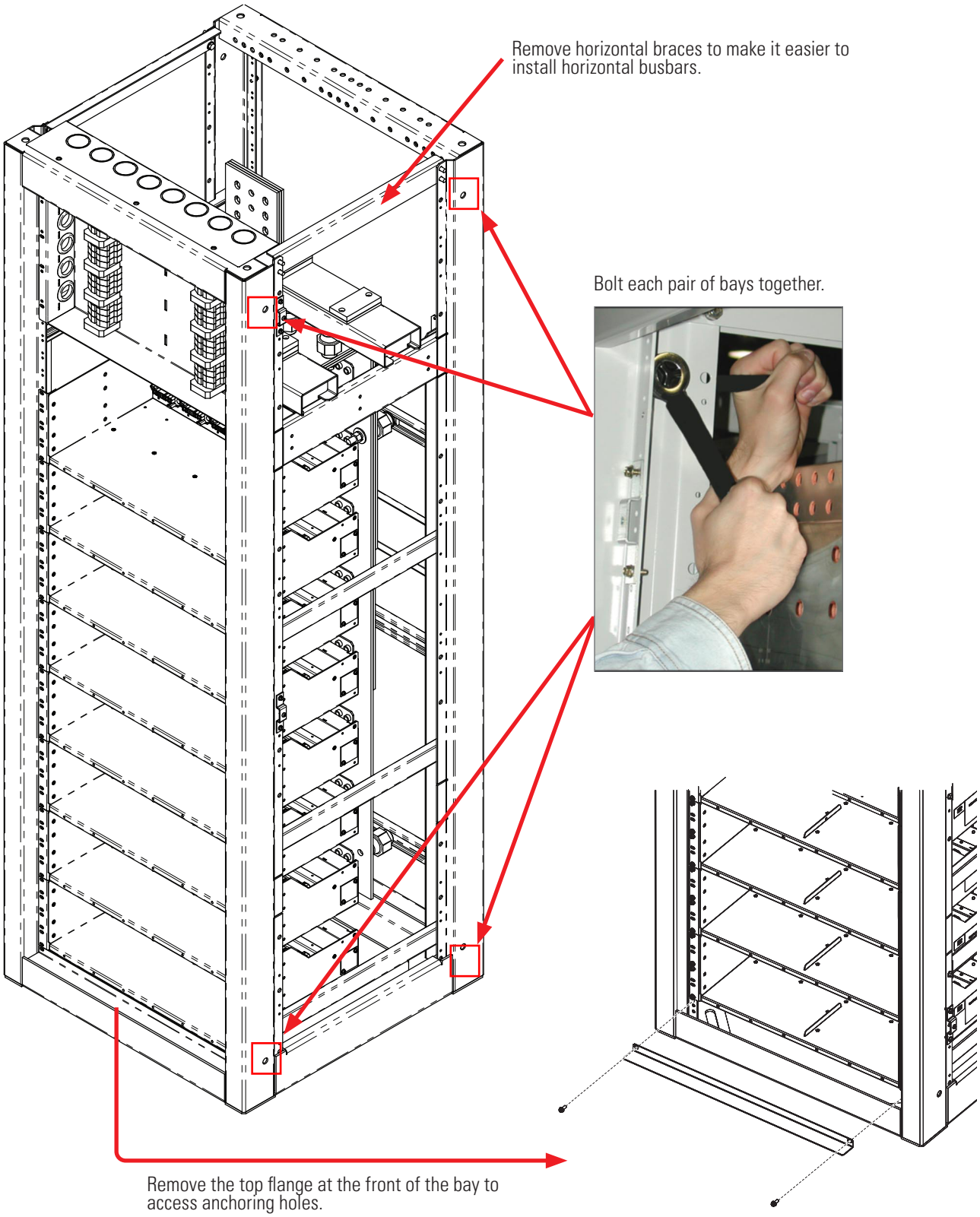


Figure 30: Bolting adjacent bays together

7.4 Installing the interbay DC buswork between adjacent frames

The interbay DC buswork ships as a kit that is sized according to the number of rectifier modules and current demand of the load.

In a new installation, the frame anchors should not have been set completely as per instructions in section 7.2.1. When adding a new frame to a working power system, it may be necessary to loosen the floor anchors in the existing frame to permit final alignment.

Refer to the drawings included with the busbar kit and follow the sheets designated for the ampacity of your power plant.

Procedure

1. Assemble the interbay buswork with the bolts that ship in the kit with the copper buses.
2. Once assembled, torque all bolts to 75 ft-lb (101.7 Nm).
3. Proceed with final setting of the bay floor anchors.

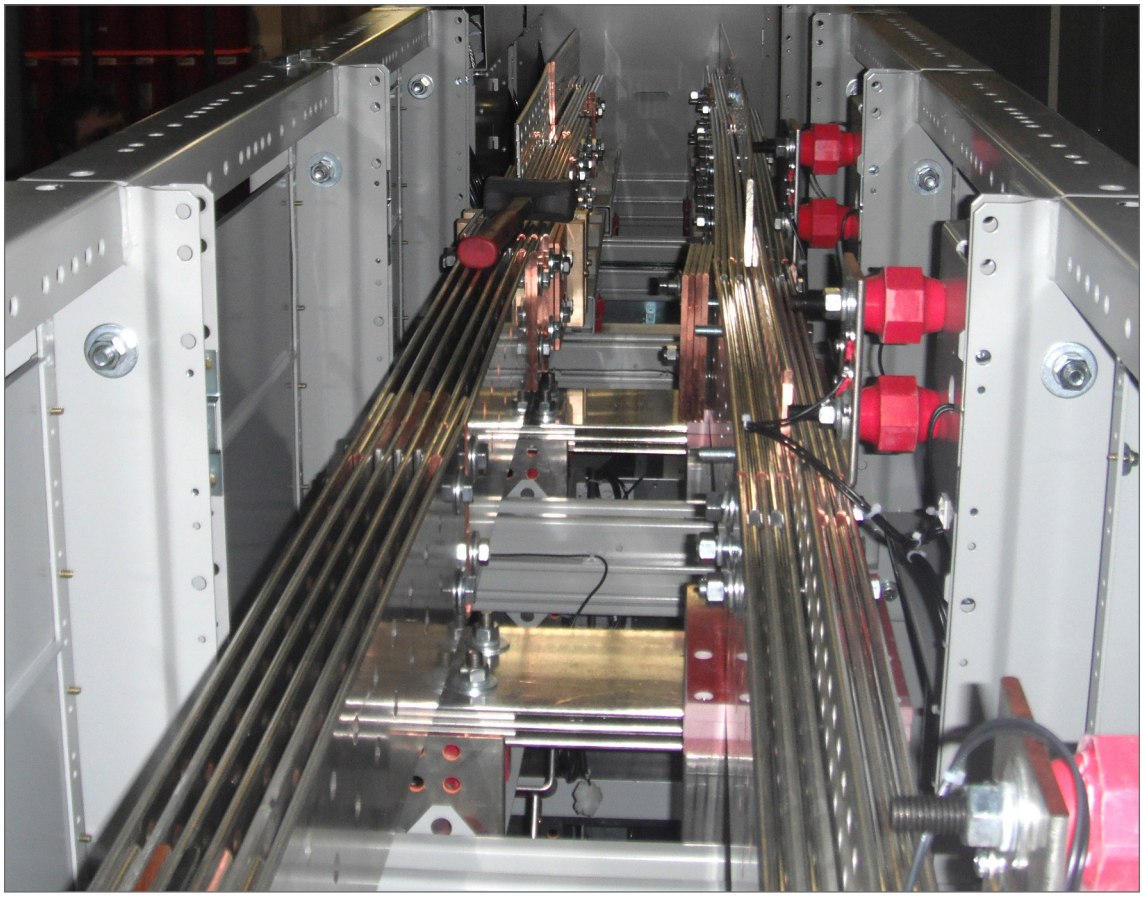


Figure 31: Example of installed interbay buswork

7.5 Connecting the shunt and interbay signal cables

This section applies to new installations as well as the installation of expansion distribution and power bays.

1. Locate the coils of cables that are tie-wrapped to the side of the power bay containing the controller.

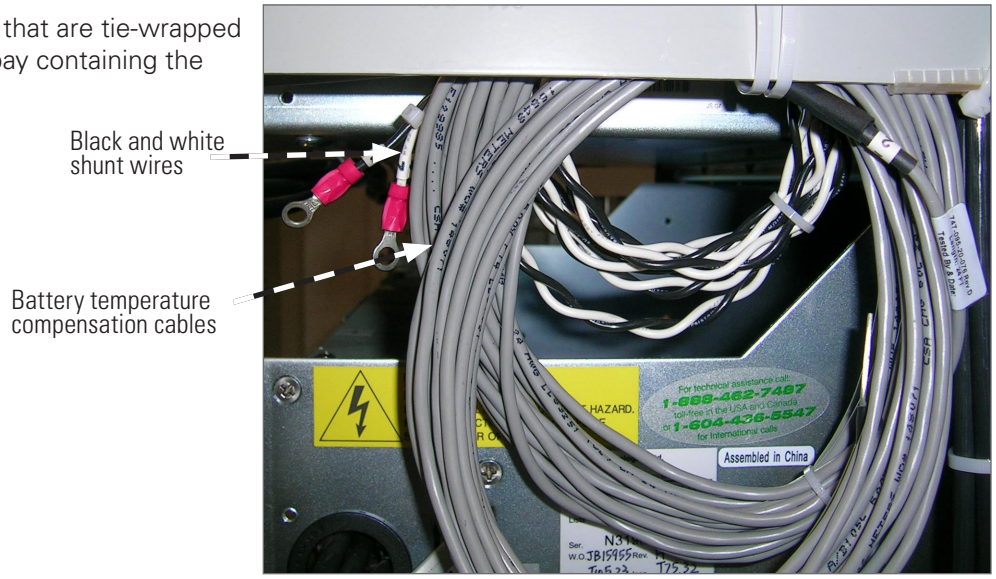


Figure 32: Shunt and interbay signal cables

2. Connect current shunt wire leads. Refer to Figure 20 for the location of the shunt in the distribution bay.

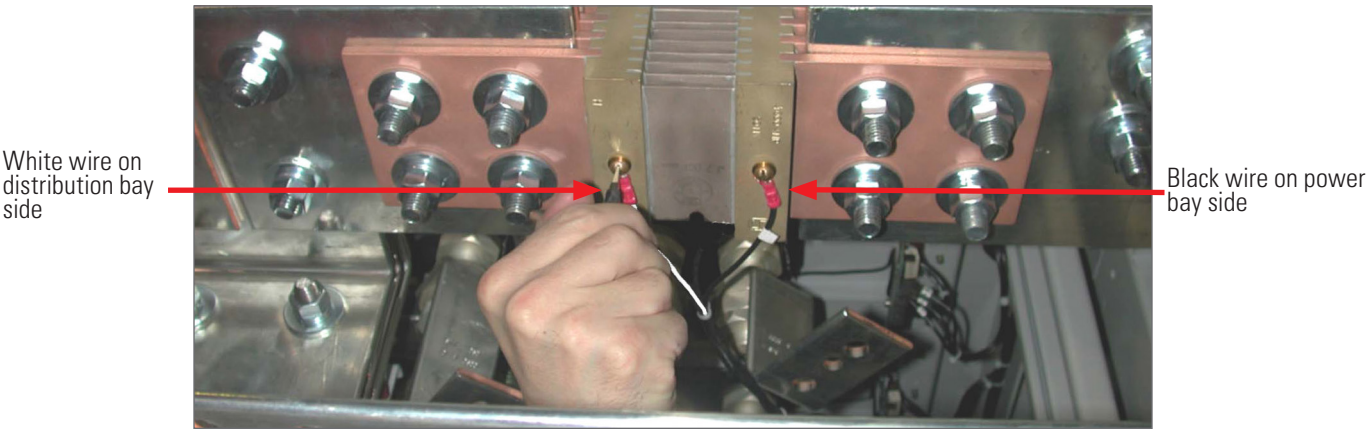


Figure 33: Shunt connections

3. Locate and connect the interbay alarm signal wire harness connectors.
4. Connect the interbay alarm signal wire harness connectors between the second and third frames, the third and fourth frames, and so on.

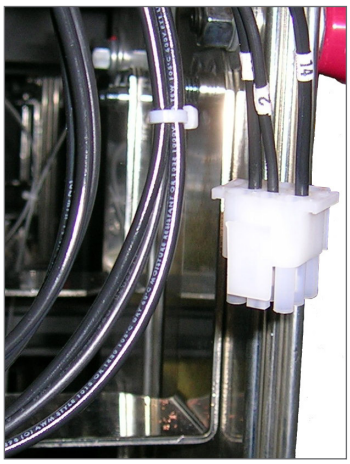


Figure 34: Interbay wiring harness

7.5.1 Interbay CAN bus cables - controller

CAN bus connections provide a communication path between the controller and rectifier modules, ADIO peripheral, shelf/bay ID peripheral, and shunt multiplexers (MUX) if installed. CAN bus cabling is sequentially daisy-chained from the controller to the external peripheral components.

Initial installation

The CAN bus cabling, from the bottom shelf of the power bay to the top shelf, is factory installed and ready for connection to the next bay. These instructions are for systems with shunt multiplexer installed in the distribution bays. If your system has no shunt multiplexer, start from step 4.

1. Locate the CAN bus cable coming from the controller (neatly coiled inside the primary power bay).
2. Connect the cable from the controller to the shunt multiplexer in the outermost distribution bay.
3. Locate and connect CAN bus cables between the shunt multiplexer distribution bays.
4. Connect the CAN bus cable from the innermost distribution bay to the bottom shelf of the primary power bay.
5. Terminate the top rectifier shelf of the primary power bay.
6. For connection to the extension power bay, remove the CAN terminator from the Cordex® HP L-ADIO smart peripheral and connect the CAN bus from CAN OUT on the peripheral to the bottom rectifier shelf of the adjacent power bay.
7. Repeat the preceding step for all power bays, working from the inner most out.
8. Terminate the top shelf of the outer most extension power bay as shown on the Figure 35 or plug the removed terminator from the Cordex® HP L-ADIO smart peripheral at step 6.

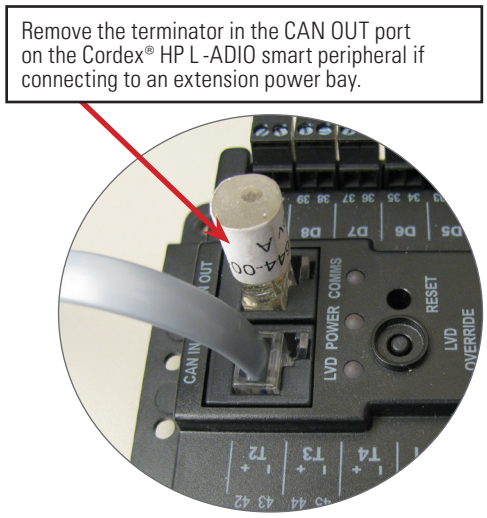


Figure 35: CAN OUT port terminator

Figure 36: Controller, CAN bus cabling Cordex® HP 4.0/4.6 kW rectifier power bay

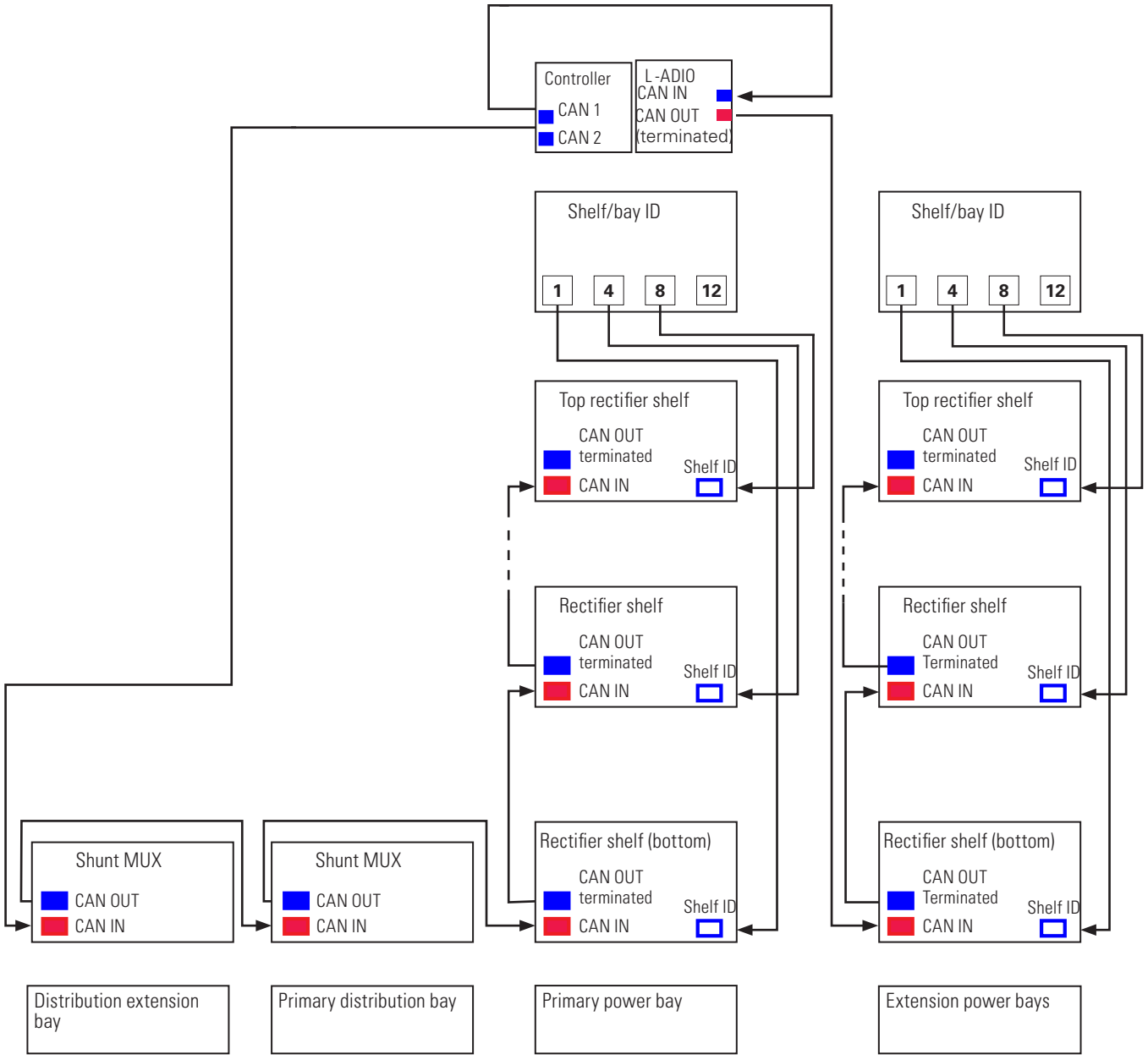


Figure 37: Controller and shelf/bay ID peripheral, CAN bus and shelf ID cabling

Expanding an existing system—CAN bus cables

NOTICE

If your power system has redundant rectifier modules, it is recommended to power off the left most rectifier module in the top shelf of the existing bay during this procedure.

In your existing system, the CAN bus is terminated at the highest shelf in the outermost power bay. (See Figure 36 for the sequence of CAN bus cabling)

1. Disable termination in its current location and enable termination in the expansion power bay as follows:
   a. Remove the left most rectifier module in the top shelf of the existing power bay. Refer to the rectifier shelf documentation for the removal and re-insertion procedure.
   b. Flip the DIP switches from **Termination Enabled** to **Termination Disabled**; see Figure 38.
   c. Replace the rectifier modules.
2. Connect the interbay CAN bus cable, which ships with the expansion bay, to the CAN OUT connector of the top rectifier shelf of the expansion bay; see Figure 39.

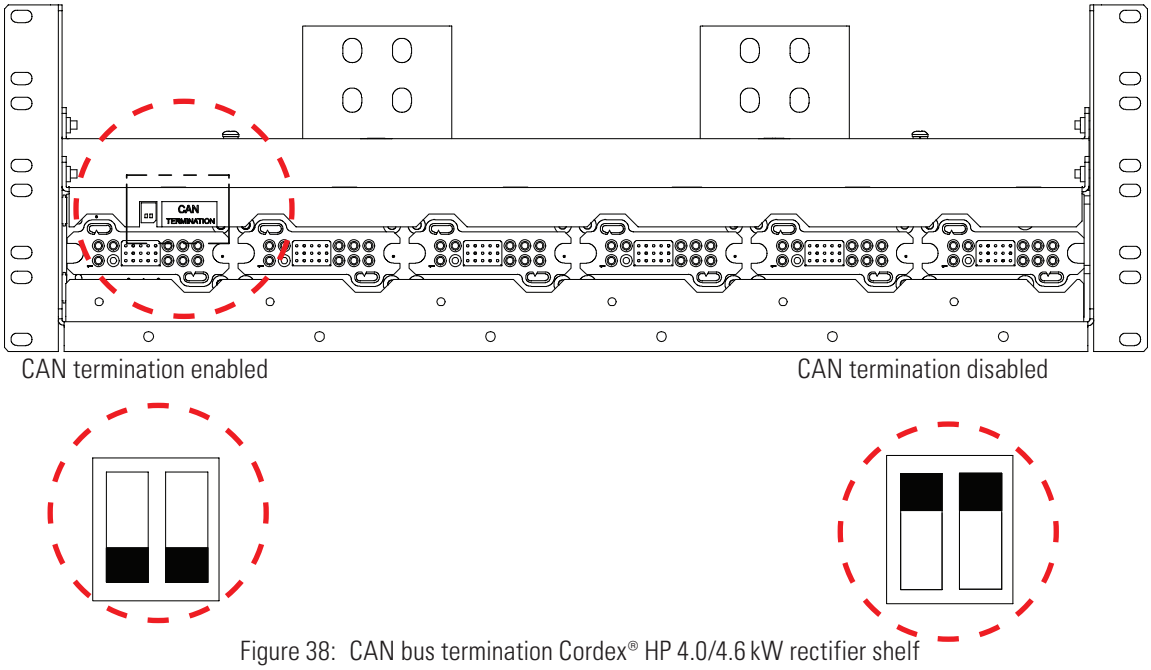


Figure 38: CAN bus termination Cordex® HP 4.0/4.6 kW rectifier shelf

If optional shunt MUX are installed, the existing outer distribution bay is connected by a CAN bus cable to the controller. The CAN bus cable is then daisy-chained to shunt MUX in the next distribution bays; see Figure 36.

3. Disconnect the existing controller-to-shunt MUX CAN bus cable.
4. Reconnect the controller to the shunt MUX in the outermost expansion bay with a longer cable from the cable kit.
5. Daisy chain the remaining shunt MUX as shown in Figure 36 using cables from the cable kit where necessary.

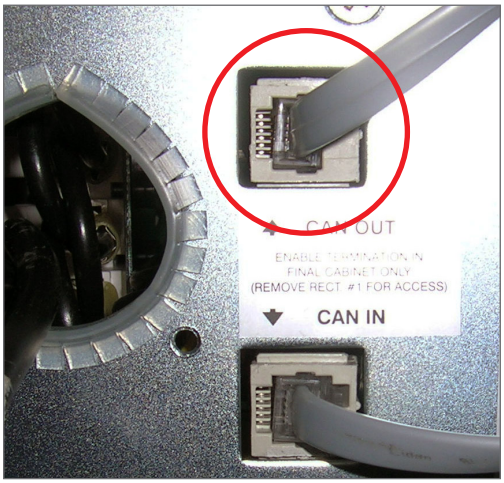


Figure 39: CAN IN and CAN OUT connection Cordex® HP 4.0/4.6 kW rectifier shelf

7.6 Mounting the optional external return busbar

The expandable external return busbar kit (PN: 0380039-001) is an option for return connections for the loads and to serve as the common connecting point for the positive side of the power bays and the battery modules.

The base kit has a 4,000 A capacity.

1. Before joining return 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 (document ID: 0380039-F0), to assemble and mount the kit on a customer-supplied auxiliary framing superstructure away from the system.

NOTICE

Requires customer supplied auxiliary frame (2 inch × 9/16 inch).

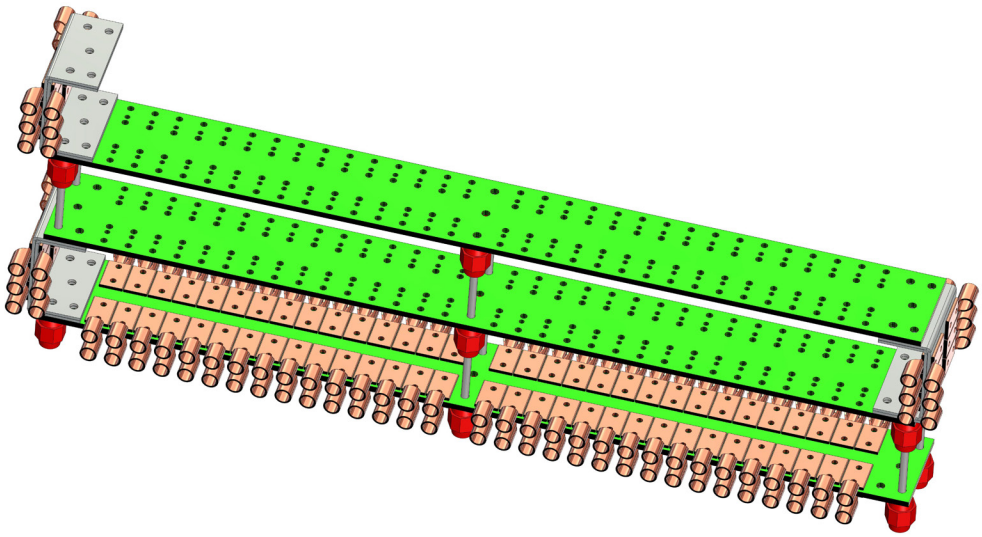


Figure 40: External battery return busbar kit

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

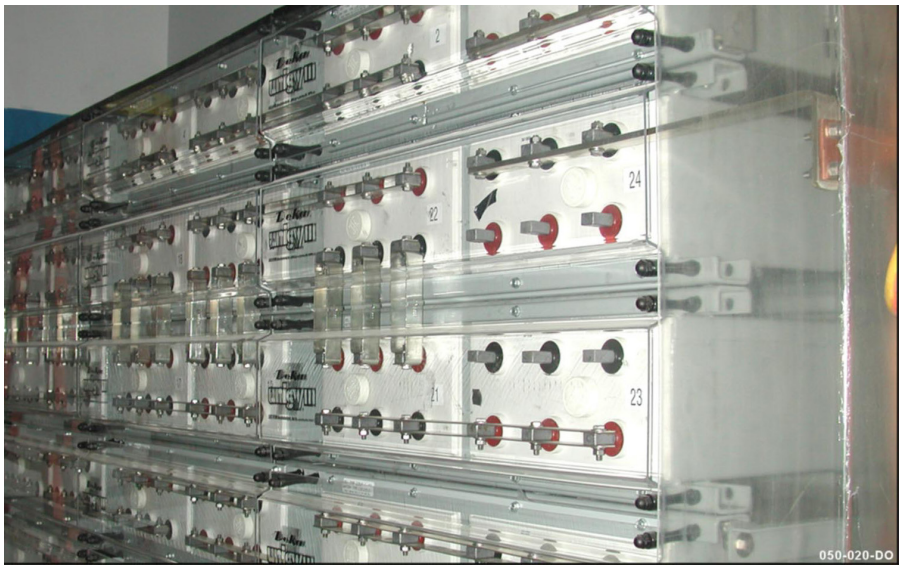


Figure 41: Battery installation

7.7.1 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.

7.7.2 Installation of external batteries

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

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

1. Assemble battery rack (if required) and the cells or monoblocks 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 inter-unit series connectors.
3. Remove any 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 grease to the terminal posts.
6. If lead plated inter-unit connectors are used, they should also be burnished and grease applied. Install the inter-unit connectors.
7. After all battery connections are completed, torque as per the battery specifications typically 100 in-lb (11.3 Nm).
8. See power system startup procedure before connecting batteries online.

7.7.3 Temperature probe for monitoring battery temperature

1. Locate the battery temperature probes coiled up in the power bay that has a controller.
2. Connect temperature probes from 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.

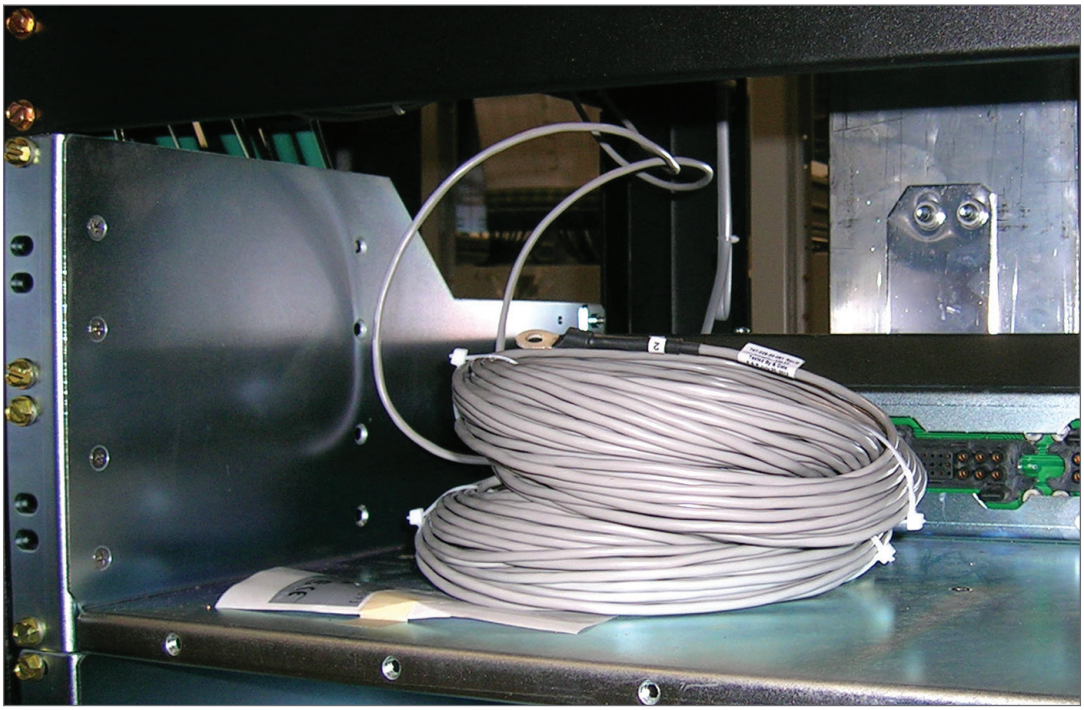


Figure 42: Battery temperature probes

7.8 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 F: 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 power system arrives pre-wired, and the installer is responsible for connecting the following:

- Utility input to the power system
- Battery strings
- Power system to the load
- Chassis and battery return to the reference ground
- Interbay alarm signals and CAN cables

All signaling wires; for example, alarms from the 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, National Electrical Code® (NEC®) and Canadian Electrical Code (CEC®); for guidelines. If required, increase the size of the cable to meet code.

Refer to Table G for cable size equivalents.

Table G: 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	13.30	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 H: 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 power 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 breaker; 750 MCM (400 mm²) cable 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 busbar	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.

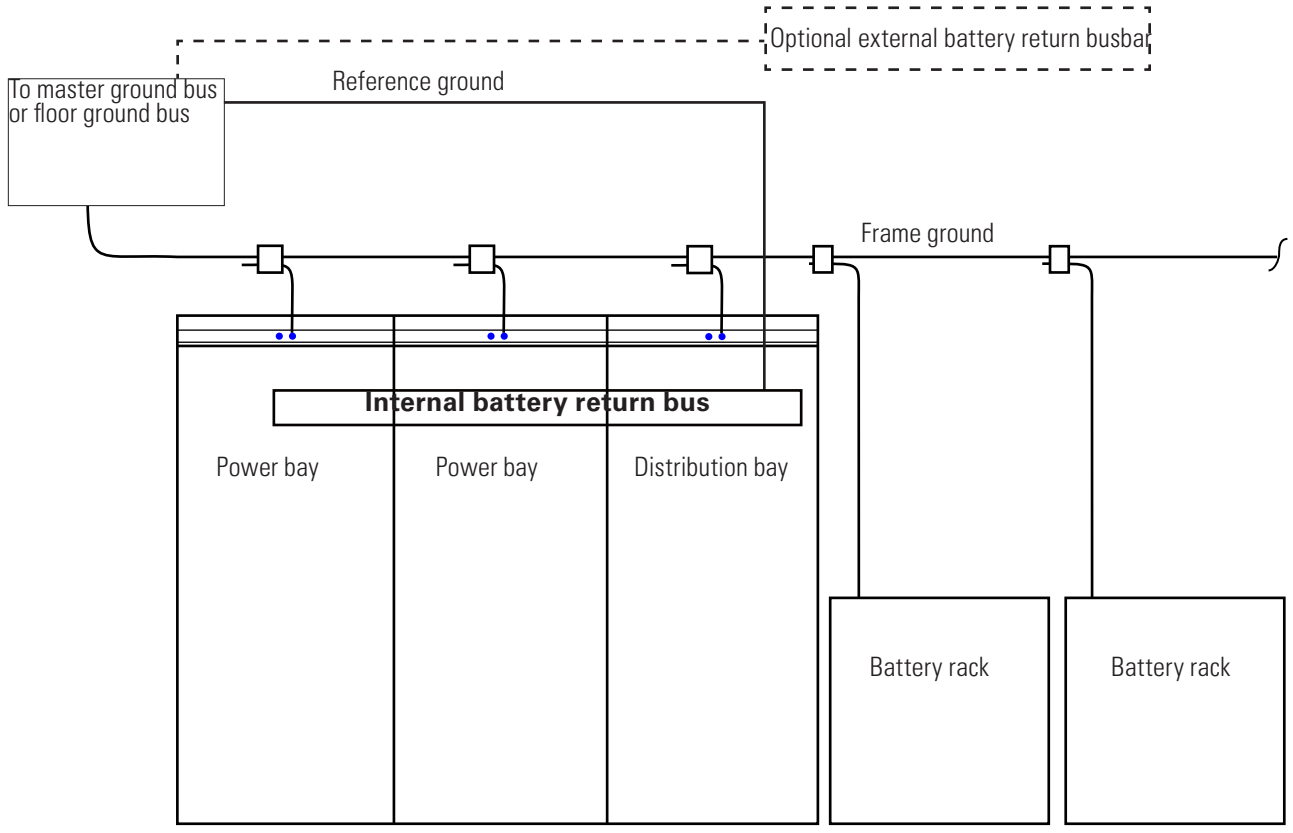


Figure 43: Battery return busbars, frame ground, and battery return reference

8.3 AC supply for the rectifier modules

Each power bay has an AC distribution panel assembly, located in the top of the unit, for connecting the AC wire circuits. Wiring to the eight individual rectifier shelves is internal to the bay. The following table lists the eight AC input configuration options.

Table I: AC supply specifications

Power bay	Feed	Input AC voltage (nominal)	Recommended breaker	Connection type	Recommended wire size	Knockout dimension (inch)	Knockout quantity
Cordex® HP 4.0/4.6 kW rectifier module							
2,000 A 4,000 A	4/8	208 VAC	100 A	3W+PE	2 AWG (35 mm²)	2.0 (1.5 KO)	8
2,000 A 4,000 A	4/8	480/277 VAC	50 A	3W+N+PE	6 AWG (16 mm²)	1.5 (1.25 KO)	8
2,000 A 4,000 A	8/16	208 VAC	50 A	3W+PE	6 AWG (16 mm²)	1.5 (1.25 KO)	16
2,000 A 4,000 A	8/16	480/277 VAC	30 A	3W+N+PE	8 AWG (10 mm²)	1.5 (1.25 KO)	16
4,000 A	6	480/277 VAC	60 A	3W+N+PE	6 AWG (16 mm²)	1.5 (1.25 KO)	8
4,000 A	48	208 to 277 VAC	30 A	2W+PE	8 AWG (10 mm²)	2.0 (1.5 KO)	8
5,000 A	54	208 to 277 VAC	30 A	2W+PE	8 AWG (10 mm²)	2.0 (1.5 KO)	8
Cordex® HP 12 kW rectifier module							
2,000 A 4,000 A	4/8	480 VAC	50 A	3W+PE	6 AWG (16 mm²)	1.5 (1.25 KO)	8
2,000 A 4,000 A	8/16	480 VAC	30 A	3W+PE	8 AWG (10 mm²)	1.5 (1.25 KO)	16
4,000 A	6	480 VAC	60 A	3W+PE	6 AWG (16 mm²)	1.5 (1.25 KO)	8

Pre wired AC panel

Figure 44: AC distribution

8.3.1 Wiring the AC distribution panel

WARNING

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

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.

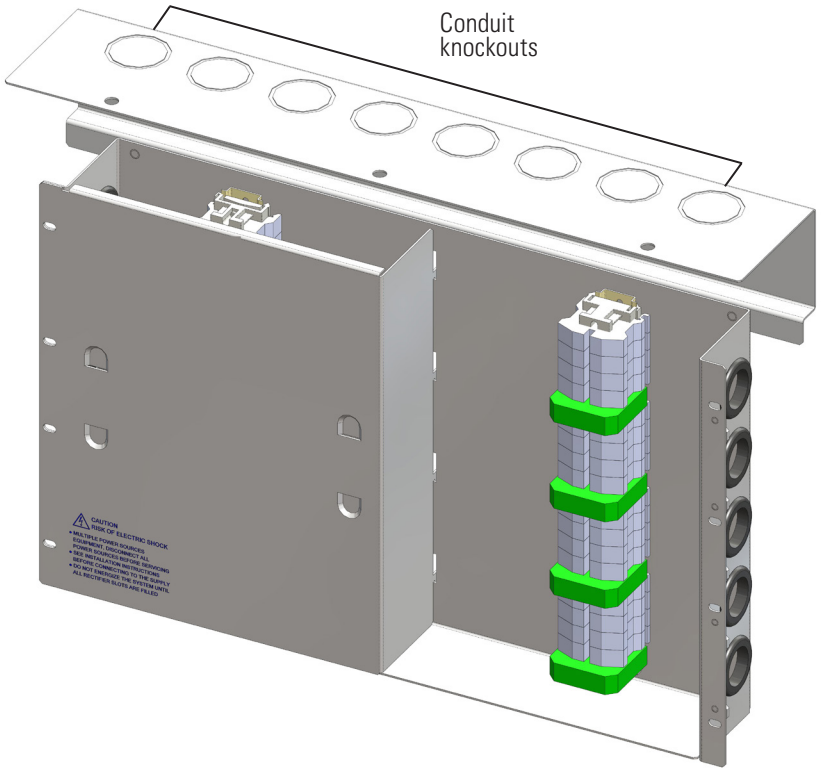


Figure 45: Pre-wired 8-feed AC panel; 3-phase, 3-wire 208/480 VAC typical (2,000/4,000 A standard power bay)

NOTICE

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

Figure 46: 5,000 A standalone power bay, controller front door

Figure 47: 5,000 A standalone power bay, AC distribution panel front access cover

Figure 48: 5,000 A standalone power bay, AC distribution panel wiring terminal blocks and ground bars (covers removed)

1. Bring AC wiring through the knockouts at the top of the AC distribution panel assembly.
2. Connect line and ground wires to the terminal blocks as shown in figures per labelling on the panel.
3. Neatly route and group wires together with cable ties as required.

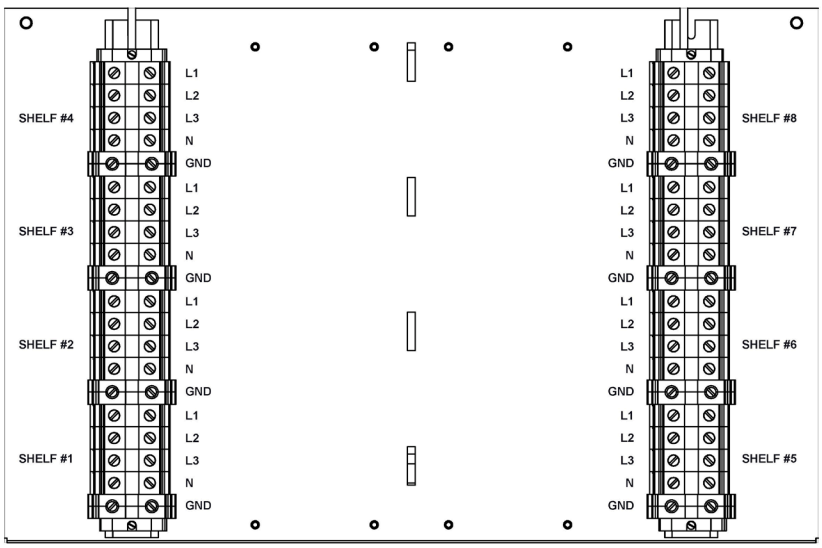


Figure 49: Terminal blocks for 8-feed 3-phase 208 VAC (3W+PE) or 480/277 VAC (3W+N+PE) input

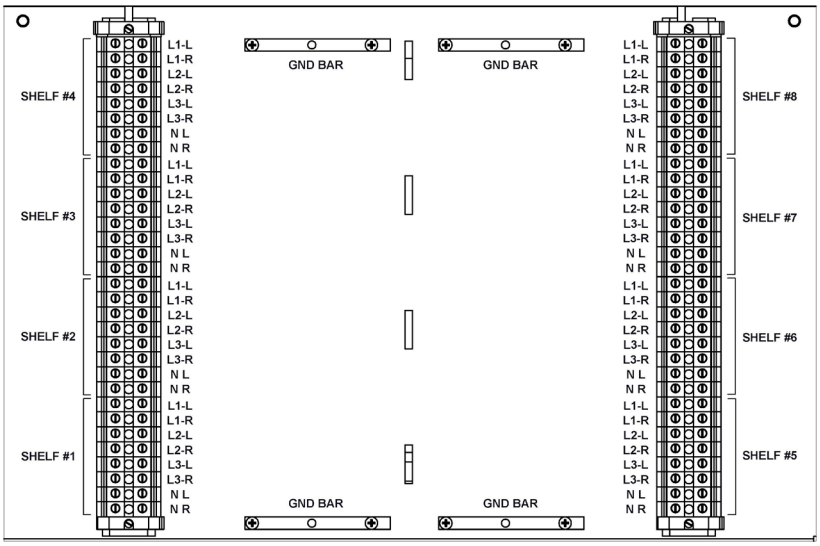


Figure 50: Terminal blocks for 16-feed 3-phase 208 VAC (3W+PE) or 480/277 VAC (3W+N+PE) input

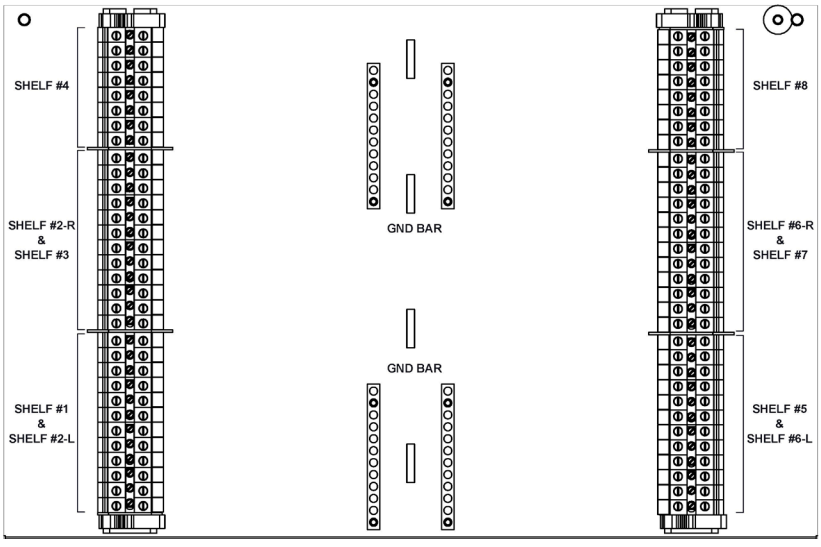


Figure 51: Terminal blocks for 6-feed 3-phase 480 VAC (3W+PE) input

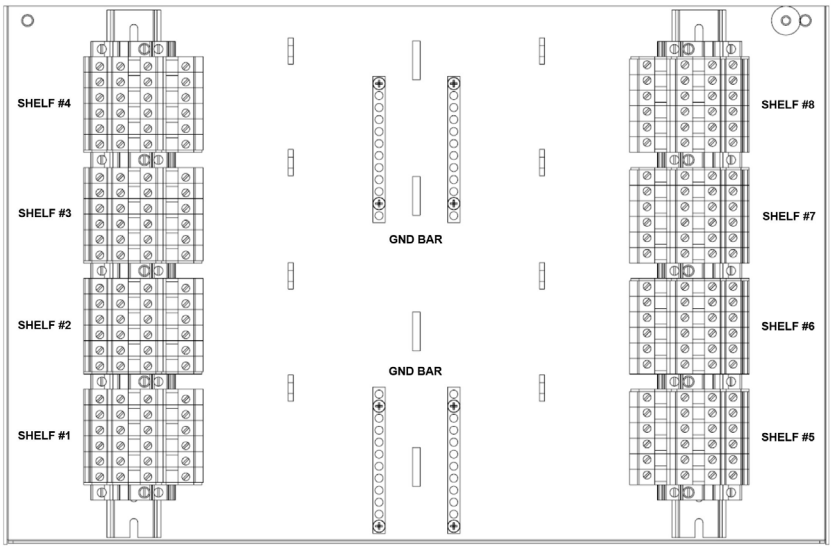


Figure 52: Terminal blocks for 48-feed 1-phase 208 to 277 VAC (2W+PE) input

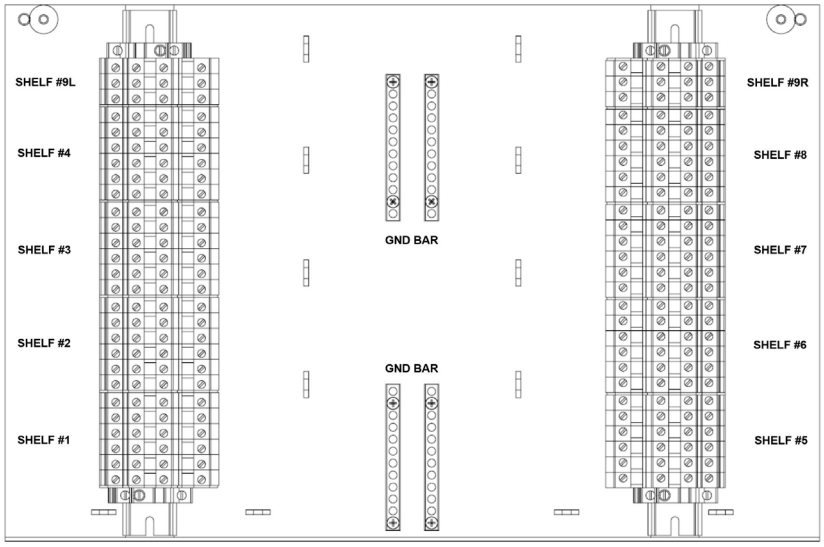


Figure 53: Terminal blocks for 54-feed 1-phase 208 to 277 VAC (2W+PE) input (5,000 A standalone power bay only)

8.4 Distribution

8.4.1 High capacity breaker panel alarm wiring

Connect the common return for the breaker alarm to the left terminal block located on the front bottom of the distribution tier panel. Connect the normally closed (NC) contact to the right terminal block located on the front bottom of the distribution shelf. Use 22 to 18 AWG (0.34 to 0.75 mm²) wires. See the following figure.

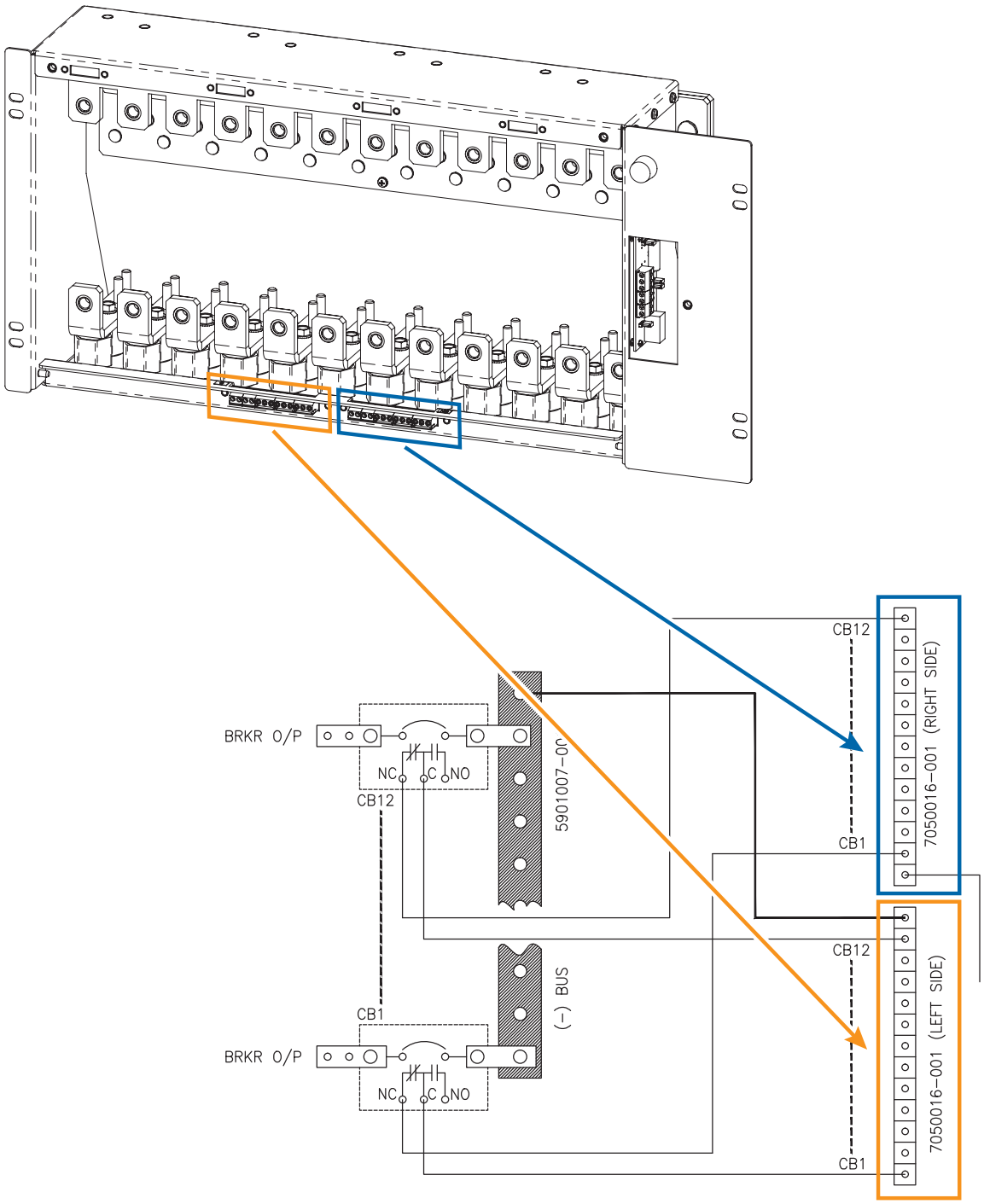


Figure 54: High capacity breaker panel alarm wiring

8.4.2 External battery return busbar wiring

Connect the external battery return bars to the associated power bay positive return detail as shown in Figure 56.

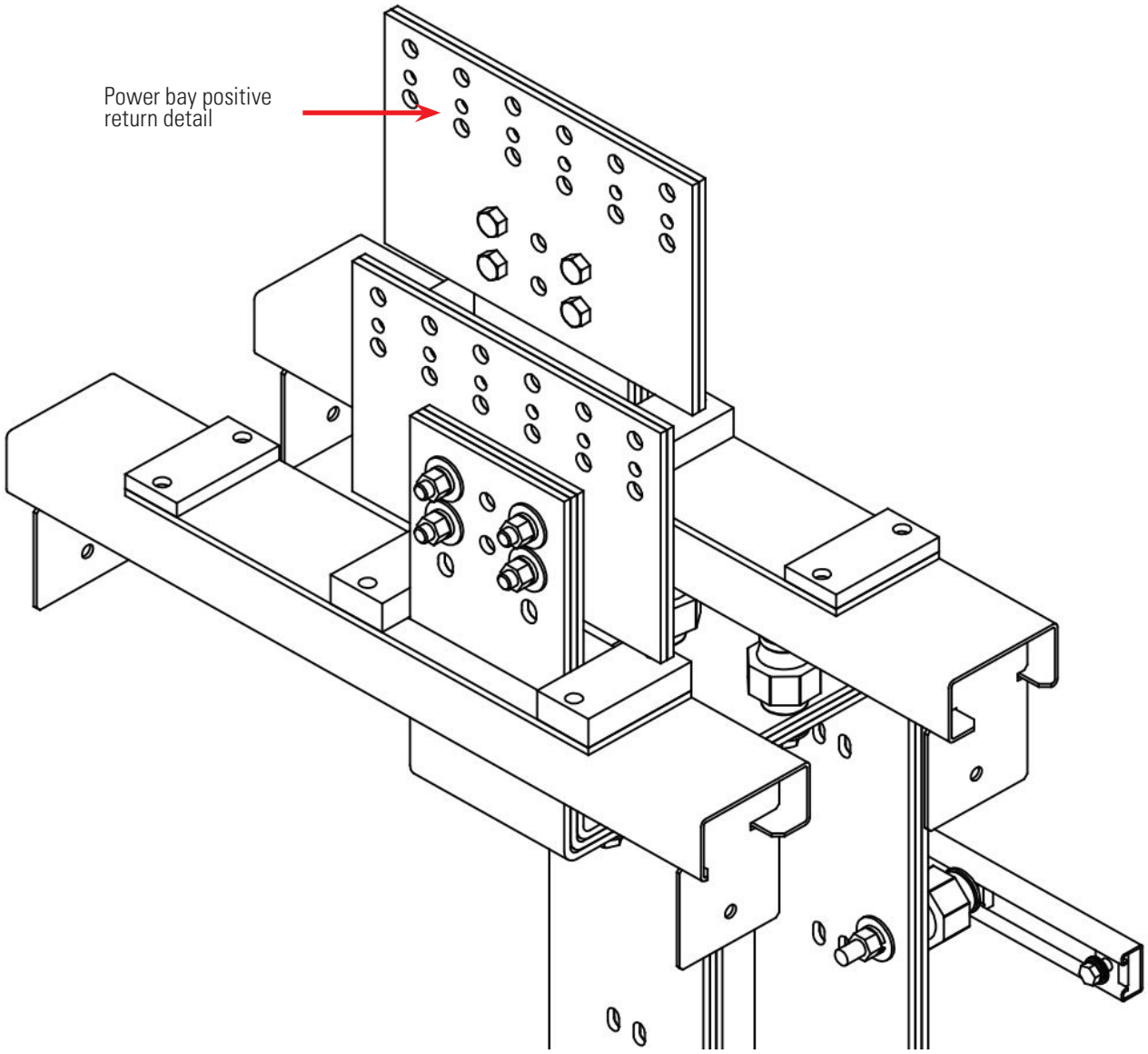


Figure 55: Battery return busbar

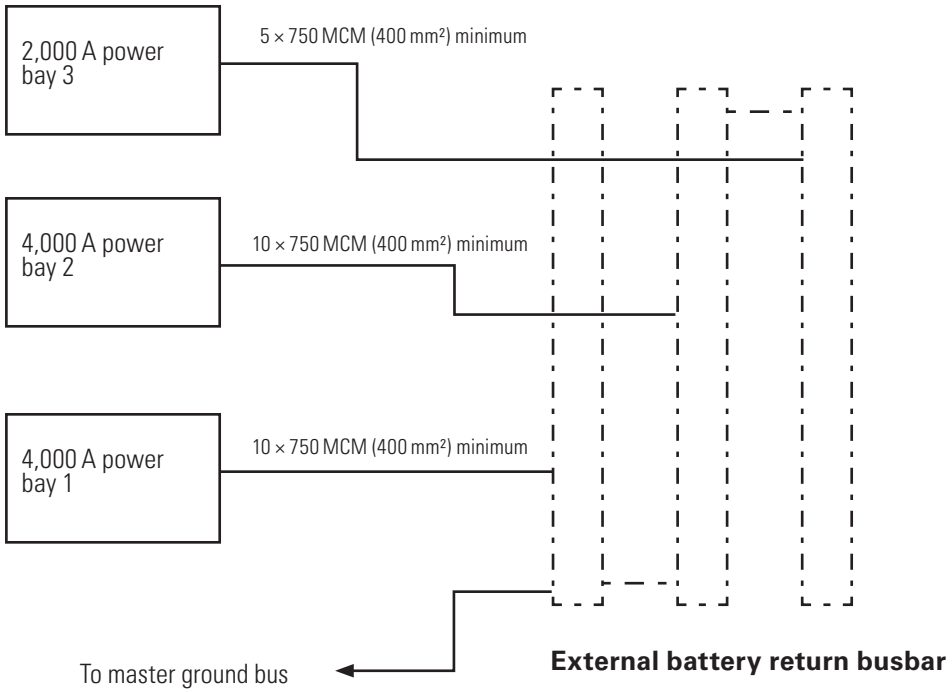


Figure 56: External battery return busbar wiring

8.4.3 Battery return and load return cables

CAUTION

Do not 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 bus shown in or to the external battery return busbar if that option is in place. In a multi-bay system, balance battery and load returns evenly between the bays.

Both busbars are designed for the following connection options:

- ½ inch holes on 1-¾ inch centers
- ⅜ inch holes on 1 inch centers

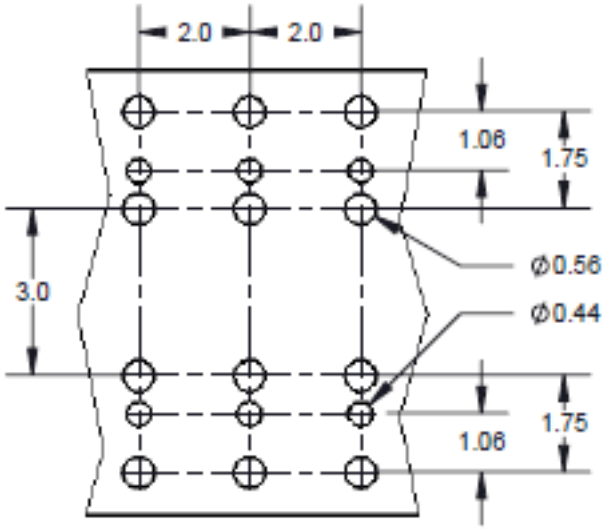


Figure 57: Customer connections spacing

8.4.4 –48 V battery cables

Connect directly to the –48 V busbar at the top of the power system bay shown in Figure 20.

8.4.5 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 0.5 V loop drop at full load as well as meeting ampacity requirements of the protection fuse or breaker.

Procedure:

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

8.4.6 External alarms

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

9. Installing standalone power and distribution bays

9.1 Standalone power bay

A single standalone power bay can be used in existing power system installations to replace multiple power bays with lower capacity.

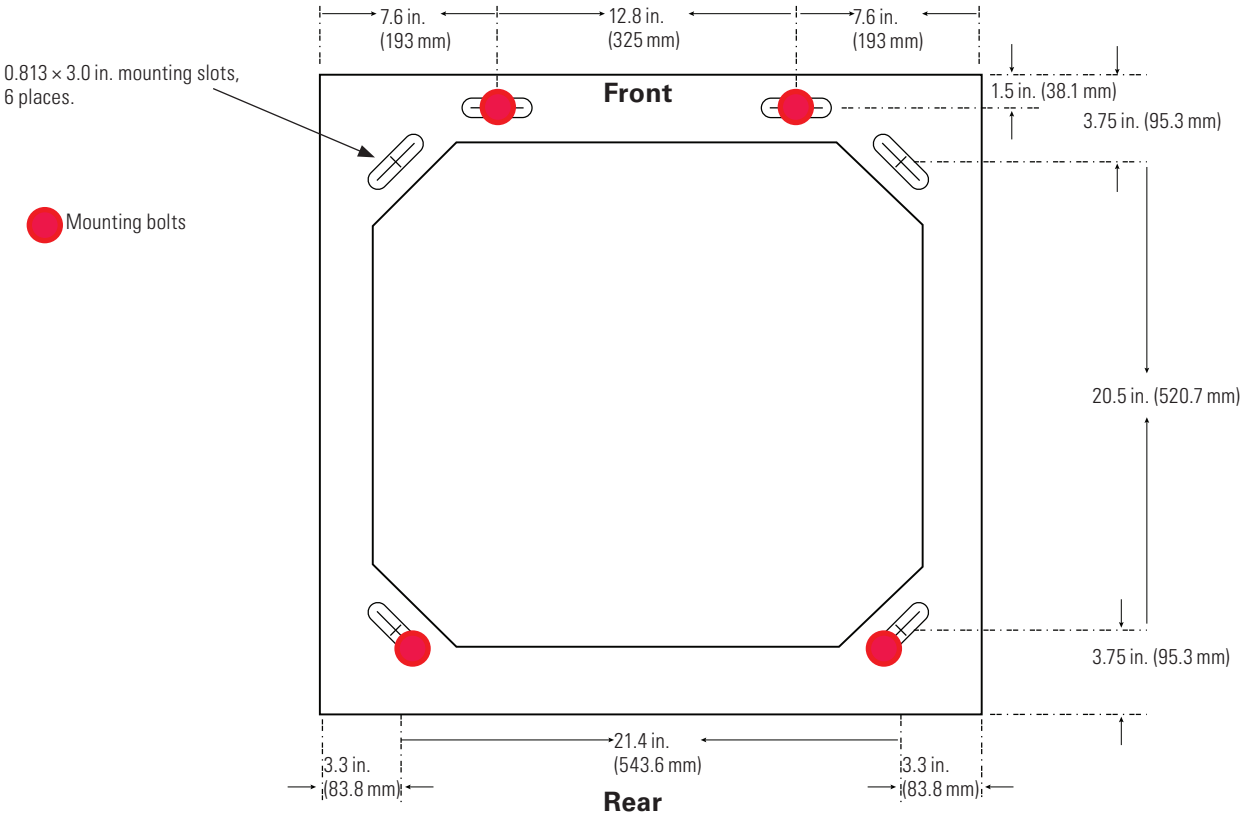


Figure 58: Base mounting hole pattern layout

1. Secure the bay to the floor. Locate bolts in slots as shown for greatest stability.
2. Connect a cable; typically a 2/0 AWG (70 mm²) cable; between the frame of the bay and MGB or FGB.
3. Refer to section 8.3 on page 51 to connect AC input power to the AC distribution bay assembly at the top of the unit.
4. Connect the power bay positive return detail to the existing system overhead battery return bus.
5. Connect the power bay HOT [–] detail to the existing system overhead HOT [–] power bus.

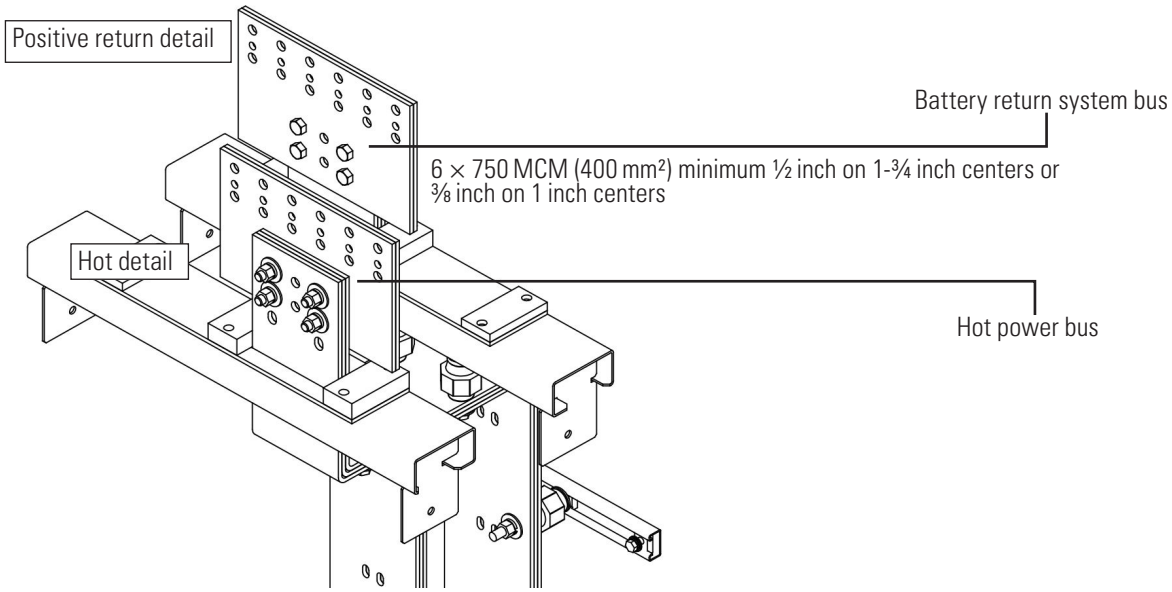


Figure 59: Overhead hot and return power bus

9.2 Standalone distribution bay

A standalone distribution bay can be installed at a distance from an existing system to distribute power to even-more-distant devices.

1. Secure the bay to the floor; see section 9.1 on page 61.
2. Connect a cable; typically a 2/0 AWG (70 mm²) cable; between the frame of the bay and MGB or FGB.
3. Run cable from the existing system overhead Hot power bus to the customer connection busbar in the distribution bay.

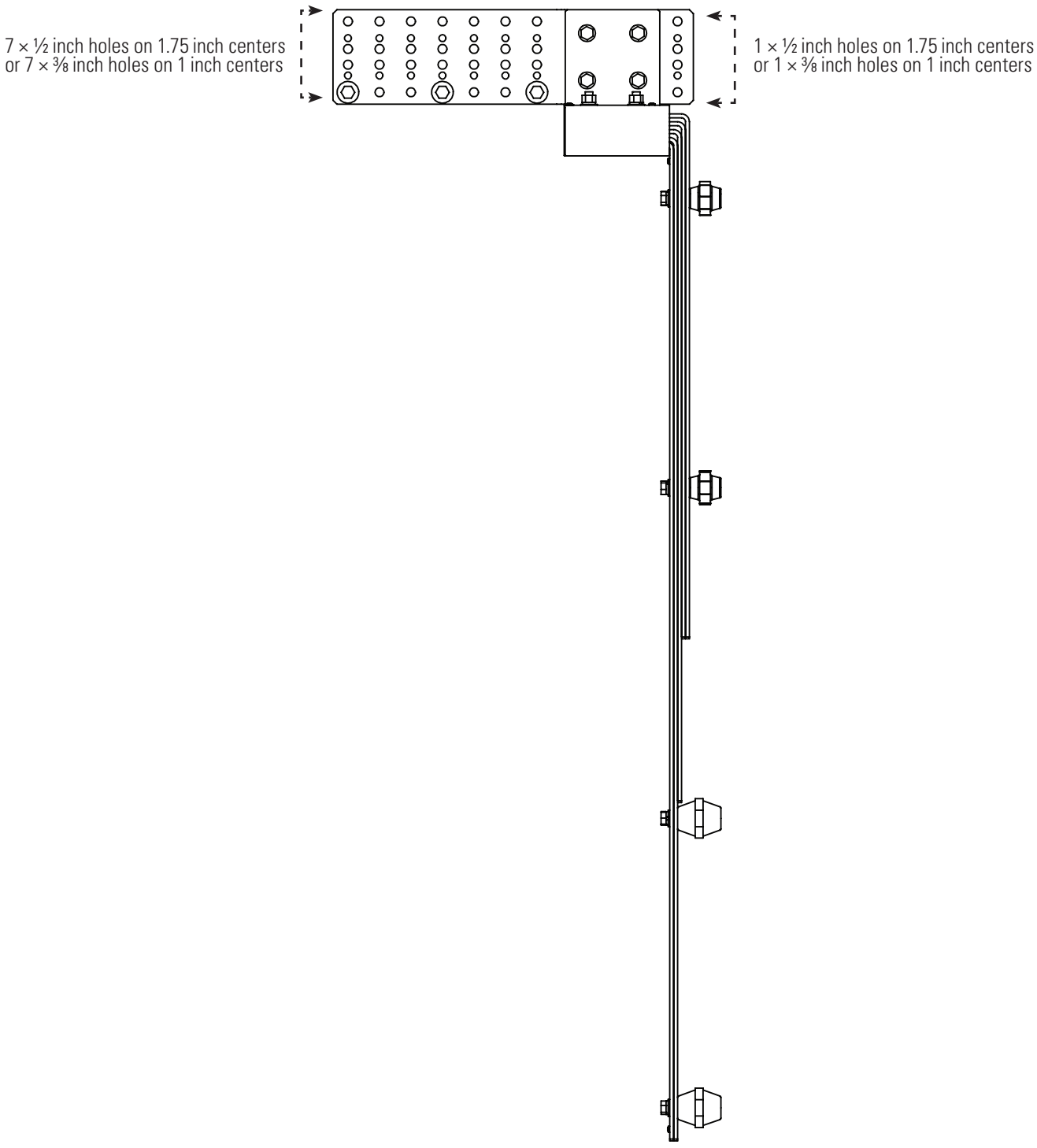


Figure 60: Overhead hot power bus

10. Power system startup

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

10.1 Check power 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.

10.2 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.

10.3 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 controller, set the battery parameters: float and equalize voltages to the capacity, Peukert exponent, and open circuit voltage levels specified by the battery manufacturer.

10.4 Final configuration and test

1. Configure other power 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:

Table J: Alarms and description

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 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.

10.5 Shelf ID connection

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.

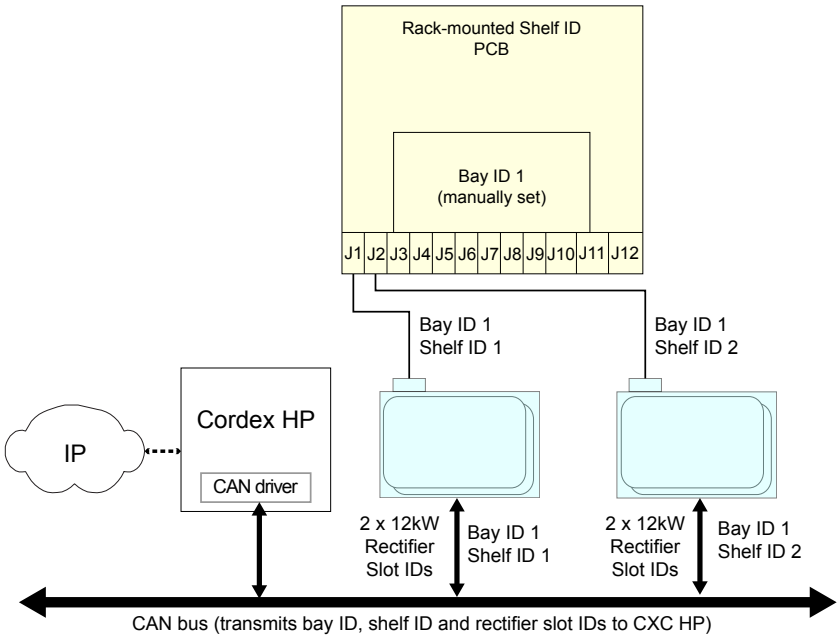


Figure 61: Example of a single bay with two rectifier shelves

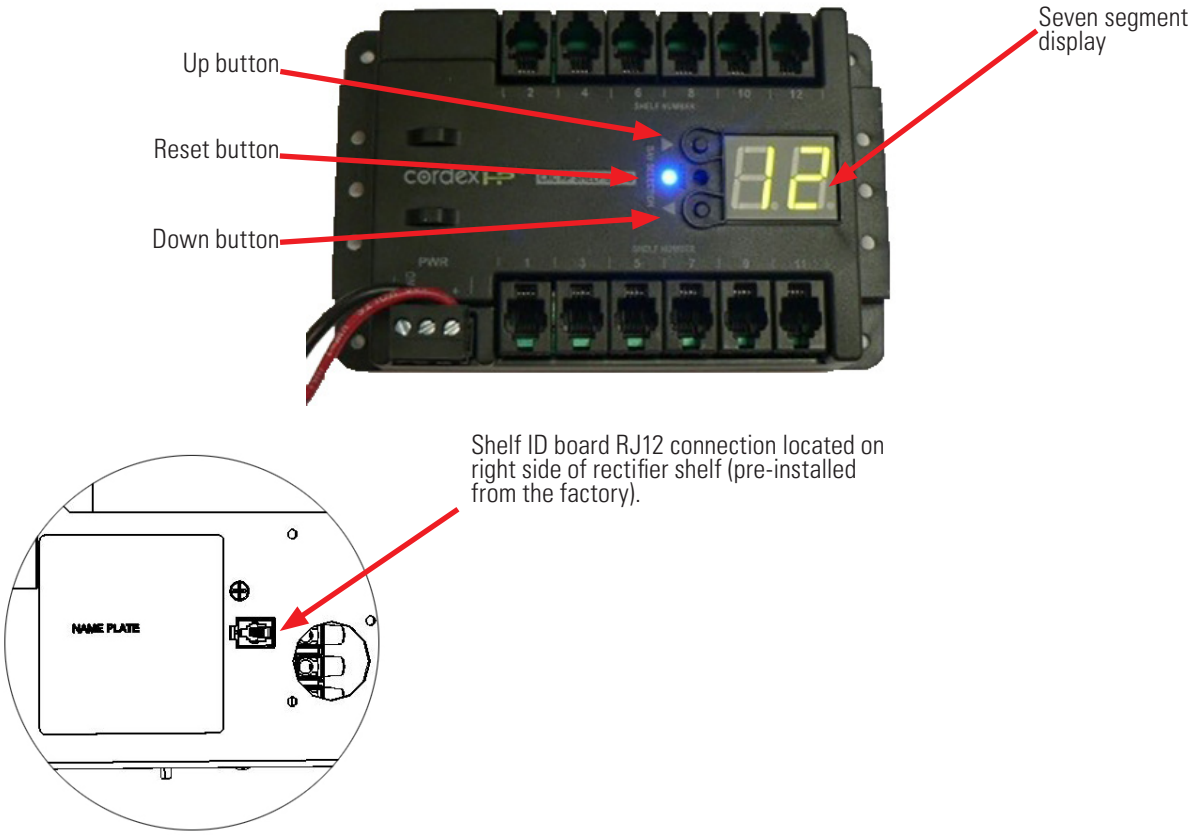


Figure 62: Cordex® HP shelf/bay ID peripheral

10.6 Controller door

The 5,000 A standalone power bay is equipped with a front door mounted EnVision™ Elite Touch controller or Cordex® CXC HP 2RU touchscreen controller. The controller can be adjusted to a lower position for a better viewing angle and easier accessibility.

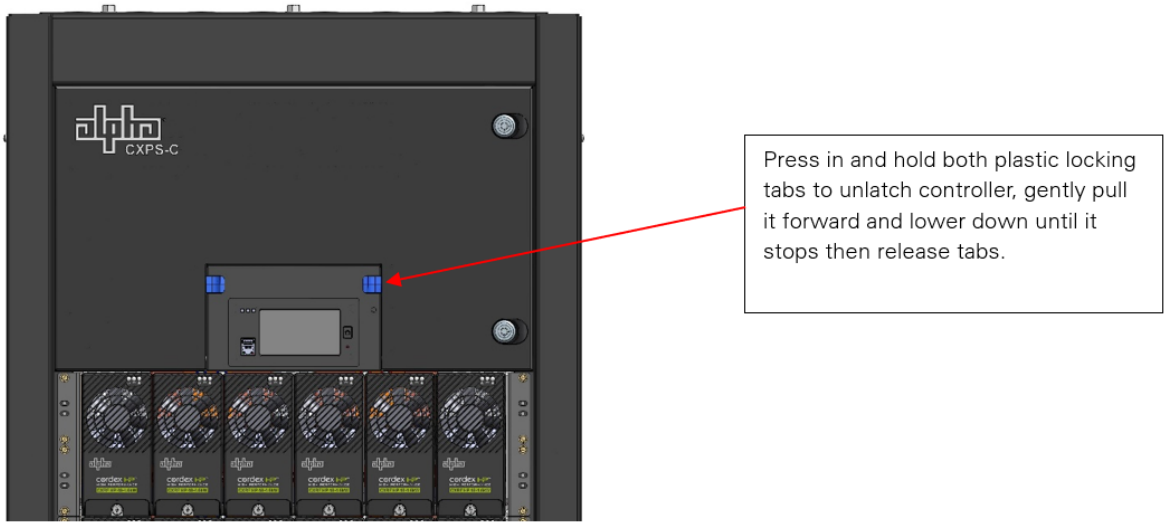


Figure 63: Controller in default position

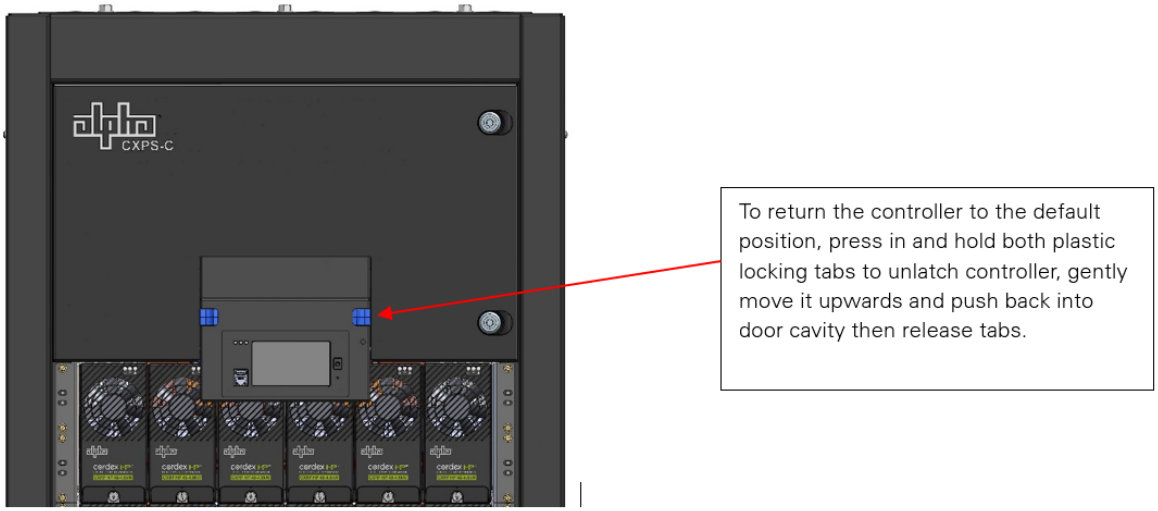


Figure 64: Controller in lowered position

11. Test and commissioning overview

11.1 Power system

All Alpha® 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 power system.

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

11.2 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 manufacturer'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.

11.3 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 breakers.

12. Maintenance

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

WARNING

Use extreme care when working inside the unit while the power 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 power system's alarms and control settings.

Table K: Sample maintenance log

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

12.1 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.

12.2 Batteries

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

WARNING

Exercise extreme caution and do not touch any connected equipment.

12.3 System controller lithium battery replacement

NOTICE

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

A removable lithium battery is located near the front panel tilt-down tray on the top of the 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 side 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 65: 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.

13. 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 (remove 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 model and shelf. The modules have various LED status indicators that provide information about the shelf system.

When the shelf system is used in conjunction with a controller, detailed shelf 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.

13.1 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.

13.2 EnVision™ Elite Touch Controller LEDs

Table M: EnVision™ Elite Touch controller LED states

LED name	Color	State	Meaning
Major or 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	N/A
Minor alarm (caution icon)	**Yellow**	**Off**	Indicates no active alarms
		Solid	Indicates one or more minor alarms.
		Flashing	N/A

OK (OK icon)	**Green**	**Off**	N/A
		Solid	Indicates that there are no alarms.
		Flashing	Flashes during initial startup.

13.3 Cordex® CXC HP System Controller LEDs

Table N: 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.

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

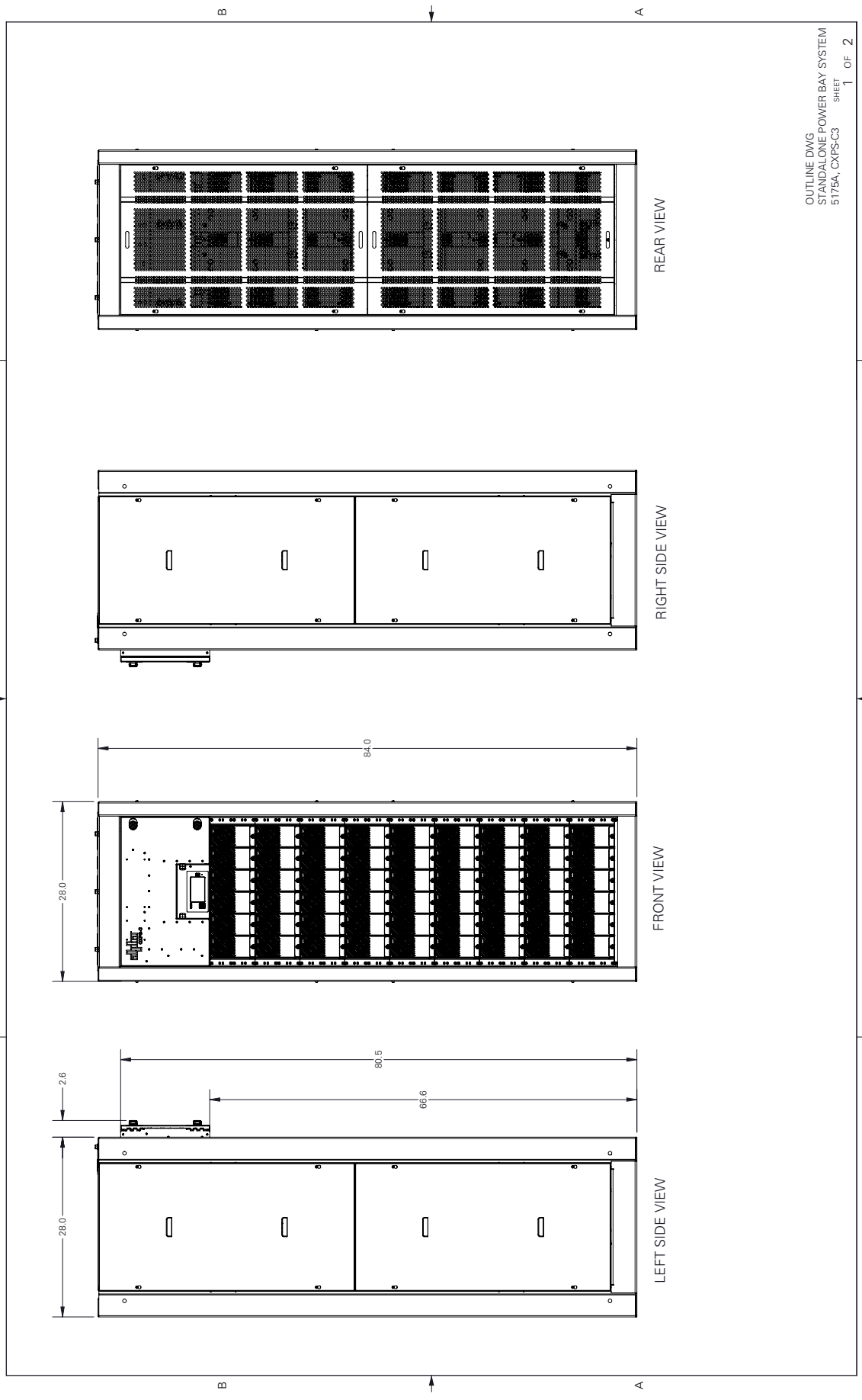
Table O: Cordex® HP L-ADIO low voltage smart peripheral LED states

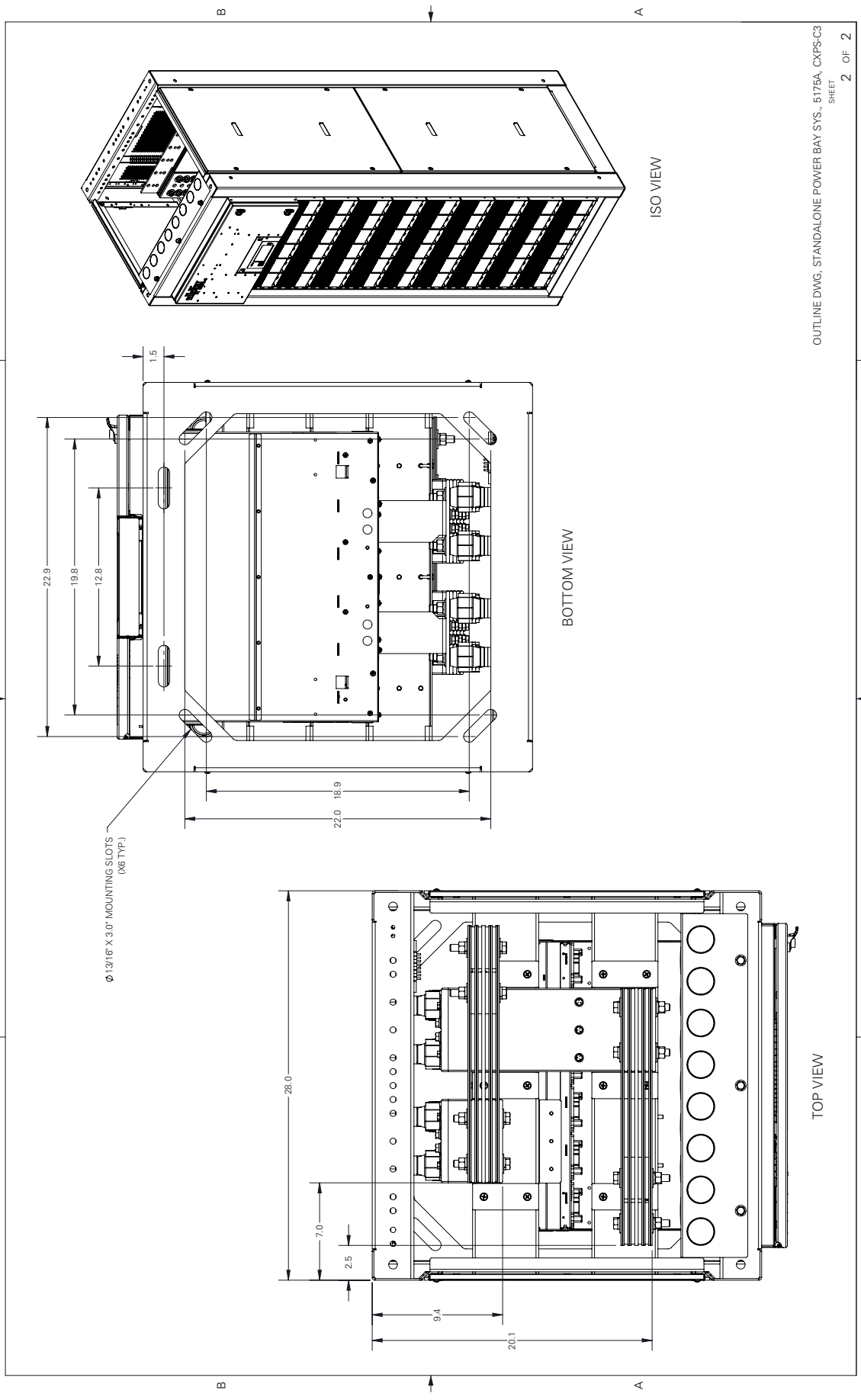
LED name	Color	State	Meaning
LVD	**Yellow**	**Off**	Indicates the LVD override feature is disabled.
		Solid	Indicates the LVD override button has been selected and the feature is enabled.
		Flashing	N/A
Power	**Blue**	**Off**	Indicates no power to the device.
		Solid	Indicates power is present.
		Flashing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

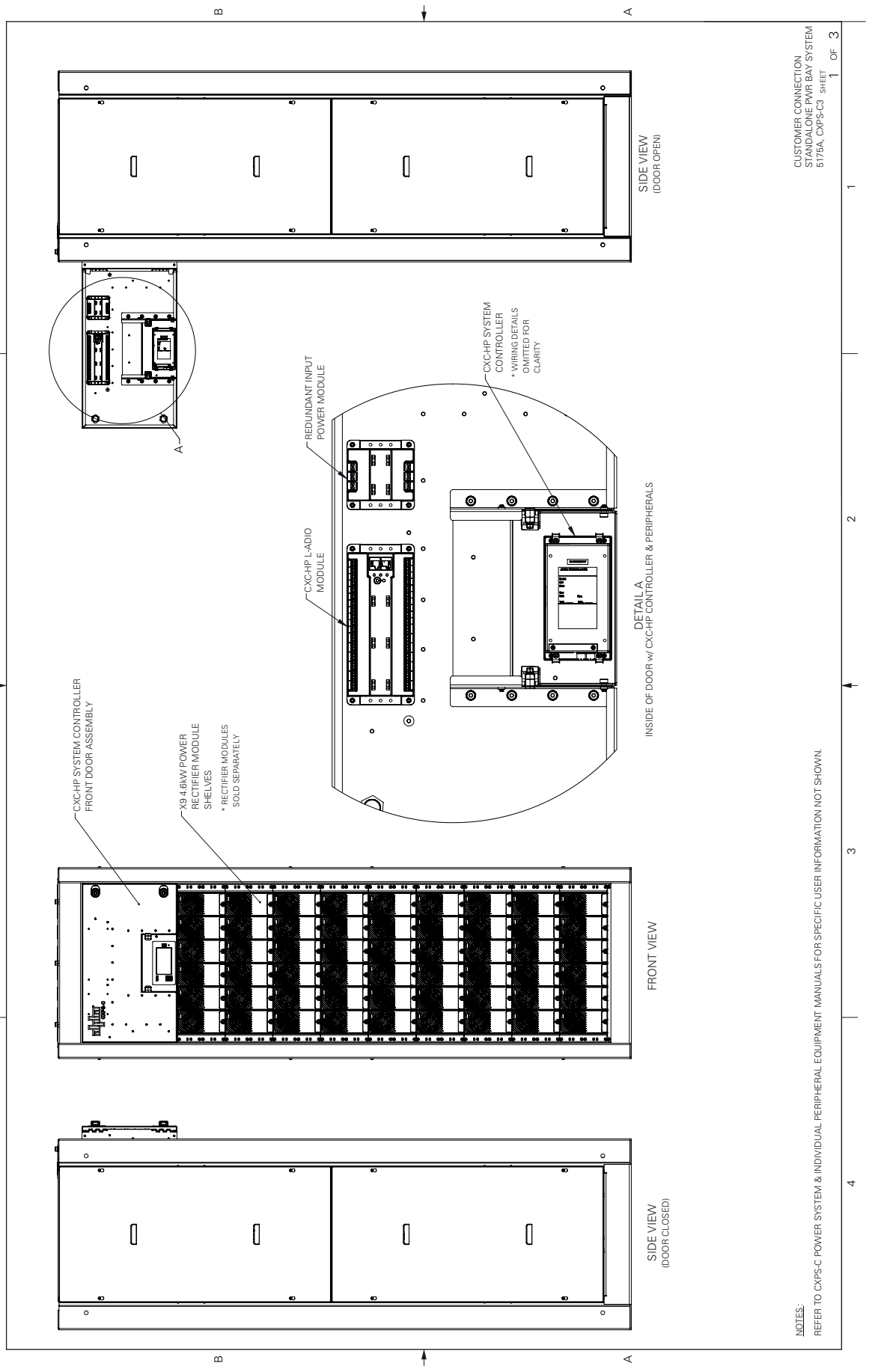
13.5 Cordex® HP Shelf/Bay ID Peripheral LED

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

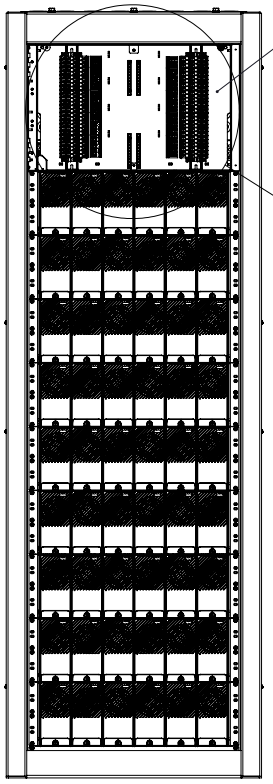
LED name	Color	State	Meaning
Power	**Blue**	**Off**	Indicates no power to the device.
		Solid	Indicates power is present.
		Flashing	N/A


OUTLINE DWG
STANDALONE POWER BAY SYSTEM
5175A, CXPS-C3
SHEET 1 OF 2
REAR VIEW
RIGHT SIDE VIEW
84.0
28.0
FRONT VIEW
80.5
66.6
2.6
28.0
LEFT SIDE VIEW

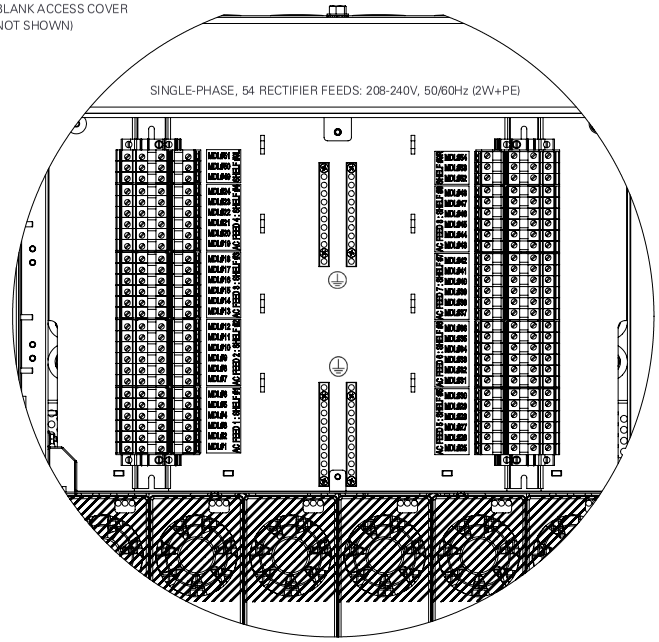

OUTLINE DWG, STANDALONE POWER BAY SYS., 5175A, CXPS-C3
SHEET 2 OF 2
ISO VIEW
BOTTOM VIEW
TOP VIEW
1.5
22.9
19.8
12.8
18.9
22.0
Ø 13/16" X 3.0" MOUNTING SLOTS (X8 TYP.)
28.0
7.0
2.5
9.4
20.1


CUSTOMER CONNECTION
STANDALONE PWR BAY SYSTEM
5175A, CXPS-C3 SHEET 1 OF 3
SIDE VIEW
(DOOR OPEN)
A
REDUNDANT INPUT
POWER MODULE
CXC-HP L-ADIO
MODULE
CXC-HP SYSTEM
CONTROLLER
* WIRING DETAILS
OMITTED FOR
CLARITY
DETAIL A
INSIDE OF DOOR w/ CXC-HP CONTROLLER & PERIPHERALS
CXC-HP SYSTEM CONTROLLER
FRONT DOOR ASSEMBLY
X9 4.6KW POWER
RECTIFIER MODULE
SHELVES
* RECTIFIER MODULES
SOLD SEPARATELY
FRONT VIEW
SIDE VIEW
(DOOR CLOSED)
NOTES:
REFER TO CXPS-C POWER SYSTEM & INDIVIDUAL PERIPHERAL EQUIPMENT MANUALS FOR SPECIFIC USER INFORMATION NOT SHOWN.

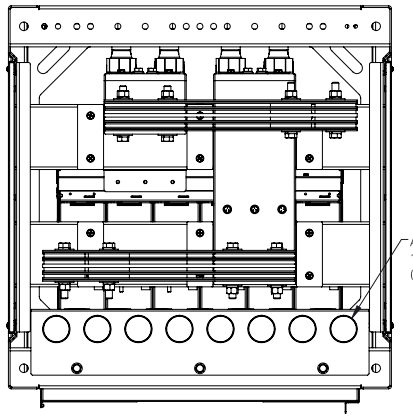
CORDEX HP 4.6kW RECTIFIER SHELVES AC POWER DISTRIBUTION PANEL CONNECTIONS



FRONT VIEW
(CXC-HP SYSTEM CONTROLLER DOOR
OMITTED FOR CLARITY)



DETAIL B
RECTIFIER AC POWER TERMINAL BLOCK ASSEMBLY & GROUNDING TERMINAL BARS



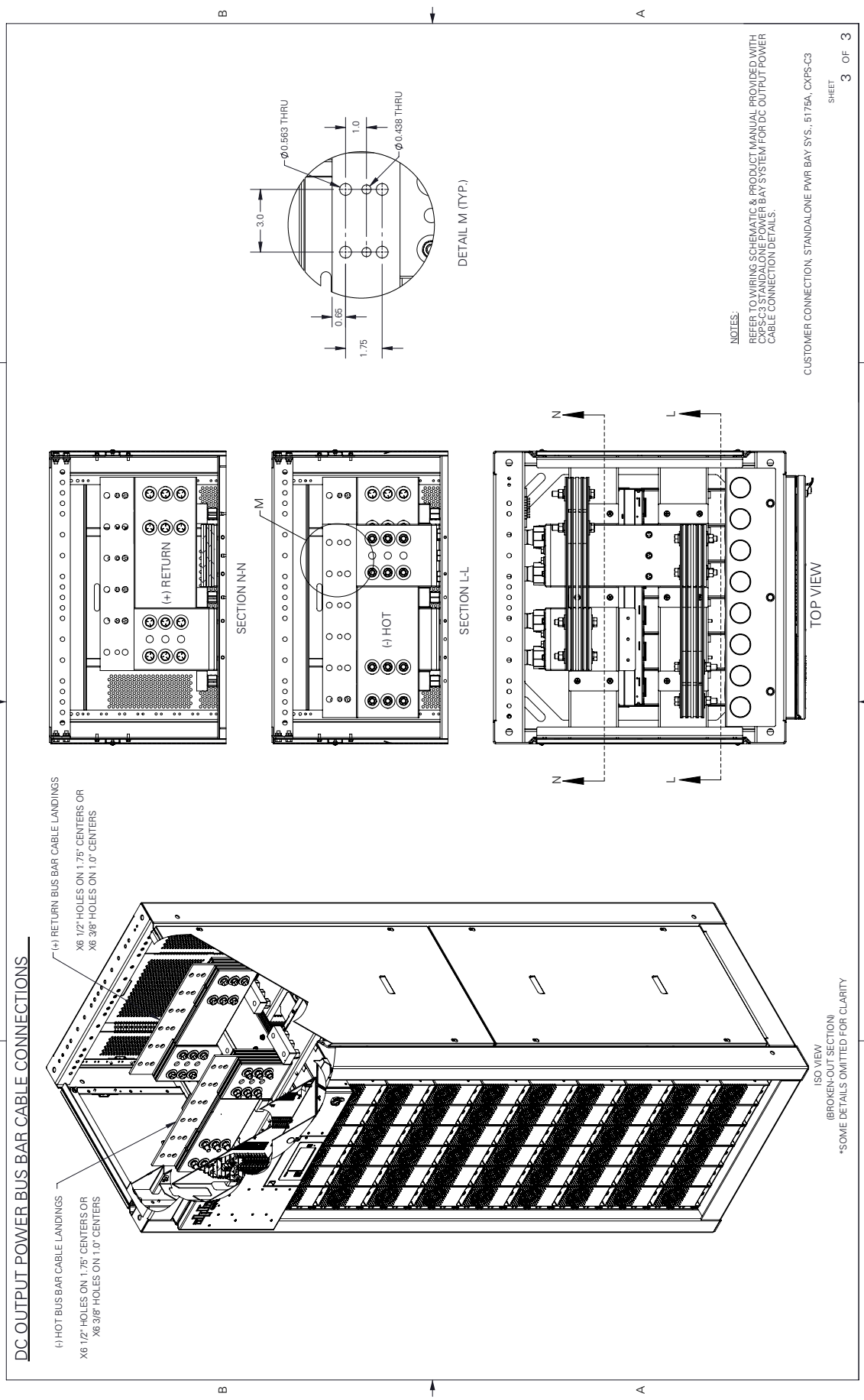
TOP VIEW

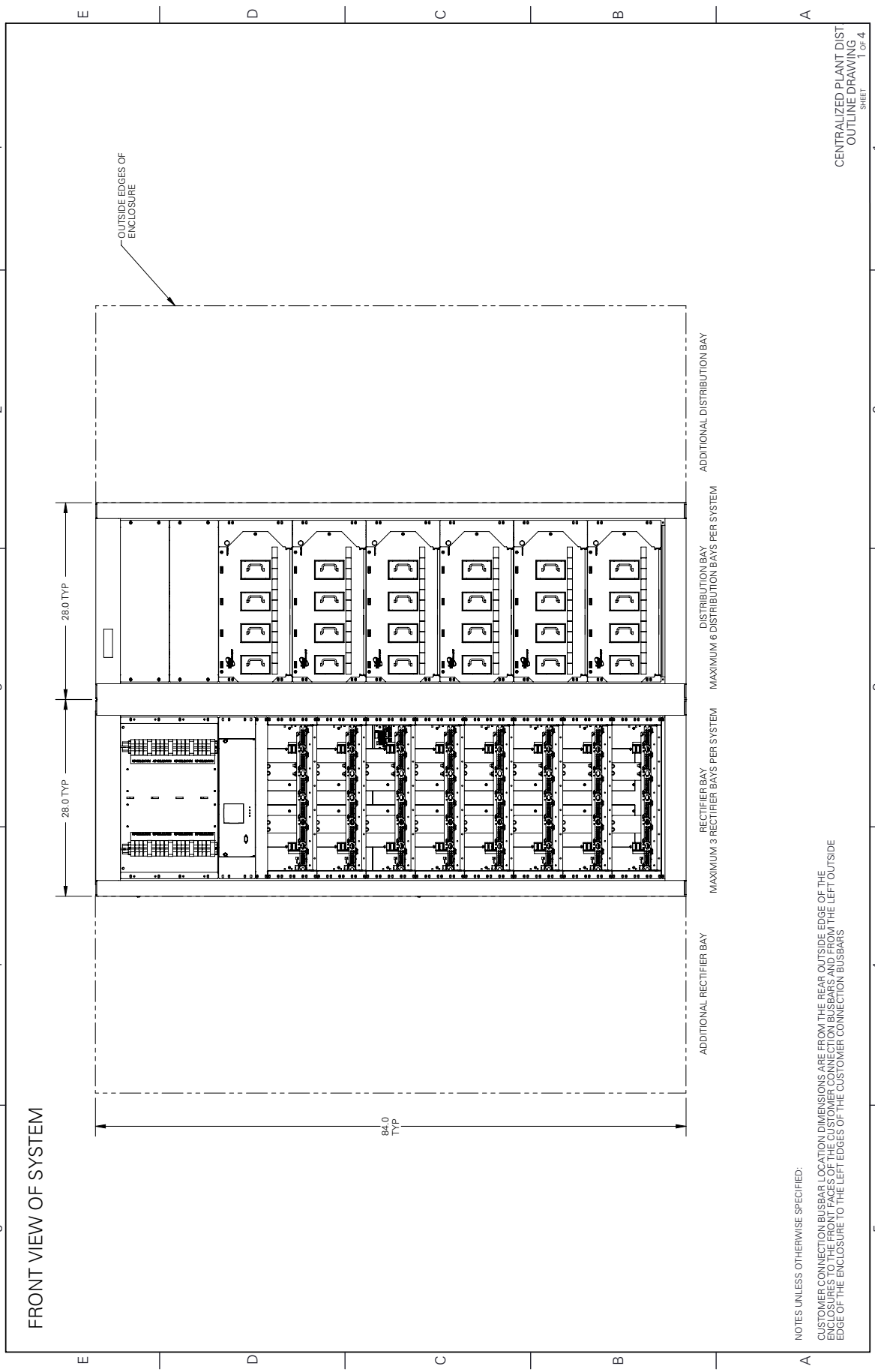
NOTES:

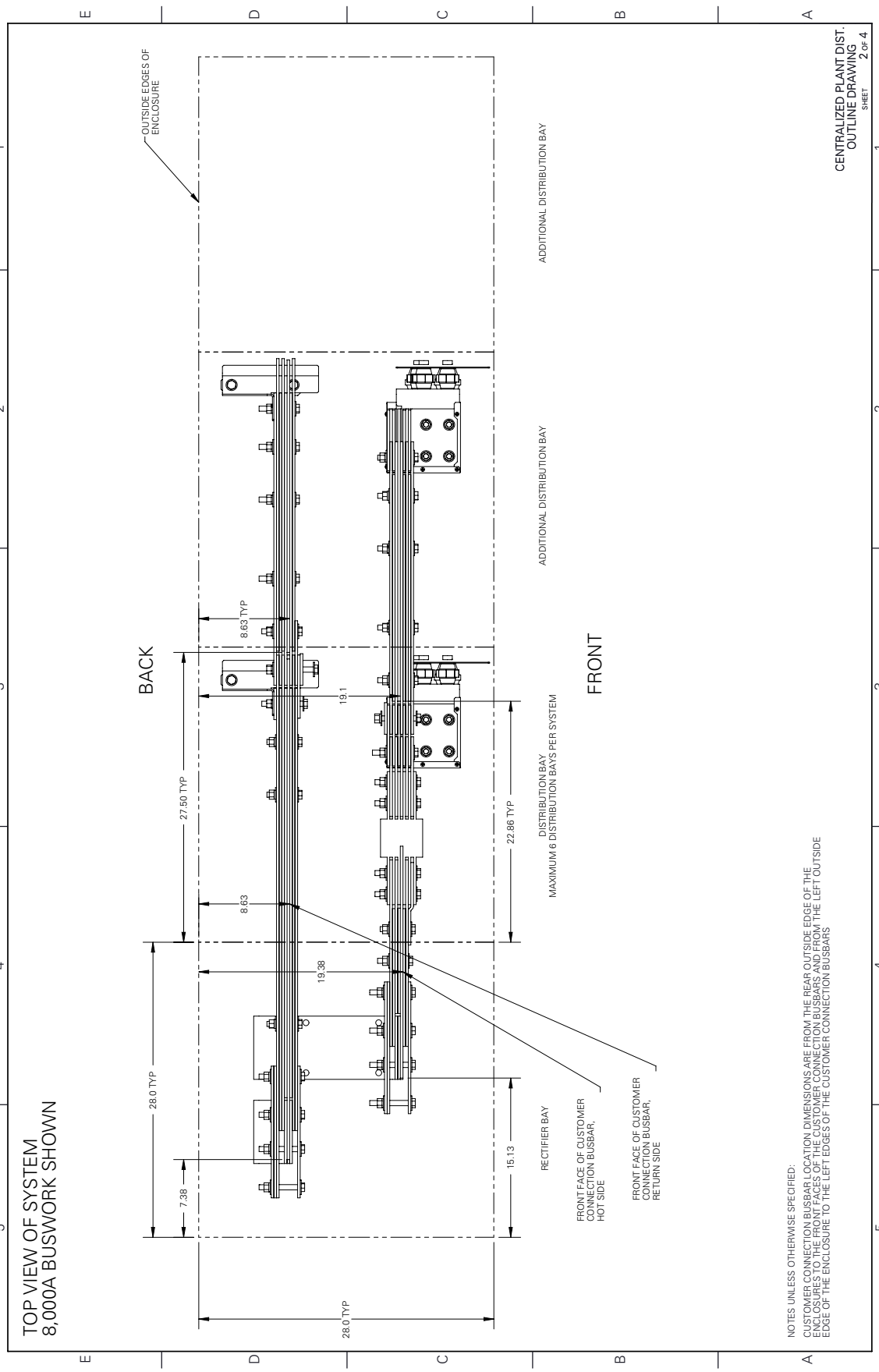
REFER TO WIRING SCHEMATIC & PRODUCT MANUAL PROVIDED WITH CXPS-C3 STANDALONE POWER BAY SYSTEM FOR AC POWER TERMINAL BLOCK CONNECTION DETAILS.

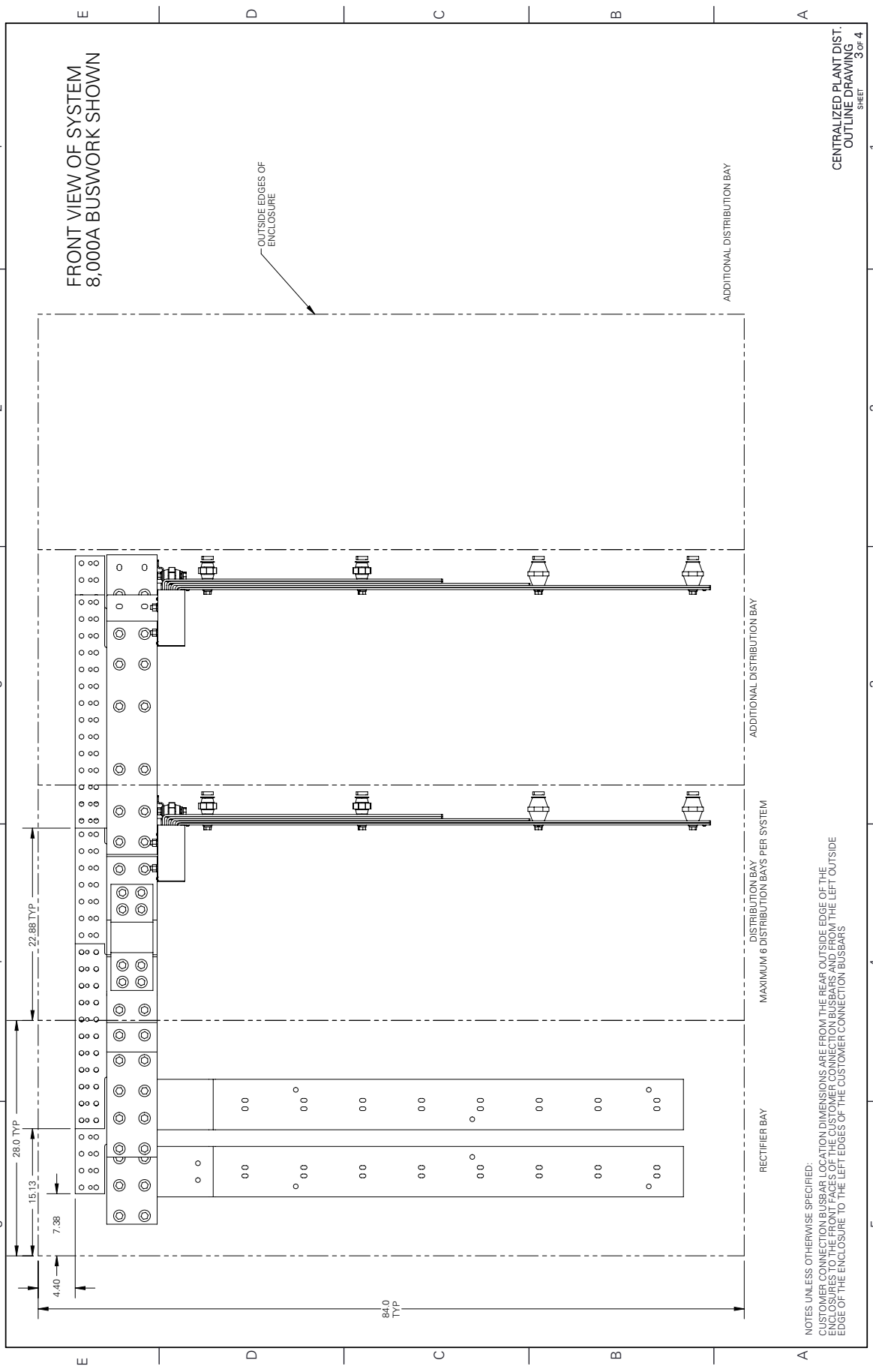
CUSTOMER CONNECTION, STANDALONE PWR BAY SYS., 5175A, CXPS-C3

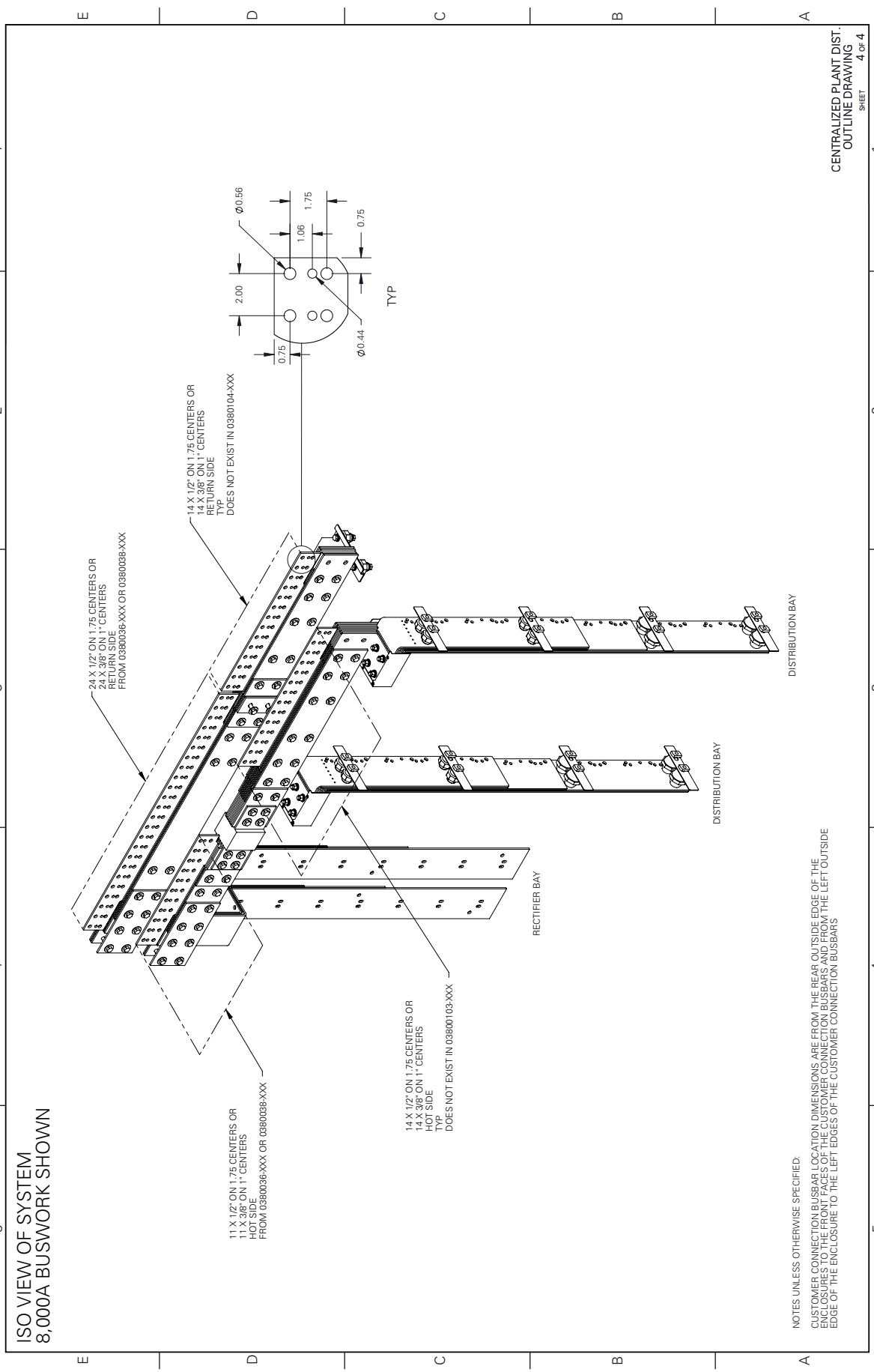
SHEET
2 OF 3

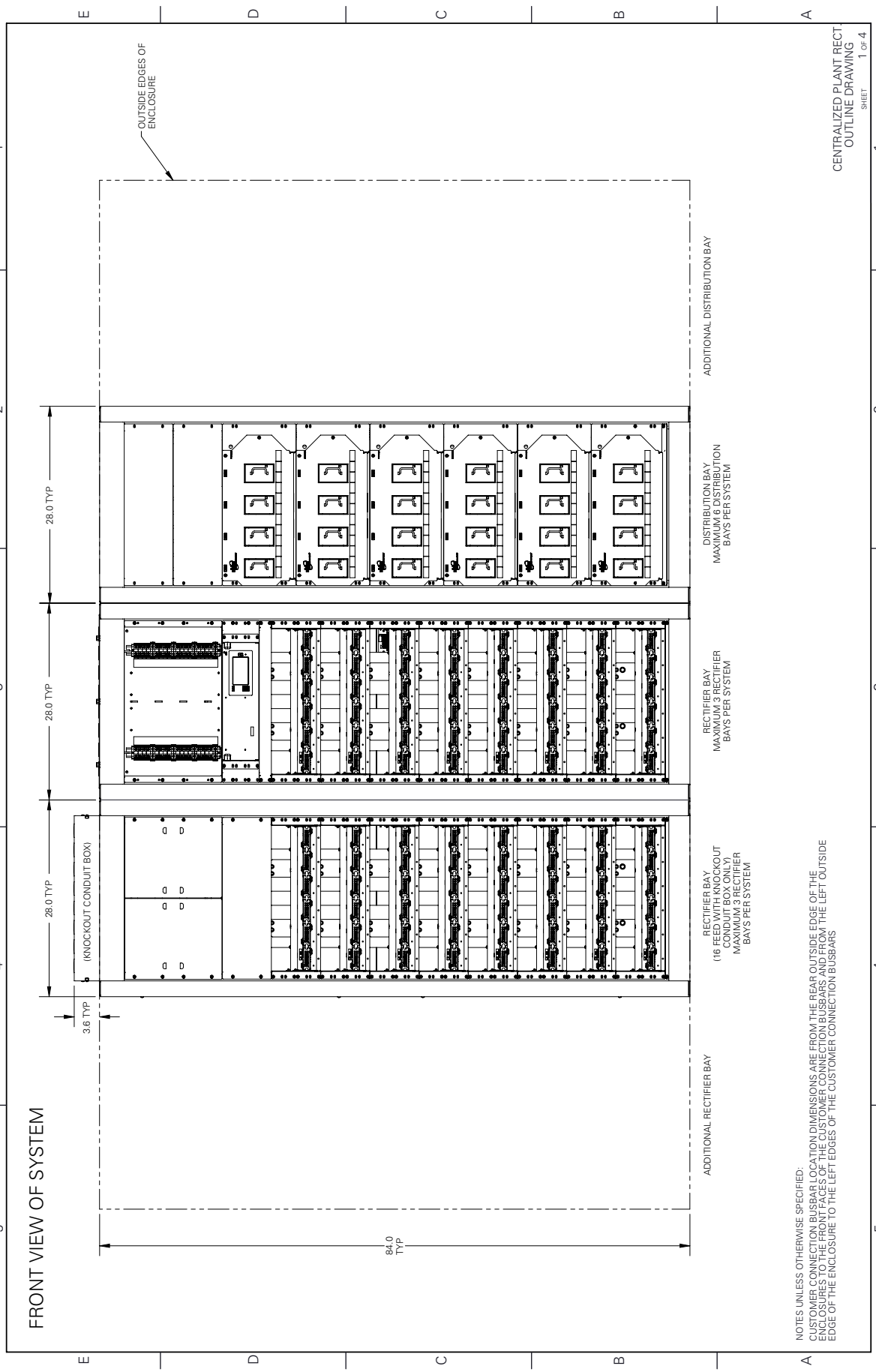

DC OUTPUT POWER BUS BAR CABLE CONNECTIONS
(-) HOT BUS BAR CABLE LANDINGS
X6 1/2" HOLES ON 1.75" CENTERS OR
X6 3/8" HOLES ON 1.0" CENTERS
(+) RETURN BUS BAR CABLE LANDINGS
X6 1/2" HOLES ON 1.75" CENTERS OR
X6 3/8" HOLES ON 1.0" CENTERS
ISO VIEW
(BROKEN-OUT SECTION)
*SOME DETAILS OMITTED FOR CLARITY
(+) RETURN
SECTION N-N
(-) HOT
SECTION L-L
TOP VIEW
DETAIL M (TYP.)
Ø0.563 THRU
Ø0.438 THRU
3.0
1.0
0.65
1.75
NOTES:
REFER TO WIRING SCHEMATIC & PRODUCT MANUAL PROVIDED WITH CXPS-C3 STANDALONE POWER BAY SYSTEM FOR DC OUTPUT POWER CABLE CONNECTION DETAILS.
CUSTOMER CONNECTION, STANDALONE PWR BAY SYS., 5175A, CXPS-C3
SHEET 3 OF 3

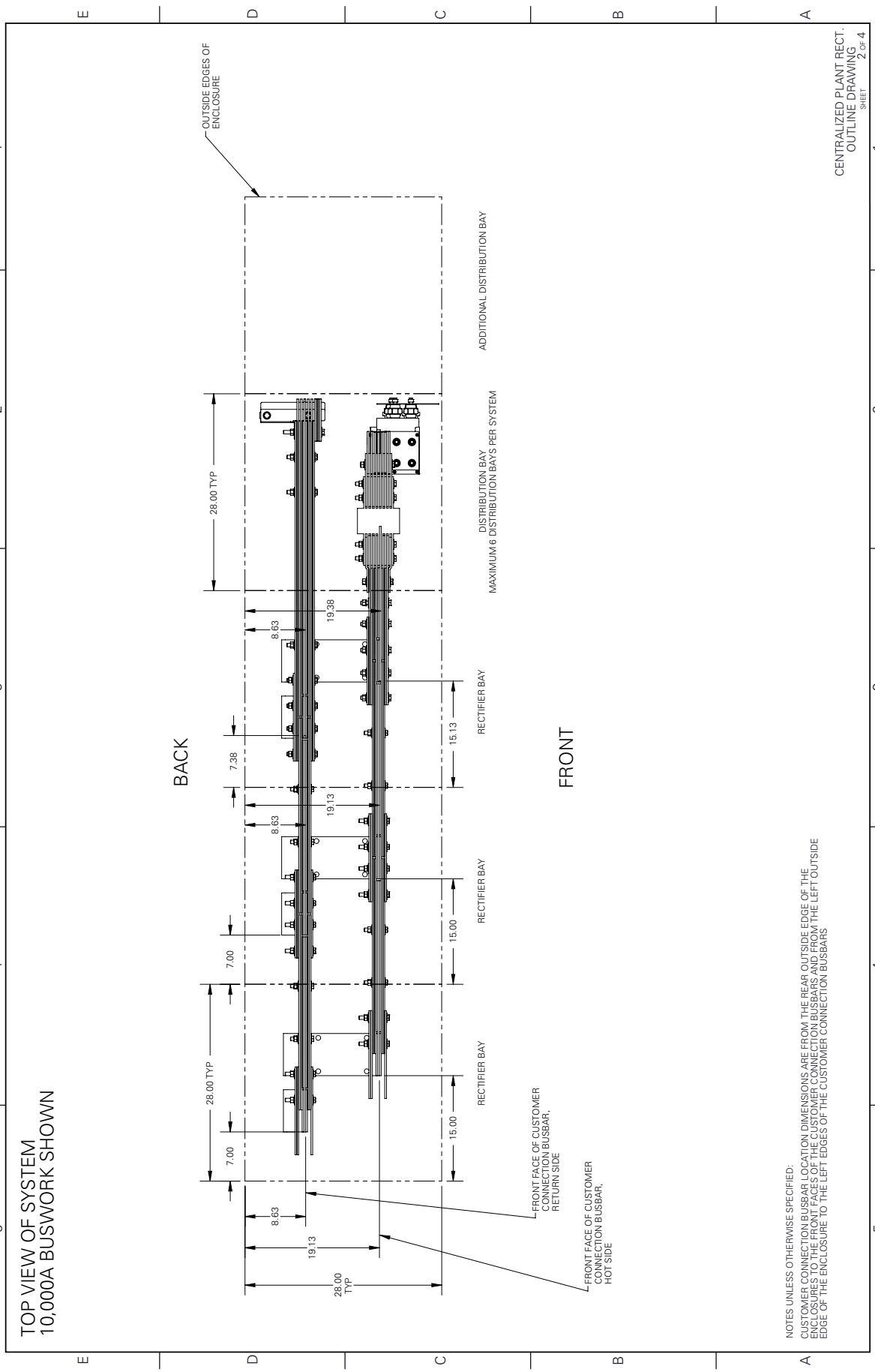

CENTRALIZED PLANT DIST
OUTLINE DRAWING
SHEET 1 OF 4
FRONT VIEW OF SYSTEM
OUTSIDE EDGES OF ENCLOSURE
28.0 TYP
28.0 TYP
84.0 TYP
DISTRIBUTION BAY
MAXIMUM 6 DISTRIBUTION BAYS PER SYSTEM
RECTIFIER BAY
MAXIMUM 3 RECTIFIER BAYS PER SYSTEM
ADDITIONAL DISTRIBUTION BAY
ADDITIONAL RECTIFIER BAY
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

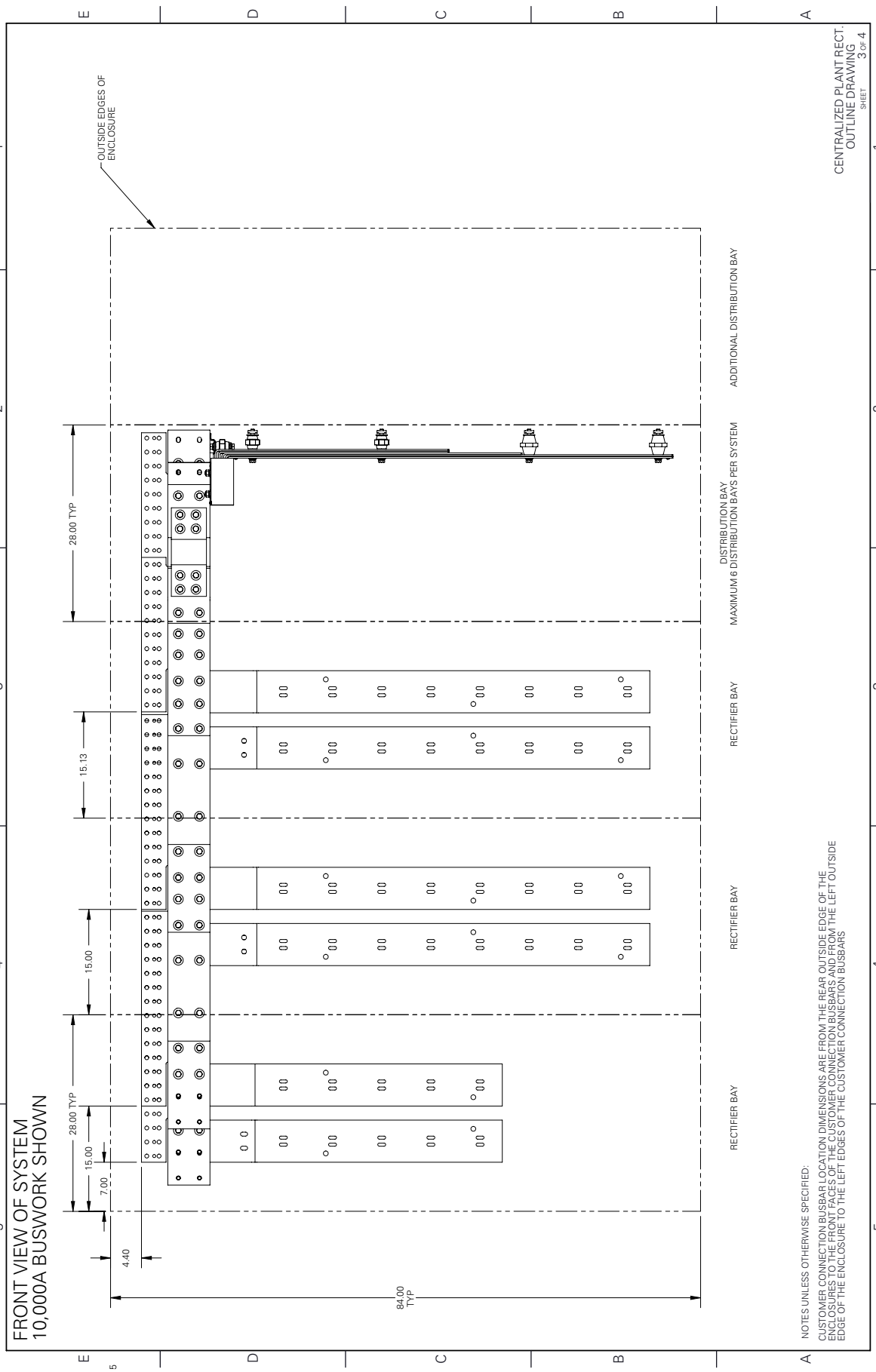

CENTRALIZED PLANT DIST.
OUTLINE DRAWING
SHEET 2 OF 4
TOP VIEW OF SYSTEM
8,000A BUSWORK SHOWN
OUTSIDE EDGES OF ENCLOSURE
BACK
FRONT
ADDITIONAL DISTRIBUTION BAY
ADDITIONAL DISTRIBUTION BAY
DISTRIBUTION BAY
MAXIMUM 6 DISTRIBUTION BAYS PER SYSTEM
RECTIFIER BAY
FRONT FACE OF CUSTOMER CONNECTION BUSBAR, HOT SIDE
FRONT FACE OF CUSTOMER CONNECTION BUSBAR, RETURN SIDE
8.63 TYP
19.1
27.50 TYP
8.63
19.38
28.0 TYP
7.38
22.86 TYP
15.13
28.0 TYP
NOTES UNLESS OTHERWISE SPECIFIED:
A CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

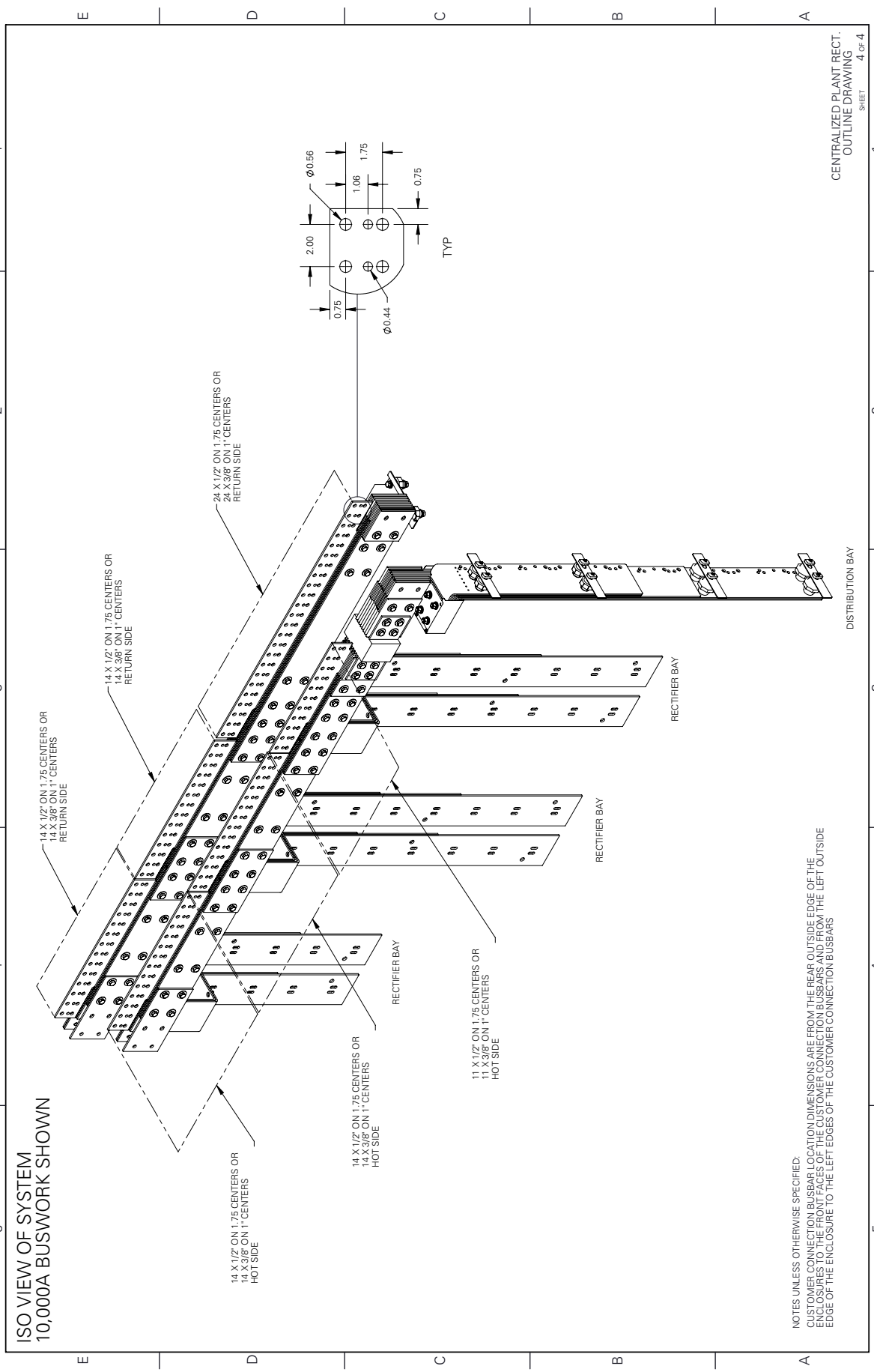

FRONT VIEW OF SYSTEM
8,000A BUSWORK SHOWN
OUTSIDE EDGES OF ENCLOSURE
ADDITIONAL DISTRIBUTION BAY
CENTRALIZED PLANT DIST.
OUTLINE DRAWING
SHEET 3 OF 4
ADDITIONAL DISTRIBUTION BAY
DISTRIBUTION BAY
MAXIMUM 6 DISTRIBUTION BAYS PER SYSTEM
RECTIFIER BAY
22.88 TYP
28.0 TYP
15.13
7.38
4.40
84.0 TYP
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

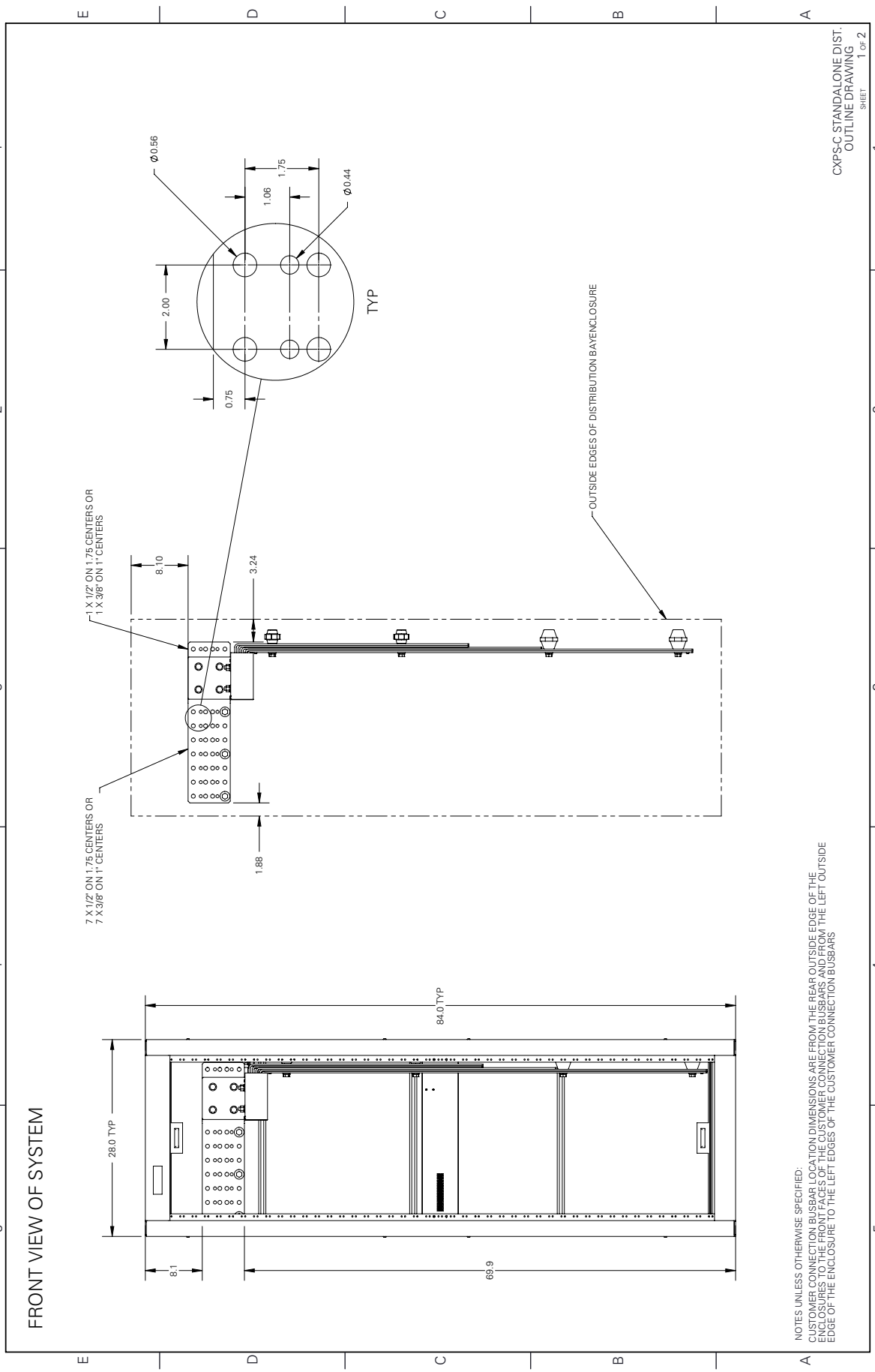

ISO VIEW OF SYSTEM
8,000A BUSWORK SHOWN
CENTRALIZED PLANT DIST.
OUTLINE DRAWING
SHEET 4 OF 4
24 X 1/2" ON 1.75 CENTERS OR
24 X 3/8" ON 1" CENTERS
RETURN SIDE
FROM 0380036-XXX OR 0380038-XXX
14 X 1/2" ON 1.75 CENTERS OR
14 X 3/8" ON 1" CENTERS
RETURN SIDE
TYP
DOES NOT EXIST IN 0380104-XXX
11 X 1/2" ON 1.75 CENTERS OR
11 X 3/8" ON 1" CENTERS
HOT SIDE
FROM 0380036-XXX OR 0380038-XXX
14 X 1/2" ON 1.75 CENTERS OR
14 X 3/8" ON 1" CENTERS
HOT SIDE
TYP
DOES NOT EXIST IN 03800103-XXX
RECTIFIER BAY
DISTRIBUTION BAY
DISTRIBUTION BAY
Ø0.56
1.06
1.75
0.75
2.00
0.75
Ø0.44
TYP
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

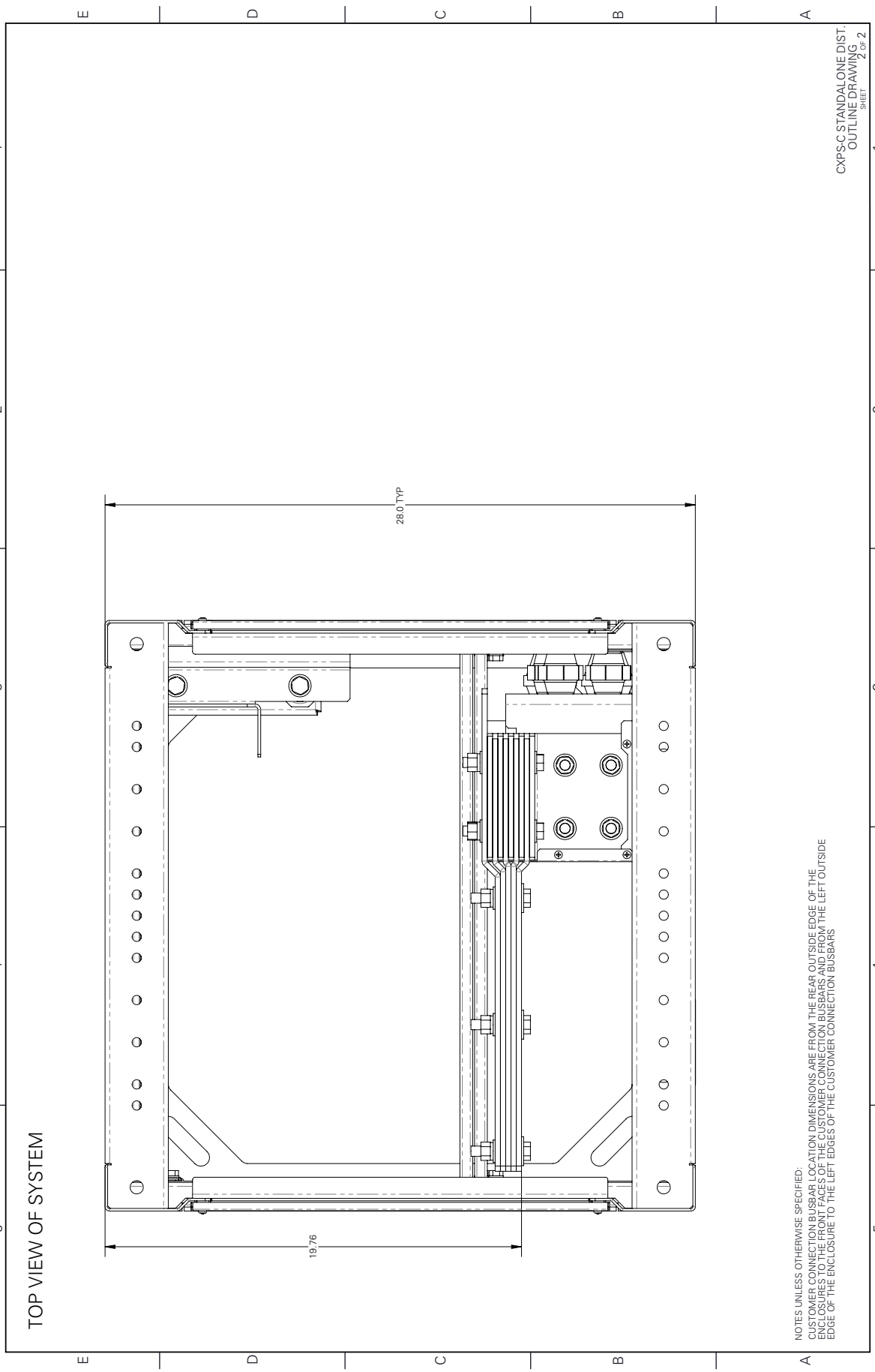

CENTRALIZED PLANT RECT.
OUTLINE DRAWING
SHEET 1 OF 4
FRONT VIEW OF SYSTEM
OUTSIDE EDGES OF ENCLOSURE
ADDITIONAL DISTRIBUTION BAY
DISTRIBUTION BAY
MAXIMUM 6 DISTRIBUTION
BAYS PER SYSTEM
RECTIFIER BAY
MAXIMUM 3 RECTIFIER
BAYS PER SYSTEM
RECTIFIER BAY
(16 FEED WITH KNOCKOUT
CONDUIT BOX ONLY)
MAXIMUM 3 RECTIFIER
BAYS PER SYSTEM
ADDITIONAL RECTIFIER BAY
28.0 TYP
28.0 TYP
28.0 TYP
(KNOCKOUT CONDUIT BOX)
3.6 TYP
84.0
TYP
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

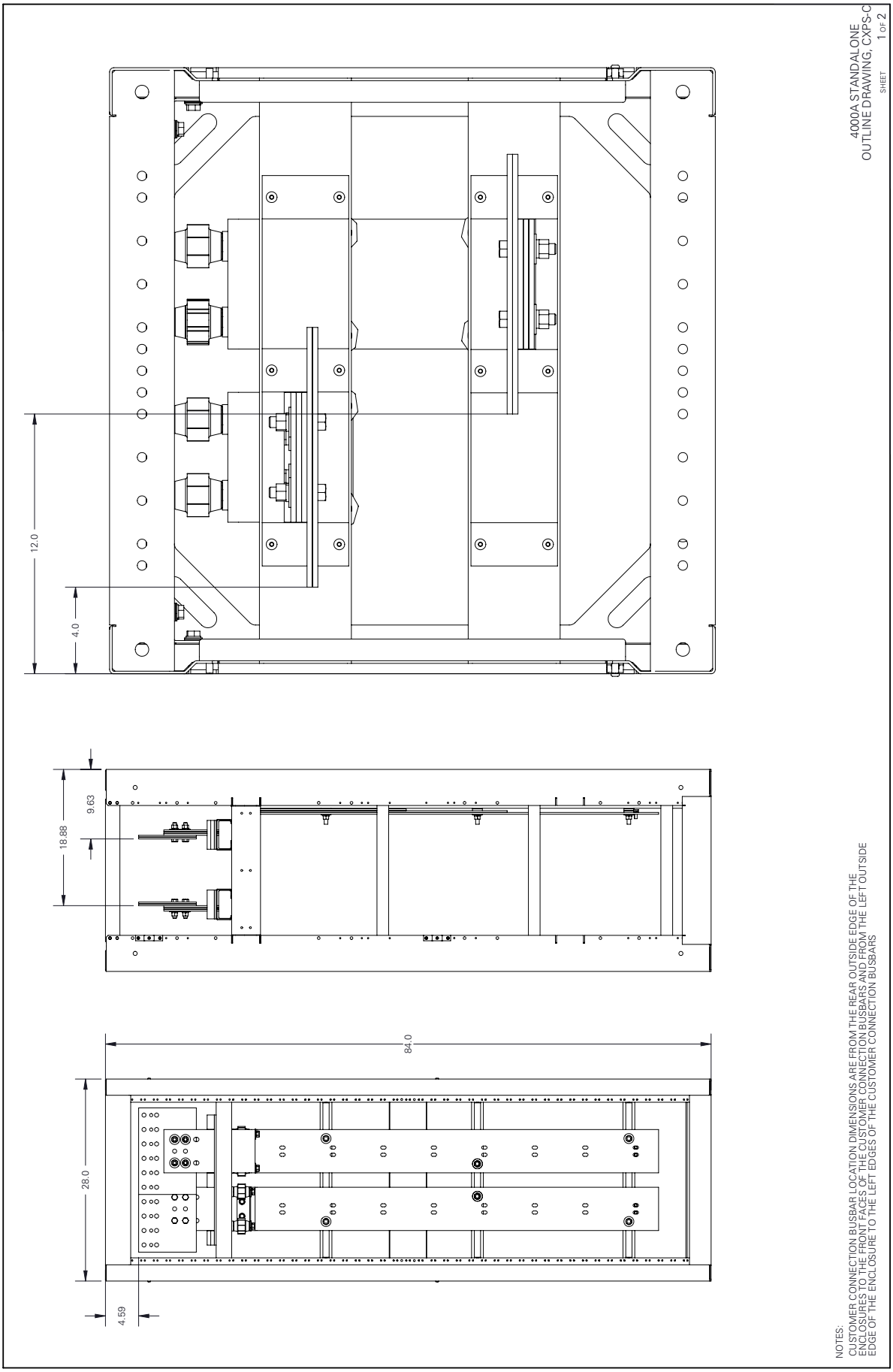

TOP VIEW OF SYSTEM
10,000A BUSWORK SHOWN
CENTRALIZED PLANT RECT.
OUTLINE DRAWING
SHEET 2 OF 4
OUTSIDE EDGES OF ENCLOSURE
BACK
FRONT
ADDITIONAL DISTRIBUTION BAY
DISTRIBUTION BAY
MAXIMUM 6 DISTRIBUTION BAYS PER SYSTEM
RECTIFIER BAY
RECTIFIER BAY
RECTIFIER BAY
28.00 TYP
28.00 TYP
28.00 TYP
19.38
8.63
7.38
19.13
8.63
7.00
15.13
15.00
15.00
7.00
8.63
19.13
28.00 TYP
FRONT FACE OF CUSTOMER CONNECTION BUSBAR, RETURN SIDE
FRONT FACE OF CUSTOMER CONNECTION BUSBAR, HOT SIDE
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

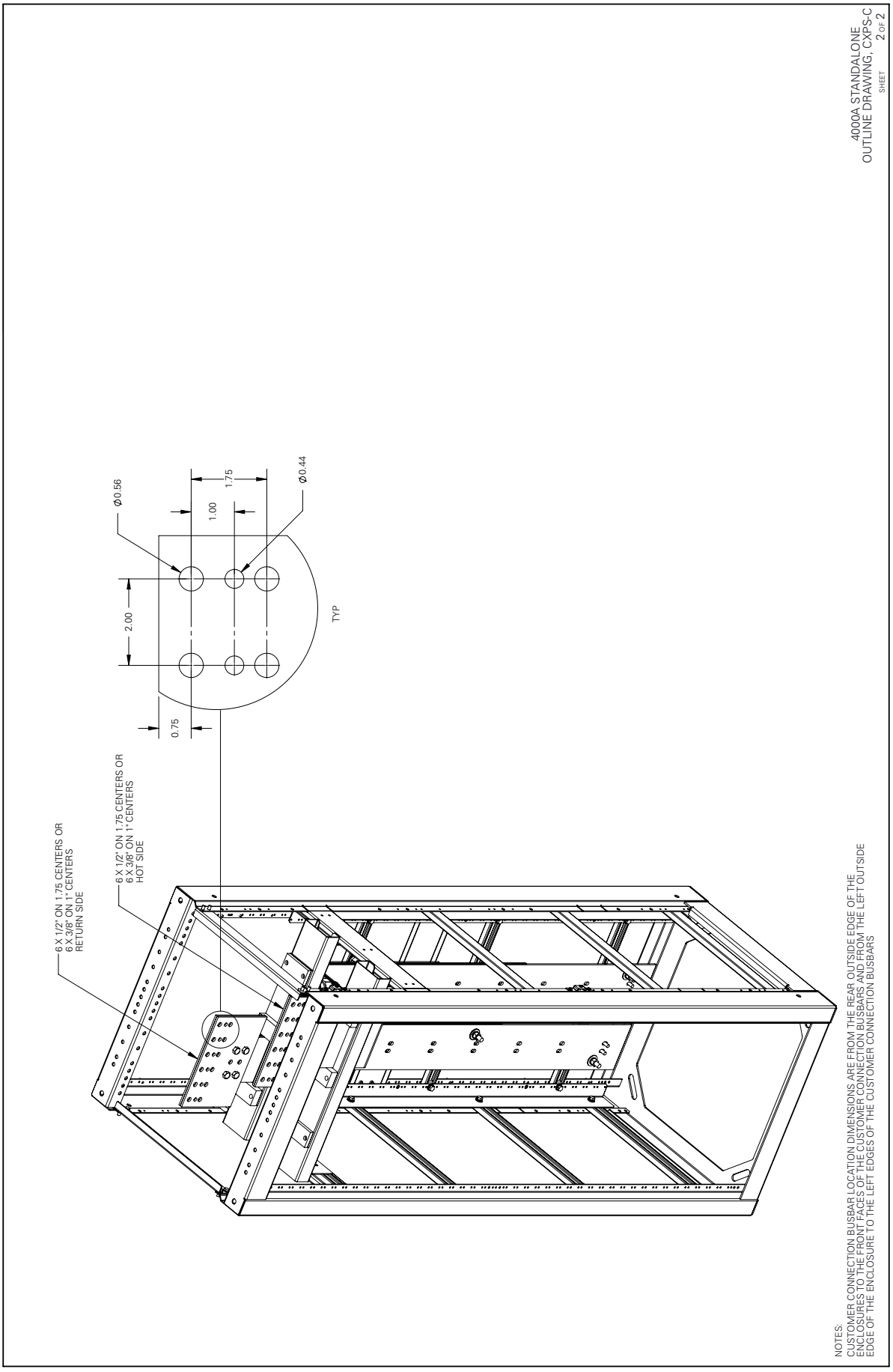

CENTRALIZED PLANT RECT.
OUTLINE DRAWING
SHEET 3 OF 4
FRONT VIEW OF SYSTEM
10,000A BUSWORK SHOWN
OUTSIDE EDGES OF ENCLOSURE
DISTRIBUTION BAY
MAXIMUM 6 DISTRIBUTION BAYS PER SYSTEM
ADDITIONAL DISTRIBUTION BAY
RECTIFIER BAY
RECTIFIER BAY
RECTIFIER BAY
28.00 TYP
15.13
15.00
28.00 TYP
15.00
7.00
4.40
84.00 TYP
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

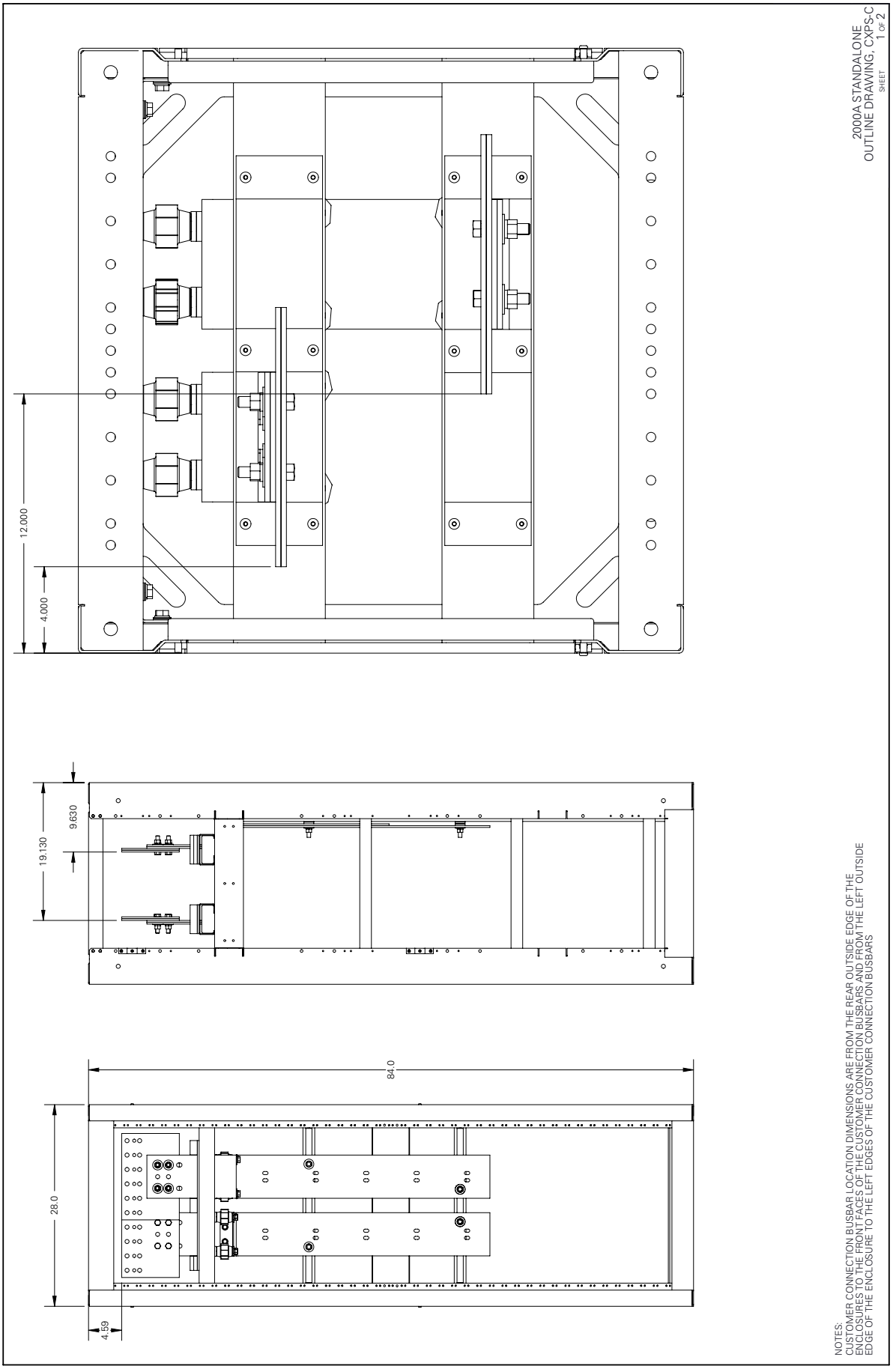

CENTRALIZED PLANT RECT.
OUTLINE DRAWING
SHEET 4 OF 4
ISO VIEW OF SYSTEM
10,000A BUSWORK SHOWN
24 X 1/2" ON 1.75 CENTERS OR
24 X 3/8" ON 1" CENTERS
RETURN SIDE
14 X 1/2" ON 1.75 CENTERS OR
14 X 3/8" ON 1" CENTERS
RETURN SIDE
14 X 1/2" ON 1.75 CENTERS OR
14 X 3/8" ON 1" CENTERS
RETURN SIDE
14 X 1/2" ON 1.75 CENTERS OR
14 X 3/8" ON 1" CENTERS
HOT SIDE
14 X 1/2" ON 1.75 CENTERS OR
14 X 3/8" ON 1" CENTERS
HOT SIDE
11 X 1/2" ON 1.75 CENTERS OR
11 X 3/8" ON 1" CENTERS
HOT SIDE
RECTIFIER BAY
RECTIFIER BAY
RECTIFIER BAY
DISTRIBUTION BAY
Ø0.56
1.06
1.75
0.75
2.00
0.75
Ø0.44
TYP
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS

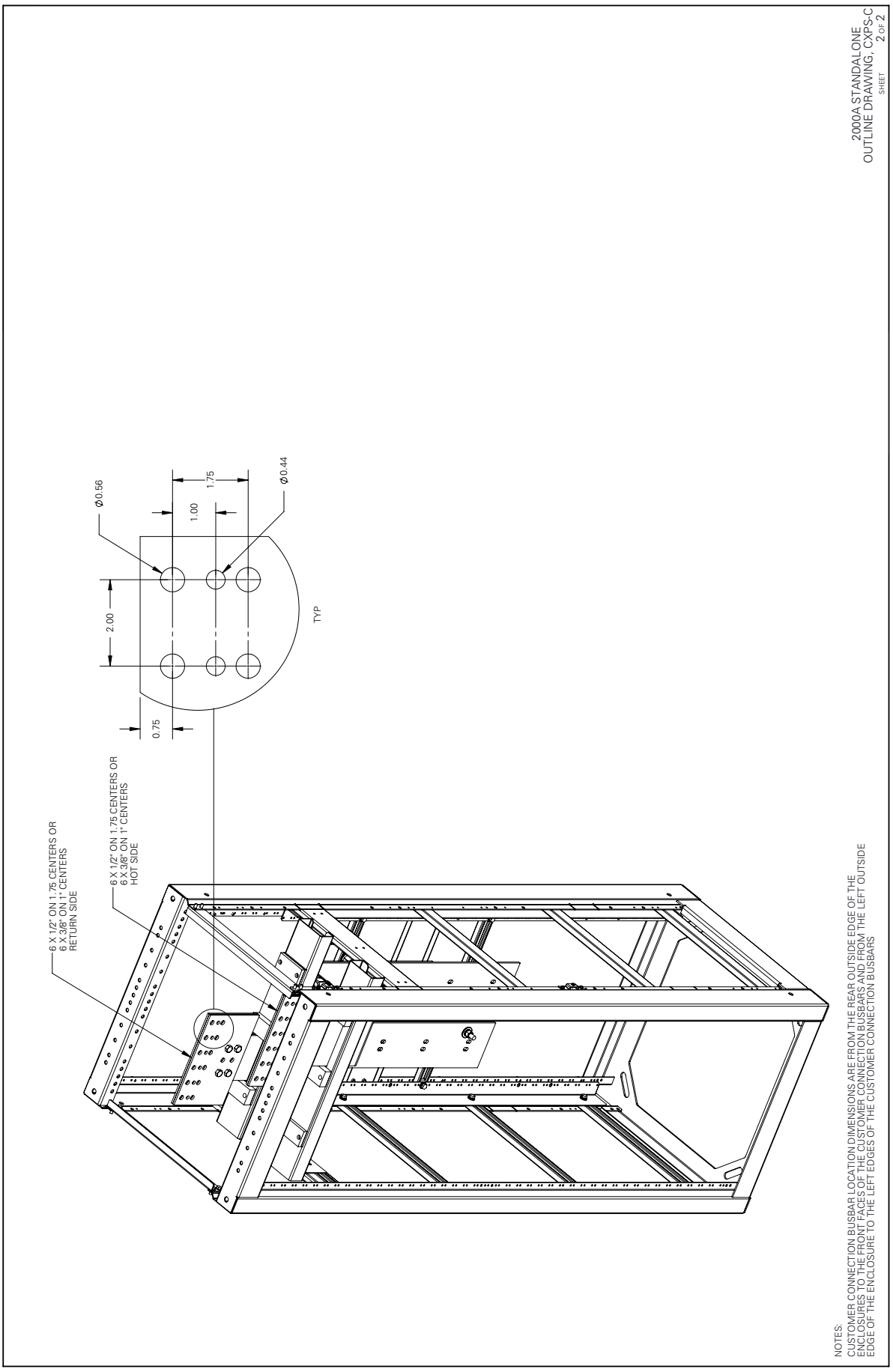

CXPS-C STANDALONE DIST.
OUTLINE DRAWING
SHEET 1 OF 2
FRONT VIEW OF SYSTEM
Ø0.56
Ø0.44
1.75
1.06
2.00
0.75
TYP
OUTSIDE EDGES OF DISTRIBUTION BAYENCLOSURE
1 X 1/2" ON 1.75 CENTERS OR
1 X 3/8" ON 1" CENTERS
7 X 1/2" ON 1.75 CENTERS OR
7 X 3/8" ON 1" CENTERS
8.10
3.24
1.88
84.0 TYP
28.0 TYP
8.1
69.9
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS


CXPS-C STANDALONE DIST.
OUTLINE DRAWING
SHEET 2 OF 2
TOP VIEW OF SYSTEM
28.0 TYP
19.76
NOTES UNLESS OTHERWISE SPECIFIED:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS


4000A STANDALONE
OUTLINE DRAWING, CXPS-C
SHEET 1 OF 2
12.0
4.0
18.88
9.63
84.0
28.0
4.59
NOTES:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS


4000A STANDALONE
OUTLINE DRAWING, CXPS-C
SHEET 2 OF 2
NOTES:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS
6 X 1/2" ON 1.75 CENTERS OR
6 X 3/8" ON 1" CENTERS
RETURN SIDE
6 X 1/2" ON 1.75 CENTERS OR
6 X 3/8" ON 1" CENTERS
HOT SIDE
Ø0.56
Ø0.44
1.75
1.00
2.00
0.75
TYP


2000A STANDALONE
OUTLINE DRAWING, CXPS-C
SHEET 1 OF 2
12.000
4.000
9.630
19.130
84.0
28.0
4.59
NOTES:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS


2000A STANDALONE
OUTLINE DRAWING, CXPS-C
SHEET 2 OF 2
NOTES:
CUSTOMER CONNECTION BUSBAR LOCATION DIMENSIONS ARE FROM THE REAR OUTSIDE EDGE OF THE ENCLOSURES TO THE FRONT FACES OF THE CUSTOMER CONNECTION BUSBARS AND FROM THE LEFT OUTSIDE EDGE OF THE ENCLOSURE TO THE LEFT EDGES OF THE CUSTOMER CONNECTION BUSBARS
6 X 1/2" ON 1.75 CENTERS OR
6 X 3/8" ON 1" CENTERS
RETURN SIDE
6 X 1/2" ON 1.75 CENTERS OR
6 X 3/8" ON 1" CENTERS
HOT SIDE
Ø0.56
Ø0.44
1.75
1.00
2.00
0.75
TYP

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