CXPS-C
Centralized Power Plant

Technical Guide 9400001-J1

Effective: 11/2018

Alpha Technologies Ltd.

CXPS-C
Centralized Power Plant

NOTE:

Photographs contained in this manual are for illustrative purposes only. These photographs may not match your installation.

NOTE:

Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this powering system, contact Alpha Technologies or your nearest Alpha representative.

NOTE:

Alpha shall not be held liable for any damage or injury involving its enclosures, power supplies, generators, batteries, or other hardware if used or operated in any manner or subject to any condition inconsistent with its intended purpose, or if installed or operated in an unapproved manner, or improperly maintained.

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1. Safety

SAVE THESE INSTRUCTIONS: This manual 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 manual before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies or the nearest Alpha 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 manual. Where these symbols appear, use extra care and attention.

The use of ATTENTION indicates specific regulatory/code requirements that may affect the placement of equipment and/or installation procedures.

NOTE:

A NOTE provides additional information to help complete a specific task or procedure. Notes are designated with a checkmark, the word NOTE, and a rule beneath which the information appears

CAUTION!

CAUTION indicates safety information intended to PREVENT DAMAGE to material or equipment. Cautions are designated with a yellow warning triangle, the word CAUTION, and a rule beneath which the information appears.

WARNING!

WARNING presents safety information to PREVENT INJURY OR DEATH to personnel. Warnings are indicated by a shock hazard icon, the word WARNING, and a rule beneath which the information appears.

HOT!

The use of HOT presents safety information to PREVENT BURNS to the technician or user.

1.2 General Warnings and Cautions

WARNING!

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

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

1.3 Electrical Safety

WARNING!

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

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

a. Remove all metallic jewelry, such as watches, rings, metal rimmed glasses, or necklaces.
b. Wear safety glasses with side shields at all times during the installation.
c. Use OSHA approved insulated hand tools. Do not rest tools on top of batteries.

WARNING!

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

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Input voltages can range up to 240 Vac. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.
- 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 circuit 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.

1.4 Battery Safety

- Never transport an enclosure with batteries installed. Batteries must ONLY be installed after the enclosure has been securely set in place at its permanent installation location. Transporting the unit with batteries installed may cause a short circuit, fire, explosion, and/or damage to the battery pack, enclosure and installed equipment.
- Servicing and connection of batteries must be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Batteries contain or emit chemicals known to cause cancer and birth defects or other reproductive harm. Battery post terminals and related accessories contain lead and lead compounds. Wash your hands after handling batteries.

WARNING!

Follow 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.

2. Introduction

2.1 Product Overview

The CXPS-C power system provides high capacity DC power for large communications applications—central offices, mobile switching centers, 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 modular switched mode rectifiers. It is a fully automatic system, which provides float and equalize capability for the batteries.

The basic system consists of two bays and inter-bay copper busbars (Figure 1). The Power bay converts AC to fully regulated and filtered 48Vdc power, which is fed through a load shunt to the Distribution Bay.

The system can be expanded from the center-out to a full 12,000A capacity system using the CXC HP controller.

The system is configurable in 4000A, 8000A and 12000A (CXC HP) capacity.

2.2 Part Numbers and List Options

The 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; e.g., additional Cordex HP rectifiers. For more information, see the ordering guide on the Alpha website.

Figure 1 — CXPS-C Centralized Power Plant Basic System

3. Specifications

Table A — Specifications for CXPS-C Power System	
Electrical	
DC Output Voltage	48V
AC Input Voltage	
6 feeds:	**4.0kW Rectifier Shelf** 277/480Vac, 60Hz (3 Phase - 3 Wire + N + PE) **12kW Rectifier Shelf** 480Vac, 60Hz (3 Phase - 3 Wire + PE)
8 feeds:	**4.0kW Rectifier Shelf** 208Vac, 60Hz (3 Phase - 3 Wire + PE) 277/480Vac, 60Hz (3 Phase - 3 Wire + N + PE) **12kW Rectifier Shelf** 480Vac, 60Hz (3 Phase - 3 Wire + PE)
16 feeds:	**4.0kW Rectifier Shelf** 208Vac, 60Hz (3 Phase - 3 Wire + PE) 277/480Vac, 60Hz (3 Phase - 3 Wire + N + PE) **12kW Rectifier Shelf** 480Vac, 60Hz (3 Phase - 3 Wire + PE)
Nominal Rectifier Voltage	4.0kW: 208 to 277Vac 12.0kW 480Vac
Max. Bus Capacity	4,000A, 8,000A, or 12,000A (CXC HP) 2,000A or 4,000A per power bay 6,000A per distribution bay
Number of negative landings for batteries (rectifier side of the shunt)	Single Power bay: 11 X 1/2" on 1 3/4" centers or 24 x 3/8" on 1" centers Each Additional Power bay: 14 X 1/2" on 1 3/4" centers or 14 x 3/8" on 1" centers
Number of landings on the load side of the shunt to feed unfused power to remote distribution	Single Distribution Bay: 14 X 1/2" on 1 3/4" centers or 11 X 3/8" on 1" centers Each Additional Distribution Bay: 14 X 1/2" on 1 3/4" centers or 14 X 3/8" on 1" centers
Mechanical	
Enclosure	1.095 mm (14 gauge) steel
Mounting	Standard 23" relay rack (flush rack mount) in box bay
Dimensions, H x W x D	213 x 71 x 71 cm (84 x 28 x 28 in)
Weight	Power bay (no rectifiers): approximately 272 kg (600 lb) Distribution bay: 432 kg (950 lb) (filled with TPL fuses)
Environmental	
Temperature	0 to + 40°C (32 to 104°F)
Relative Humidity	0 to 95% RH non-condensing
Elevation	-500 to 2000 m (-1640 to 6562 ft)
Agency compliance	
CSA	C22.2 No. 60950-1-07
UL	UL 60950-1, Second Edition
EMC	FCC CFR47 Part 15 Class A; ICES-003
NEBS	Level 3

Table B — Related Components	
Cordex HP 4kW rectifier	
See the Cordex HP 4kW rectifier datasheet for more detailed information.	
Cordex HP 12kW rectifier	
See the Cordex HP 12kW rectifier datasheet for more detailed information.	
System level alarms/controls	
Alarms/control parameters are user-programmable through built-in digital supervisory unit. See CXC HP datasheet for detailed information on alarms and controls.	
Indicators:	LCD with touch screen System OK (green LED) System minor alarm (yellow LED) System major alarm (red LED)
Load disconnect:	Panel based. 2000A per TPL fuse/Bolt-in breaker panel 600A pre plug-in bullet TLS/TPS fuse/CB panel
Alarm connections:	0.34 to 2.5 mm^2 (14 to 22AWG)
Smart peripheral modules	
Shunt multiplexer	6 shunt inputs per module
External return bar	
Mounting	2" Auxiliary framing (customer supplied)
Termination	With 3 horizontal bars: 202 sets of 1/2" holes on 1 3/4" centers or 202 sets of 3/8" holes on 1" centers
Unit capacity per bay	4000A
Ultimate capacity	12,000A (3 bay limit)

Table C — Distribution, Panels

Panel Type/ Busbar	Quantity/Rating	Max Rating per Panel	Output Termination
TPL Fuses	61 to 800A (up to 24 per distribution bay)	2000A	2 hole 1/2" dia. on 1 3/4" centers or 2 hole 3/8" dia. on 1" centers allows for dual cable landing back to back
Bolt-in breakers	1 pole up to 250A 2 pole 300 to 400A 3 pole 500 to 700A 4 pole 800A 5 pole 1000A 6 pole 1200A	2000A	2 hole 3/8" dia. on 1" center and 1/2" dia. on 1 3/4" center 12x 1 Position 2 hole, 3/8" dia. on 1" center only
Plug-in bullet breakers	1 pole up to 100A 2 pole 110 to 200A 3 pole 225 to 300A	600A	1 pole: 2 hole 1/4" dia. on 5/8" centers 2 and 3 pole: 2 hole, 3/8" dia. on 1 centers (100A and 125A breakers/fuses need one breaker space)
Plug-in TPS/TLS fuse holders	Up to 125A, 18 per panel	600A	2 hole 1/4" dia. on 3/8" centers

Table D — Distribution, Busbars	
Number of negative landings for batteries (rectifier side of the shunt)	Single power bay: 11 X 1/2" on 1 3/4" centers or 24 x 3/8" on 1" centers Each additional power bay: 14 X 1/2" on 1 3/4" centers or 14 x 3/8" on 1" centers
Number of landings on the load side of the shunt to feed unfused power to remote distribution	Single distribution bay: 14 X 1/2" on 1 3/4" centers or 11 x 3/8" on 1" centers Each additional power bay: 14 X 1/2" on 1 3/4" centers or 14 x 3/8" on 1" centers
Internal return bar	Overhead bus ground, 24 sets of 2 hole, 1/2" dia. on 1 3/4" centers or 3/8" dia. on 1" centers (basic one power plus one distribution bay); 14 additional sets per additional rectifier or distribution bay

4. Features

The basic system consists of two bays and inter-bay copper busbarss. 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 power system

- 1x 4000A power bay (8 shelves) or 1x 2000A power bay (4 shelves)
- 1x 6000A distribution bay
- System controller

Expandable to include

- 1x or more additional 4000A power bay (8000A or 12000A system capacity)
- 1x or more additional 2000A power bay (4000A, 6000A, 8000A, 10000A or 12000A system capacity)
- 1x or more additional 6000A distribution bays (12000A distribution capacity)

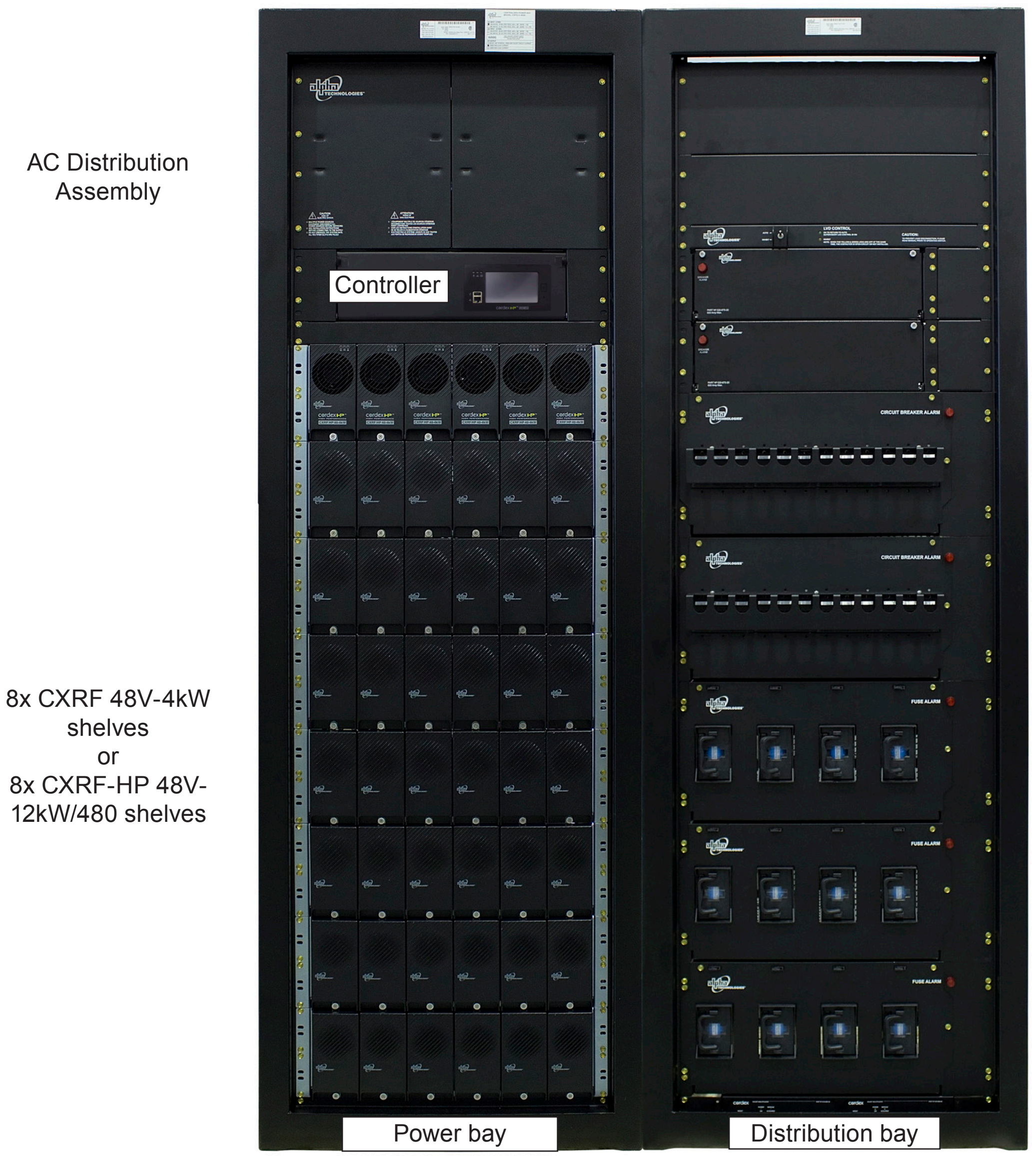


Figure 2 — Basic Power System

4.1 Power Bays

4.1.1 Cordex HP System Controller

The Cordex HP system 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 the following:

- Designed to communicate directly with HP rectifiers
- 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 controller manual shipped with your order for detailed information.

4.1.2 Cordex HP Rectifier Shelves

A 4000A power bay has eight rectifier shelves and a 2000A bay has four rectifier shelves. Each rectifier shelf can hold up to six Cordex HP 4kW rectifier modules or two 12kW/480 rectifier modules.

A Cordex HP 4.0kW rectifier supplies a nominal output of 74A at 54Vdc and the 12kW/480 rectifier supplies 222A at 54Vdc nominal. Rectifier specifications are included in the Cordex HP rectifier manual included with the system documentation package.

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

4.1.3 AC Termination Wiring

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

A split AC terminal box allows for feeds from two separate sources. Eight feed is standard; six or sixteen feed is an option. See the specifications in Chapter 3 on page 9.

4.1.4 Standalone or Add-on Power Bays

A standalone 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 CXPS-C power system.

4.1.5 Power Bay DC Charge Buses

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

In a multi-bay power system, the return vertical busbar connects to an inter-bay return bar located across the top of the power and distribution bays. Similarly the -48V vertical busbar connects to an inter-bay -48V busbar, which terminates at the system shunt located in the distribution bay.

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

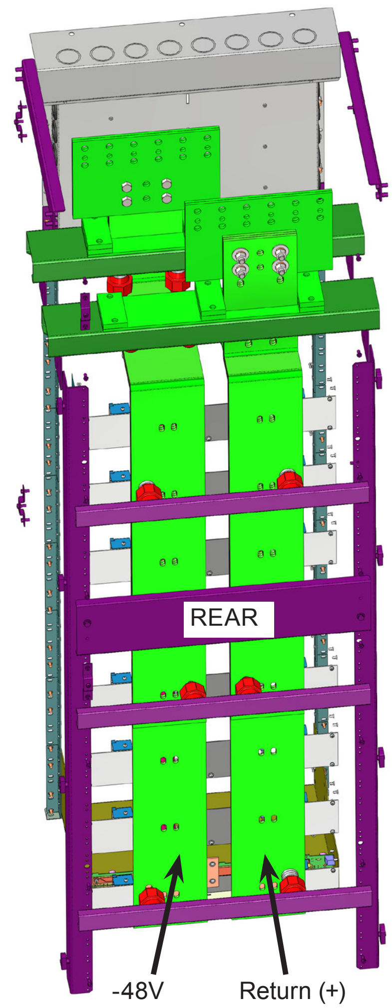


Figure 3 — Stand-alone Power Bay showing DC Charge Buses

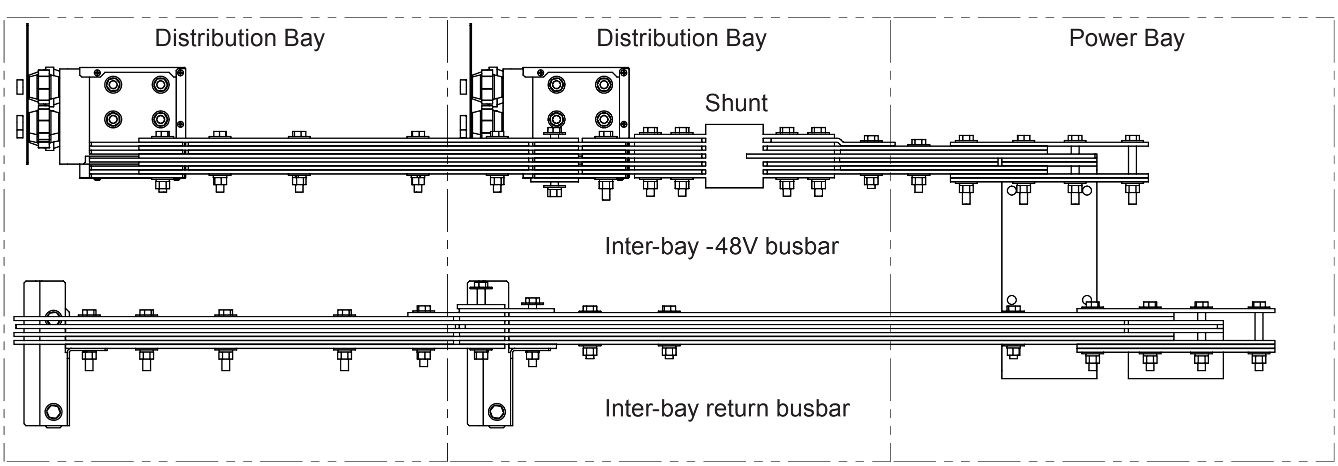


Figure 4 — Top View of Horizontal Inter-bay Busbars

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 Alarms and LEDs

Rectifier status, such as mains OK, Minor and Major alarms, display on the rectifier front panel.

A rectifier Major alarm indicates, the module has shut down due to a critical fault.

A rectifier Minor alarm indicates the module has a non-critical alarm, however, it has not shut down.

See the Cordex HP rectifier manual included with the system documentation package for detailed information.

Figure 5 — 4.0kW Rectifier Front Panel LEDs

Figure 6 — 12kW (3-phase) Rectifier 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/CB tier combinations, with or without LVLD option, as shown in Table E and Figure 7.

Table E — Distribution Options per Bay

Tier Type	Rating	Max Rating per Panel	Number of Positions per Bay
TPL fuses	100-800A	2000A	4 fuse holders per tier Max 6 fuse tiers per bay
Bolt-in breakers (high capacity)	1 pole 100 to 250A	2000A	12 breaker poles per tier Max 6 panels per bay
	2 pole 300 to 400A		
	3 pole 500 to 700A		
	4 pole 800A		
	5 pole 1000A		
	6 pole 1200A		
Plug-in bullet breakers	1 pole up to 100A	600A	18 breaker poles per tier Max 12 tiers per bay (100A and 125A breakers/fuses need one breaker space between breaker and breaker beside it)
	2 pole 110 to 200A		
	3 pole 225 to 300A		
Plug-in bullet TPS/TLS fuse holders	Up to 125A	600A	18 fuse holders per tier Max 12 fuse tiers per bay (100A and 125A breakers/fuses need one breaker space between breaker and breaker beside it)

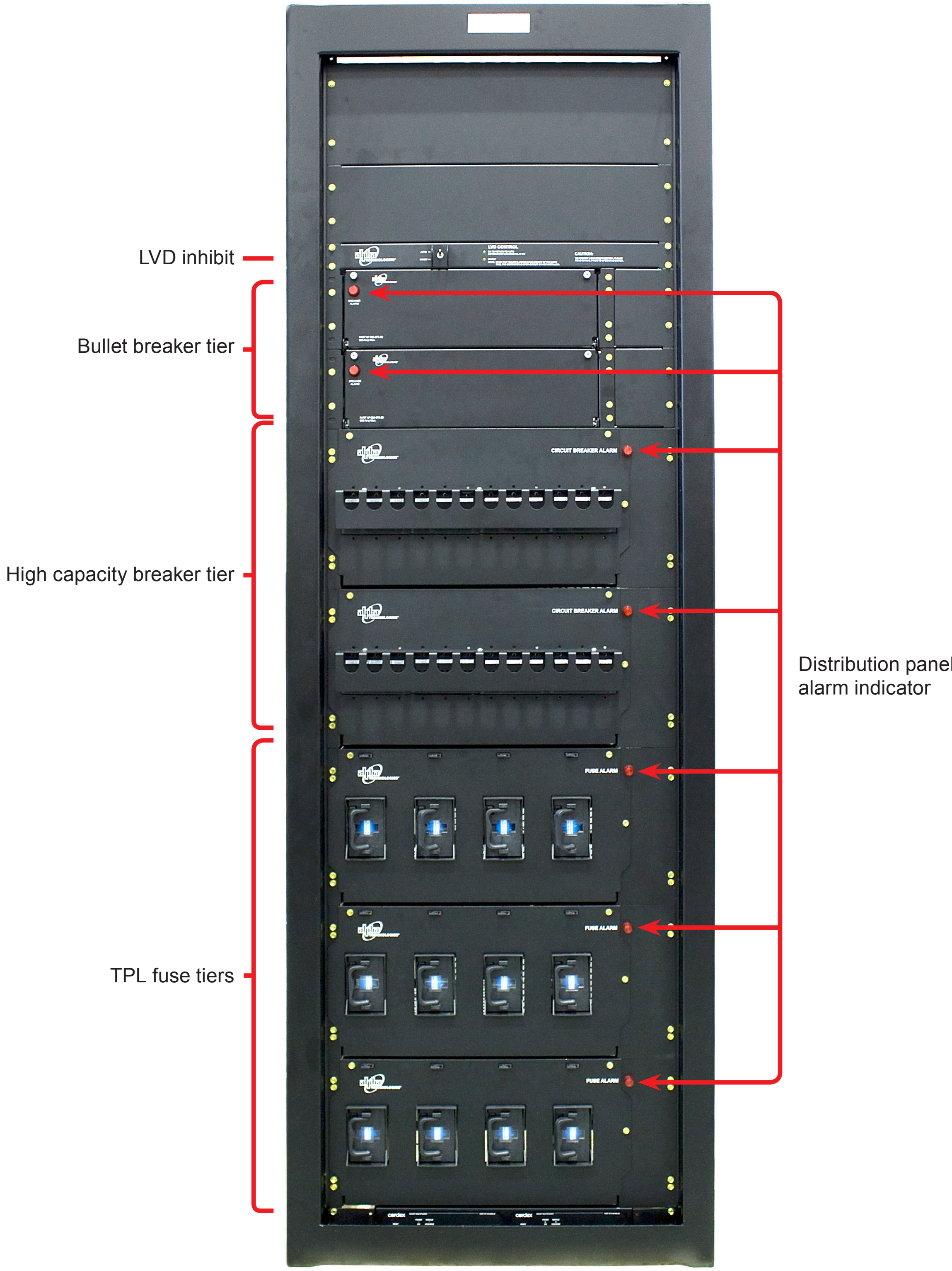


Figure 7 — Distribution Panel Options

4.3.1 4 Position TPL Tier Features

- Occupies 1 tier position
- 2000A tier rating
- Each position accepts max 800A TPL fuse
- Current on each TPL is monitored via an 800A shunt
- 2x landings per fuse 2 hole, 3/8" dia. on 1" center or 1/2" dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

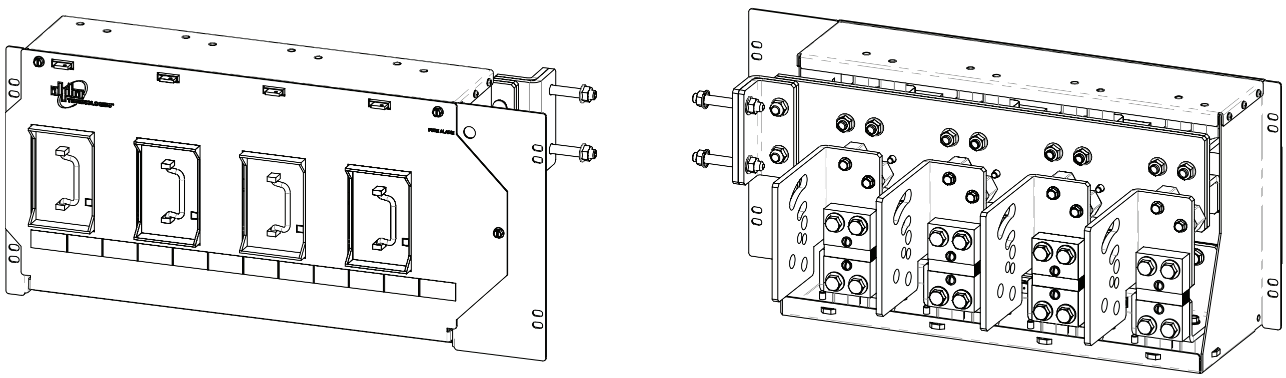


Figure 8 — 4 Position TPL

4.3.2 12x 1 Position high Capacity Breaker Tier Features

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 1P (250A max) high capacity breaker
- Individually monitored by 300A Shunts
- 1x landings per position 2 hole, 3/8" dia. on 1" center
- Option for whole Tier LVD 2000A disconnect

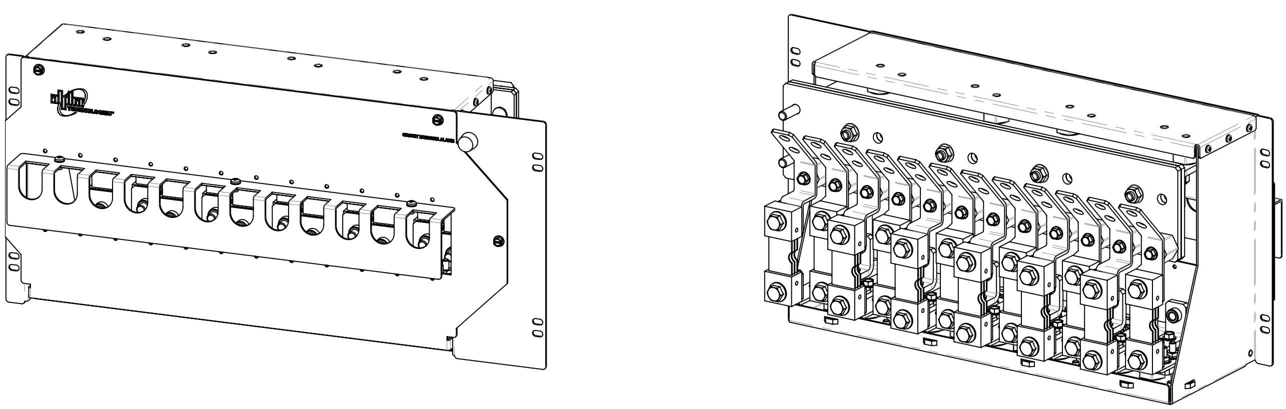


Figure 9 — 12x 1 Position High Capacity Breaker

4.3.3 6x 2 Position high Capacity Breaker Tier Features

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 2P (300A-400A) high capacity breaker
- Individually monitored by 800A Shunts
- 2x landings per position 2 hole, 3/8" dia. on 1" center & 1/2" dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

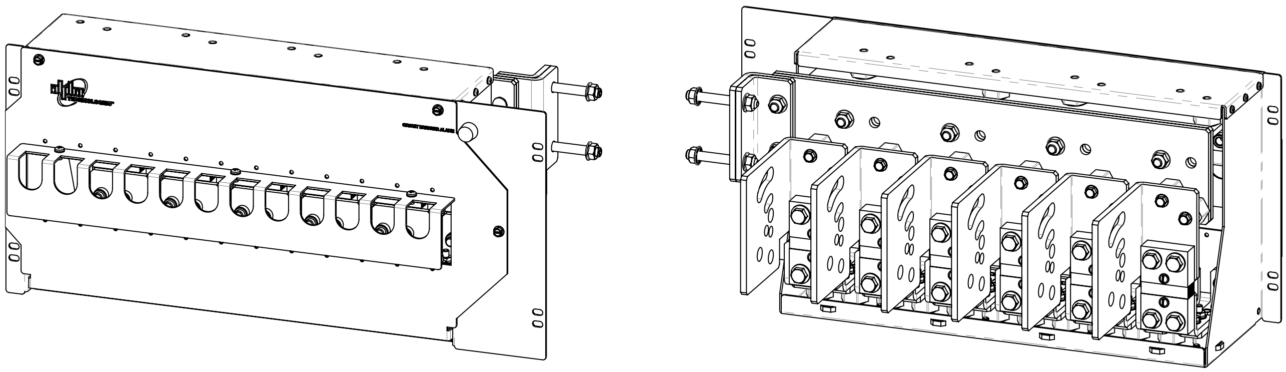


Figure 10 — 6x 2 Position High Capacity Breaker

4.3.4 4x 3 Position high Capacity Breaker Tier Feature

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 3P (500A-700A) high capacity breaker
- Individually monitored by 1000A Shunts
- 2x landings per position 2 hole, 3/8" dia. on 1" center & 1/2" dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

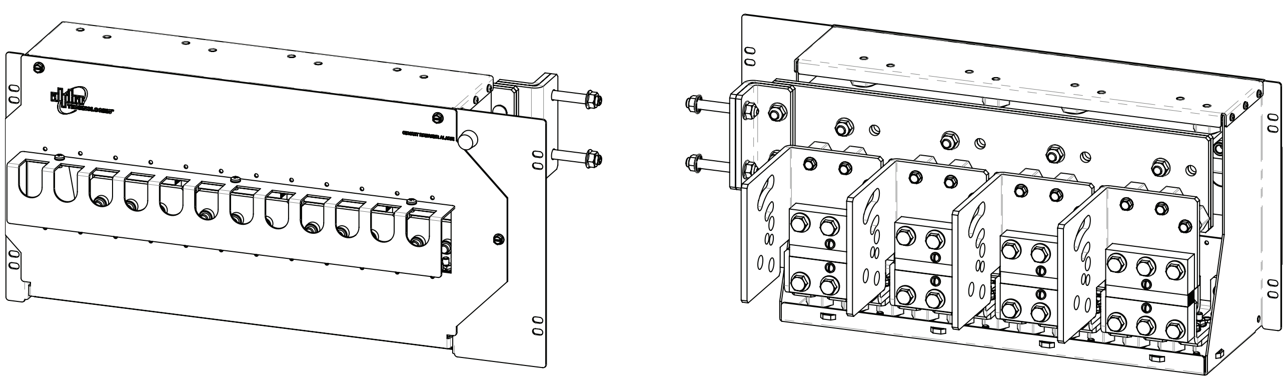


Figure 11 — 4x 3 Position High Capacity Breaker

4.3.5 3x 4 Position high Capacity Breaker Tier Features

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 4P (800A) high capacity breaker
- Individually monitored by 1000A Shunts
- 2x landings per position 2 hole, 3/8" dia. on 1" center & 1/2" dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

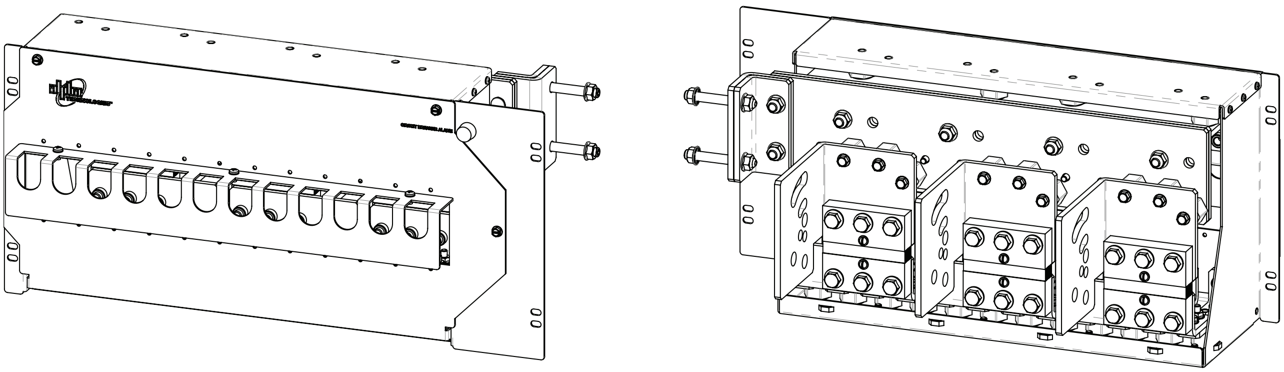


Figure 12 — 3x 4 Position High Capacity Breaker

4.3.6 2x 5 Position high Capacity Breaker Tier Features

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 5P (1000A) high capacity breaker
- Individually monitored by 1500A Shunts
- 2x landings per position 2 hole, 3/8" dia. on 1" center & 1/2" dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

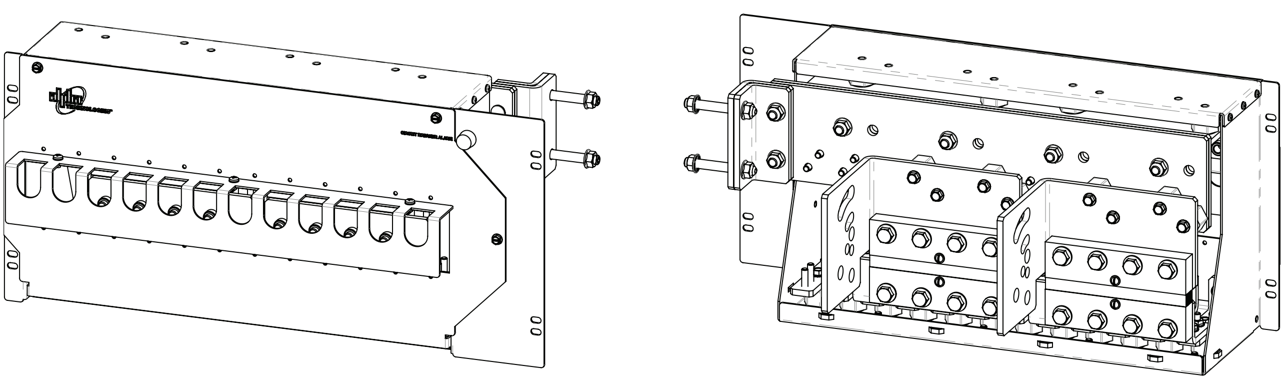


Figure 13 — 2x 5 Position High Capacity Breaker

4.3.7 2x 6 Position high Capacity Breaker Tier Feature

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 6P (1200A) high capacity breaker
- Individually monitored by 1500A Shunts
- 2x landings per position 2 hole, 3/8" dia. on 1" center & 1/2" dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

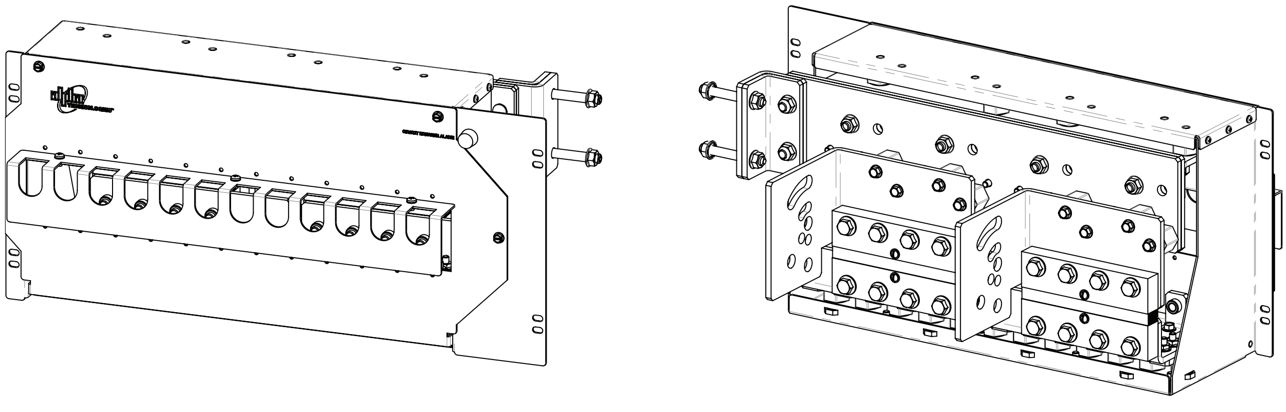


Figure 14 — 2x 6 Position High Capacity Breaker

4.3.8 4x 2 & 4x 1 Position high Capacity Breaker Tier Features

- Occupies 1 tier positions
- 2000A tier rating
- Can accept 4x1P (250A Max) high capacity breaker
- Can accept 4x 2p (300A-400A) high capacity breaker
- Individually monitored by 400A and 800A Shunts
- 1 Position 1x landings per position 2 hole, 3/8" dia. on 1" center
- 2 Position 2x landings per position 2 hole, 3/8” dia. on 1" center & 1/2” dia. on 1 3/4" center
- Option for whole Tier LVD 2000A disconnect

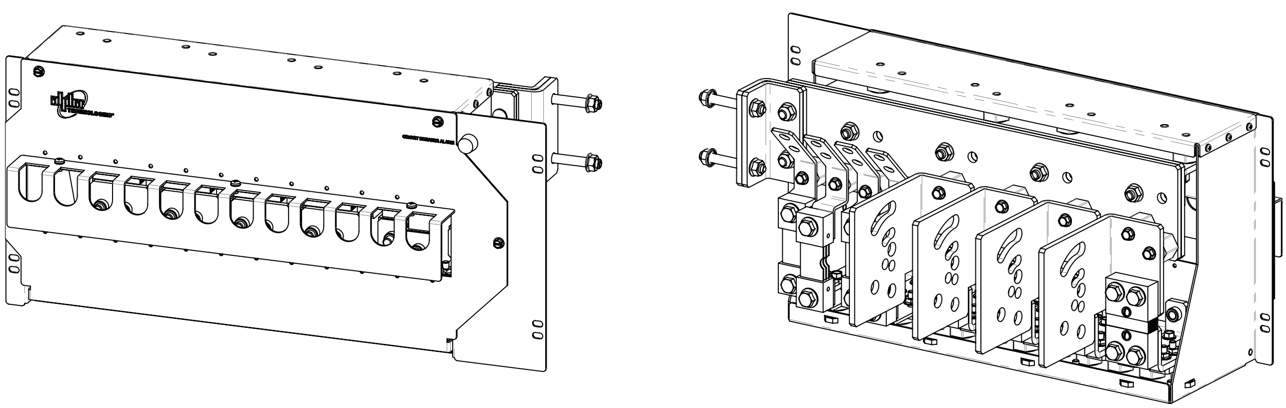


Figure 15 — 4x2 & 4x1 Position High Capacity Breaker

4.3.9 18 Position Bullet Breaker Tier Features

- Occupies 1/2 tier positions
- 600A tier rating
- Can accept standard 1P (125A), 2P (200A), and 3P (300A) plug in breakers
- Total shelf monitoring by 800A Shunt
- 1P breaker/fuse (1 pole, 2 hole, 1/4" dia. on 5/8" center)
- 2P & 3P (2 hole, 3/8" dia. on 1" center) via adaptors
- Option for whole tier LVD 600A disconnect
- 100A and 125A breakers/fuses need one breaker space

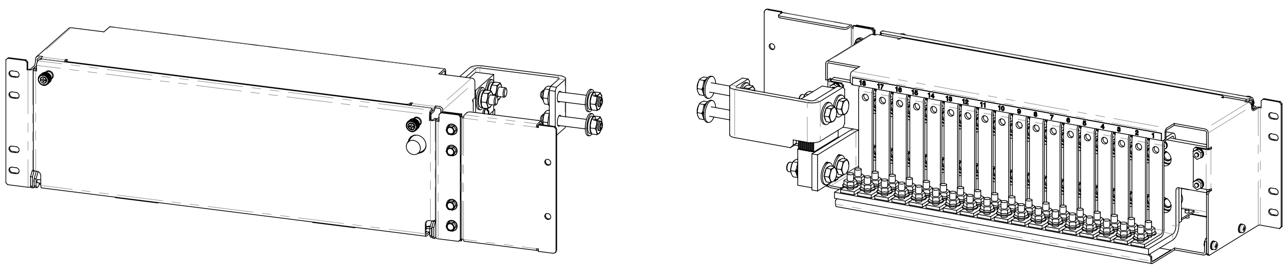


Figure 16 — 18 Position Bullet Breaker

4.3.10 18 Position Bullet Breaker Return Feature

- Occupies 1/2 tier positions
- 600A tier rating

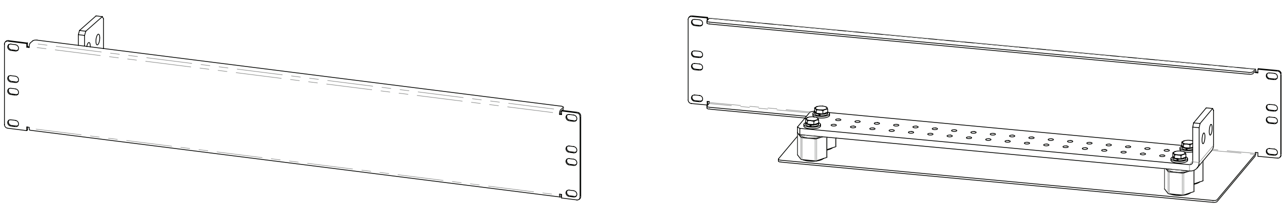


Figure 17 — 18 Position Bullet Breaker Return

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 6000A continuous operation.

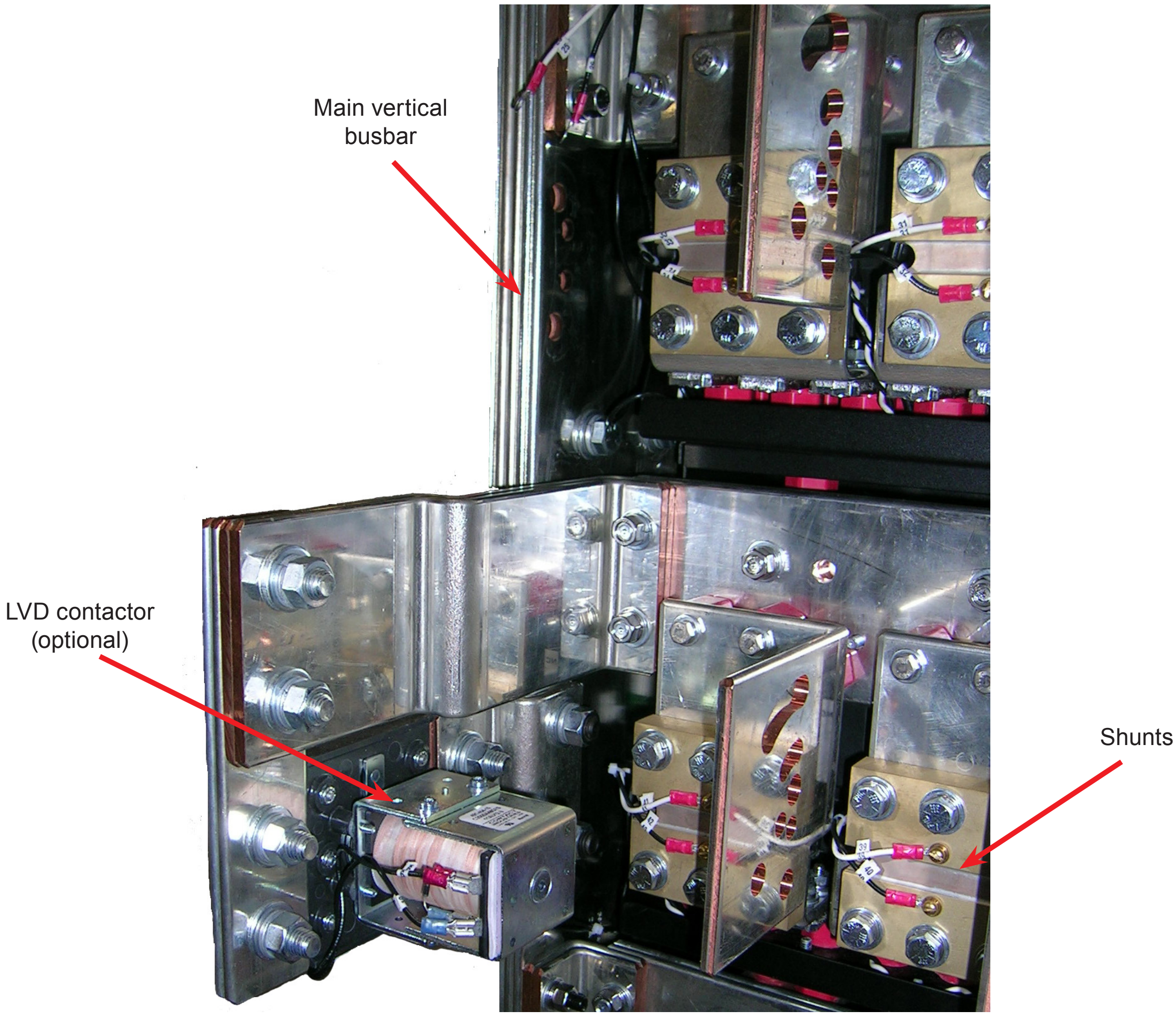


Figure 18 — Distribution Bay—DC Distribution Bus

4.3.12 Distribution Shunts

Each distribution panel has shunts (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 shelves of the individual distribution bay. The current measurements are sent to the controller, using CAN communications, for data logging and display.

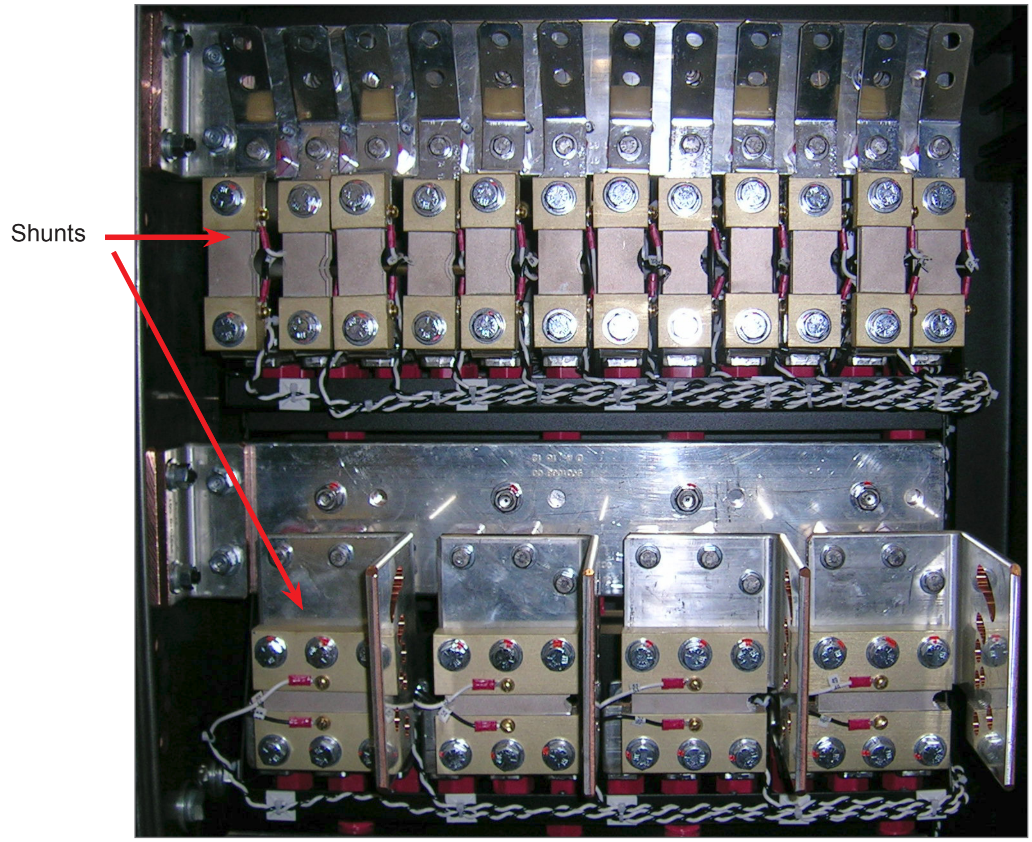


Figure 19 — Distribution Shunts

4.3.13 Low Voltage Load Disconnect (LVLD) Option

The LVLD feature provides automatic disconnect of the system loads after a prolonged power failure when the batteries have been fully discharged to a preset battery voltage. Contactors are installed in series with the load.

The system loads are automatically reconnected once AC is restored and battery voltage has risen above a preset value. The 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 2000A for TPL/bolt in breaker and 600A for plug-in bullet panel.

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

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

4.3.14 Low Voltage Battery Disconnect (LVBD, purchased separately)

The LVBD contactors, installed in the external battery disconnect panels, are placed in series with the batteries to provide automatic disconnect of the system batteries after a prolonged power failure when the batteries have been fully discharged.

The batteries are automatically reconnected once AC is restored. Control is performed by the controller, and is triggered by the battery voltage. Additional field wiring for this functionality is required; see battery disconnect manual for details.

4.3.15 Distribution Panel Alarms

Fuse/Breaker alarms occur when one or more fuse or breaker has opened. Each Breaker/Fuse panel is equipped with one alarm which is wired to the system controller.

Indication is provided by a red lamp on each distribution panel (Figure 7).

4.4 DC Inter-bay Copper

The inter-bay busbar is available in 4000A, 8000A and 12000A nominal sizing as required. Maximum continuous load ratings are 80% due to shunt capability. All live inter-bay bus work is contained within the system cabinets. Return busbars can be factory ordered as internal for smaller systems with 12 or less large capacity circuits, or external for systems with more than 12 distribution circuits.

Figure 20 shows 12000A buswork with internal return, which can be expanded to include one more bay.

Table F on page 37 lists the available busbar kits and the corresponding drawing numbers. Typically these drawings ship with the pre-packaged busbars for assembly at the destination.

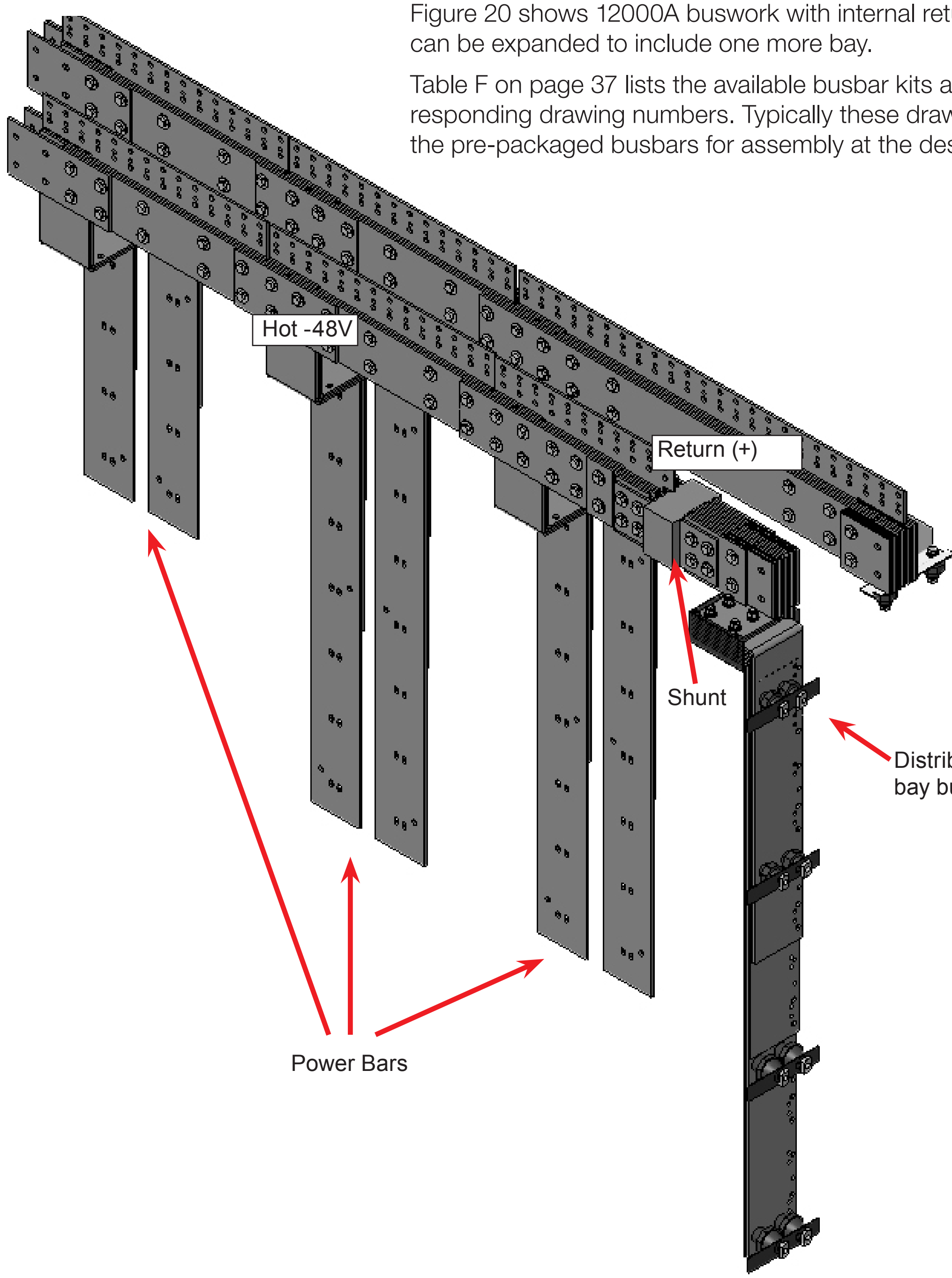


Figure 20 — Inter-bay DC Connections (Front View)

4.4.1 Live Bay Expansion

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

4.4.2 Internal Return Bar (Optional)

The positive DC inter-bay common bar 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 positive, and site reference ground. There are 24 termination points on a basic power system.

4.4.3 -48Vdc Busbar (Optional)

The -48Vdc inter-bay bar also runs horizontally across the top of the distribution and power bays (within the bays), interconnecting the vertical -48Vdc distribution buses in each bay. There are 11 termination points on a basic power system.

4.4.4 External Return Bar (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 bar is required for systems that have more than 12 large capacity circuits in the distribution bays.

It is available with up to 3 horizontal bars and

- 202 sets of 1/2" holes on 1-3/4" centers or
- 202 sets of 3/8" holes on 1" centers

Maximum current carrying capability is 4000A per section. Multiple bars can be installed for a total of 8000A (2 bar) and 12000A (3 bar).

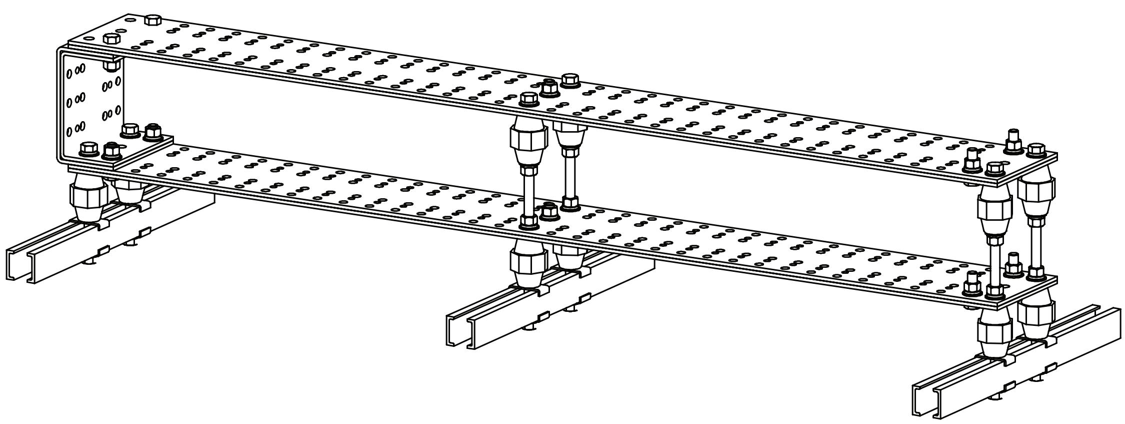


Figure 21 — External Battery Return Ground Bar (2 bars shown)

4.5 Cordex HP Controller

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

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

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

Figure 22 — Cordex CXC HP Controller

4.5.1 Controller Features

The controller has the following features:

- Front touchscreen: full color LCD touchscreen display, 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.
- Front panel reset: for emergency use only to restart the controller if the unit touch screen or home button are not responding.
- Front panel LEDs: for alarms, progress and status indication.
- Audio speaker: built-in audio tones during active alarms, and can be disabled if required.
- Ethernet: dual ports 10/100 BaseT Ethernet connection on both the front and rear of the controller for remote or local communication.
- USB: dual ports, on each on the front and rear of the controller for upgrades and file management via a standard USB flash drive.
- CAN: dual independent CAN bus ports for communication with the Alpha Cordex™ and AMPS family of products, which allows for a greater number of devices.
- Real-time clock with field replaceable lithium battery: allows for timestamps on alarms and events.
- System fail alarm/relay: which activates when there is a major internal failure. During such a condition the unit attempts to reset.

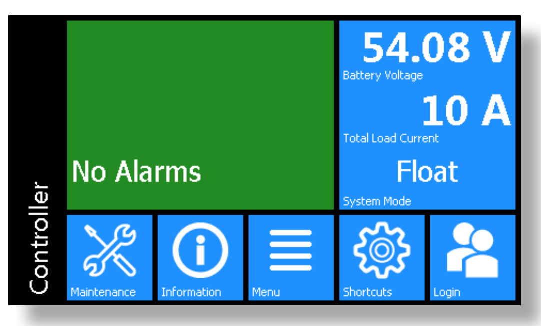


Figure 23 — LCD Color Touchscreen Display

4.6 External Peripherals

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

4.6.1 L-ADIO

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

Figure 24 — L-ADIO I/O Peripheral

Analog Inputs

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

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

Four temperature input channels, T1 – 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 0V to 5V and is powered internally from the L-ADIO.

Digital Inputs

The L-ADIO accommodates up to eight digital input channels, D1 – 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/control signals from rectifiers, converters 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 L-ADIO 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 L-ADIO contains three LEDs for peripheral status indication.

LVD – Yellow	=	LVD Override Engaged
Power – Blue	=	Power present to device
Comms – Green	=	L-ADIO has been acquired by the controller

Front Panel Reset Button

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

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

CAUTION – Pressing the reset button will cause the L-ADIO to lose communication with the controller.

LVD Override

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

To engage the LVD override function, press 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, press and hold the LVD button again for three seconds.

4.6.2 6I-ADIO

The 6I-ADIO is an analog input peripheral providing six isolated shunt inputs. The 6I-ADIO communicates on CAN bus to the controller and provides access to shunt inputs via the controller.

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

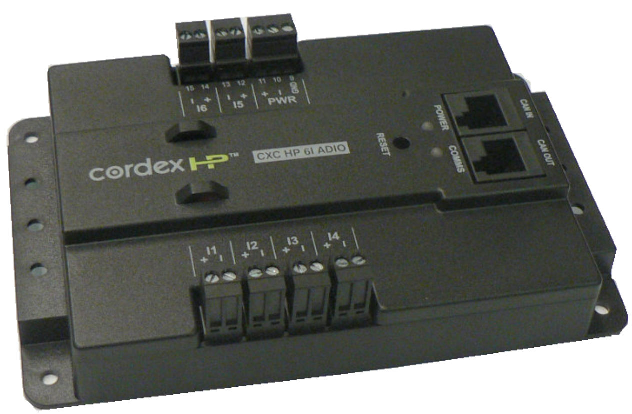


Figure 25 — 6I-ADIO Peripheral

4.6.3 Redundant Input Power Module

The redundant input power module (RIPM) provides multiple power inputs to power the controller and any I/O peripherals such as the L-ADIO. The unit enables users to wire system power into the control devices from multiple locations (e.g., on battery and load side of LVD's or A and B power system(s)) and provides Diode-or protection between power inputs.

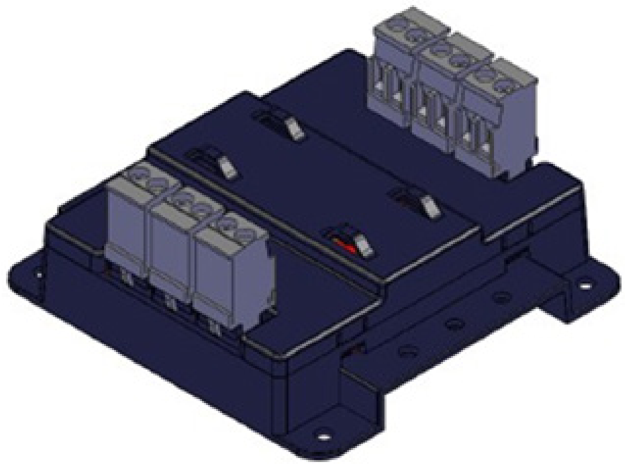


Figure 26 — Redundant Input Power Module

4.6.4 Shelf/Bay ID

The CXC HP Shelf/Bay ID peripheral enables users to identify individual 12kW/480 (3-Phase) 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. 12kW/480 rectifiers can then communicate the specific bay, shelf, and slot identification back to the master controller. The controller's LCD screen 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 the 12kW/480 rectifiers determine their slot position automatically within a shelf.

Figure 27 — Shelf/Bay ID

5. Pre-Installation Preparation

5.1 Site Selection

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

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

- Dimensions for one bay:
    - mm: 2133H x 711W x 711D
    - Inches: 84H x 28W x 28D
- Avoid areas that may be subjected to hot air exhaust from nearby equipment.
- Provide adequate space for safe installation and maintenance personnel
    - Rear: 3ft (1m) [Space not required if top access is provided for power bay]
    - Front: 3ft (1m)
    - Sides: no clearance required
    - Top: clearance required for cables and external return bar (optional)

5.1.1 Floor Plan Layout

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

Consider the following before selecting a location for the CXPS-C 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 rectifiers
- 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/DC power source
- Understand the full load on the DC system
- Window for working hours and other similar restrictions
- How much and what kind of prep work can be done in advance
    - Reinforce floors
    - Install distribution panels
    - Install cable racks
    - Run wiring
    - Minimize cable lengths
    - Minimize cable flow and congestion

5.1.2 Installation component requirements

Not Supplied

- Concrete mounting hardware
- AC electrical conduit, cable and fittings
- External DC conduit, cable and fittings
- Auxiliary frame (2" x 9/16") 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 Internet Explorer 8 (or higher), 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:1/4" drive, 0-150 in-lb for battery post connections
- Torque wrench: 3/8" drive, 0-100 ft-lb for system connections
- Insulating canvases as required (2' x 2', 1' x 1', 3' x 3', etc.)
- Cutters and wire strippers (#14 to #22 AWG) [2.5 – 34 mm^2]
- Insulated hand tools listed below:

    Combination wrenches

    Ratchet and socket set

    Various screwdrivers

    Electricians knife

    Fine tipped slot screwdriver (“tweaker”)

    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, i.e., civil, structural etc. 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.

6. Inspection

6.1 Packing Materials

Alpha 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.

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

Almost all of Alpha's packaging material is from sustainable resources and/or is recyclable. See the following table for the material and its environmental codes.

6.1.1 Returns for Service

20 PAP/PCB	01 PET	04 PE-LD	06 PS	40 FE	41 ALU	50 NW
Cardboard	**Polyethylene Terephthalate**	**Low Density Polyethylene**	**Polystyrene**	**Steel**	**Aluminum**	**Wood**
Packing boxes Caps	Flexible film Packaging	Bubble wrap Shrink wrap Plastic bags	Foam	Strapping on pallets	Strapping on pallets	Pallets Lumber

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.

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

6.2 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 for advice on the impact of any damage.

6.3 General Receipt of Shipment

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

Call Alpha Technologies if you have any questions before you proceed: 1 888 462-7487.

7. Frame Installation

NOTE:

No rectifiers should be installed at this time. Do not install rectifiers until told to do so 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 rectifiers in the power system and to allow easy access to the power system components.

7.1 Floor Drilling for Standard Anchoring

NOTE:

Earthquake anchoring is the type used in earthquake areas up to Zone 4. The CXPS-C power system frame is earthquake qualified when properly anchored to a 3000 psi (2.11 kg per sq. mm) 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 diagram also shows the preferred location for the anchor holes within the slots.

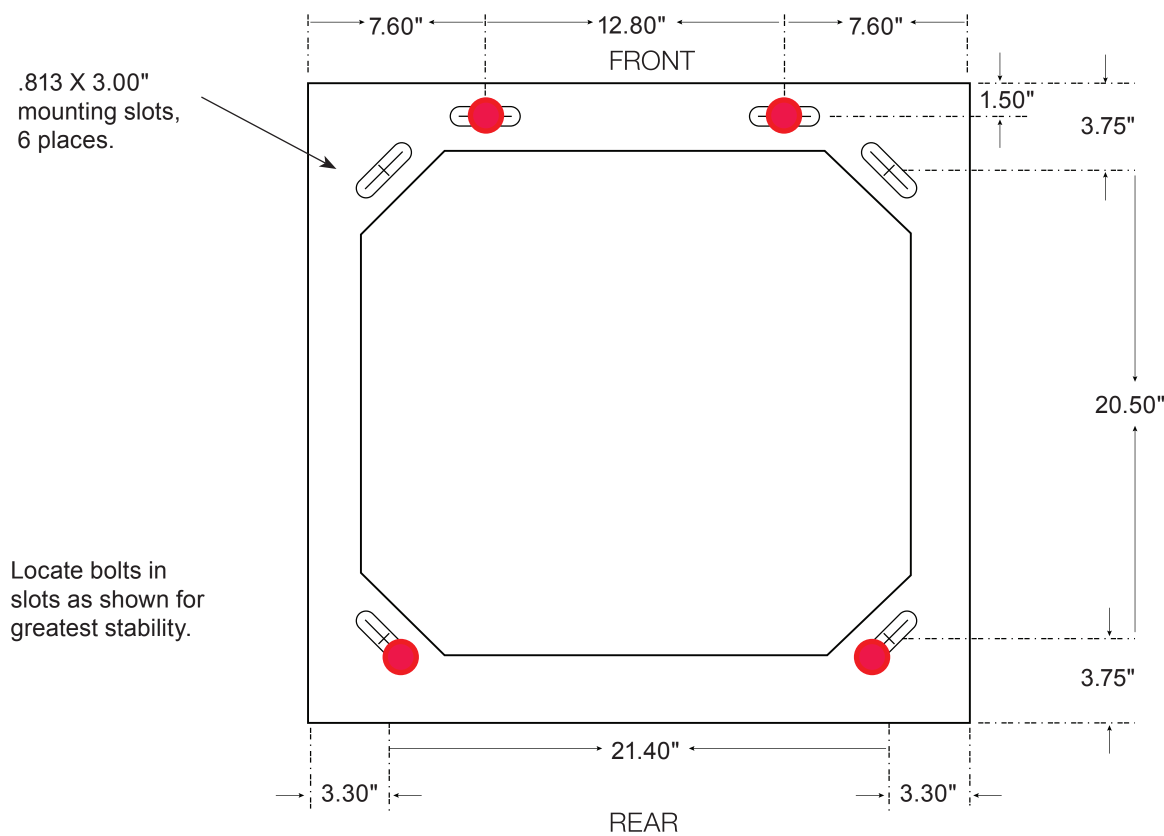


Figure 28 — Base Dimensions and Mounting Holes

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 FINGERTIGHT.
3. Check that the bay is level front-to-back and side-to-side.

CAUTION!

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.**

NOTE:

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

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

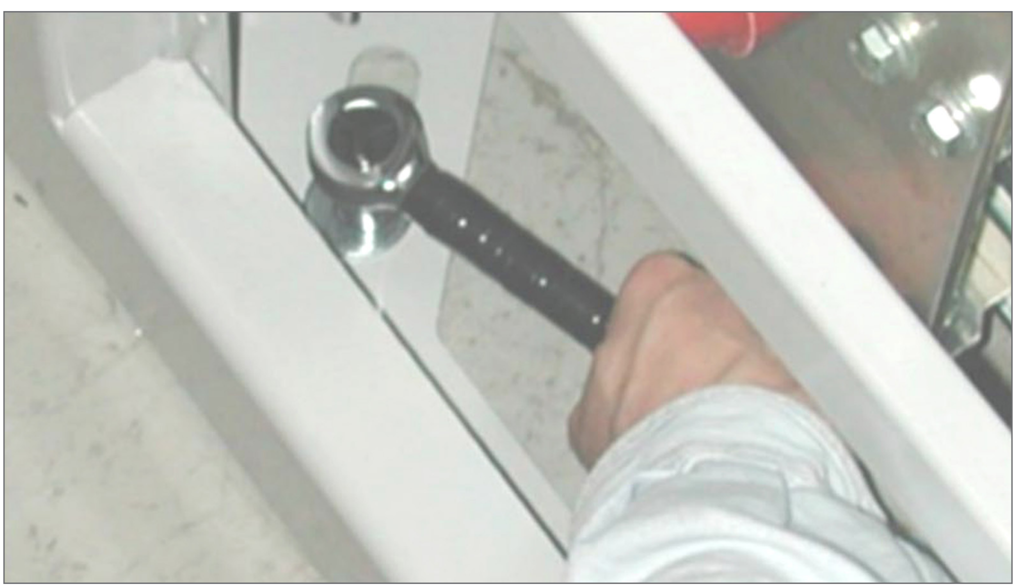


Figure 29 — Securing Power System to Concrete Floor

7.3 Securing Adjacent Bays

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

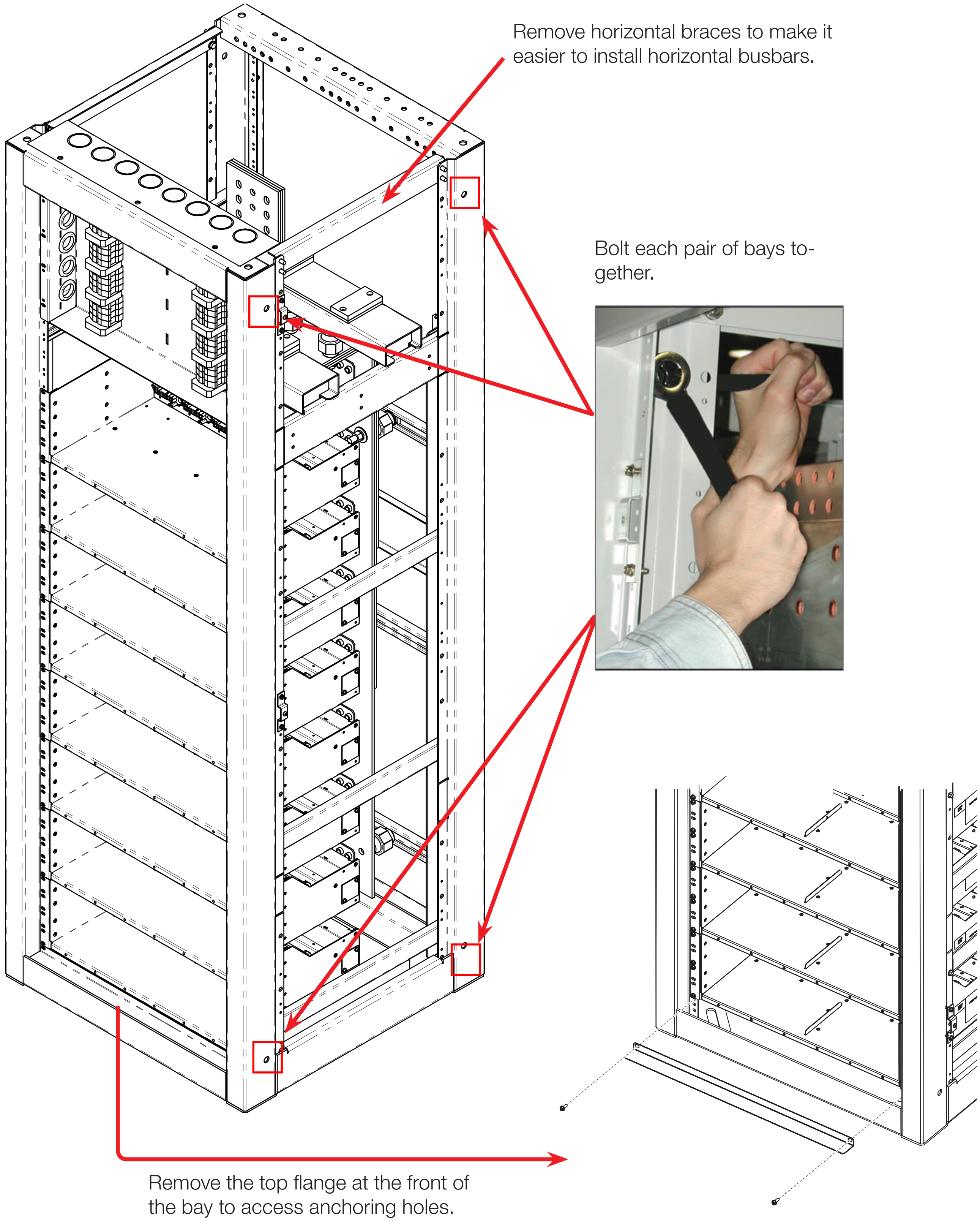


Figure 30 — Bolting Adjacent Bays Together

7.4 Installing the Inter-bay DC Bus Work between Adjacent Frames

The inter-bay DC bus work ships as a kit that is sized according to the number of rectifiers 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 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 plant. The drawings listed in Table F are also included at the end of this manual.

Table F — DC Inter-bay Bus Drawings

Drawing Number	Description
0250002-06	Centralized plant distribution outline drawing
0250009-06	Centralized plant rectifier outline drawing
0380036-001-F0	12000A Busbar connectivity kit with internal ground
0380036-002-F0	8000A Busbar connectivity kit with internal ground
0380036-003-F0	4000A Busbar connectivity kit with internal ground
0380038-001-F0	12000A Busbar connectivity kit with external ground
0380038-002-F0	8000A Busbar connectivity kit with external ground
0380038-003-F0	4000A Busbar connectivity kit with external ground
0380039-F0	External return bar kit, 4000A
0380040-F0	Legacy busbar connectivity kit
0380102-F0	Distribution to distribution internal ground bus
0380103-F0	Distribution to distribution hot bus, with landings
0380104-F0	Distribution to distribution hot bus, no landings
0380106-001-F0	12000A Busbar connectivity kit with internal ground, reversed
0380106-002-F0	8000A Busbar connectivity kit with internal ground, reversed
0380106-003-F0	4000A Busbar connectivity kit with internal ground, reversed
0380107-001-F0	12000A Busbar connectivity kit without internal ground, reversed
0380107-002-F0	8000A Busbar connectivity kit without internal ground, reversed
0380107-003-F0	4000A Busbar connectivity kit without internal ground, reversed
0380119-F0	Busbar extender kit, four cables

Procedure

1. Assemble the inter-bay bus work with the bolts that ship in the kit with the copper buses.
2. Once assembled, torque all bolts to 75 ft/lbs.
3. Proceed with final setting of the bay floor anchors.

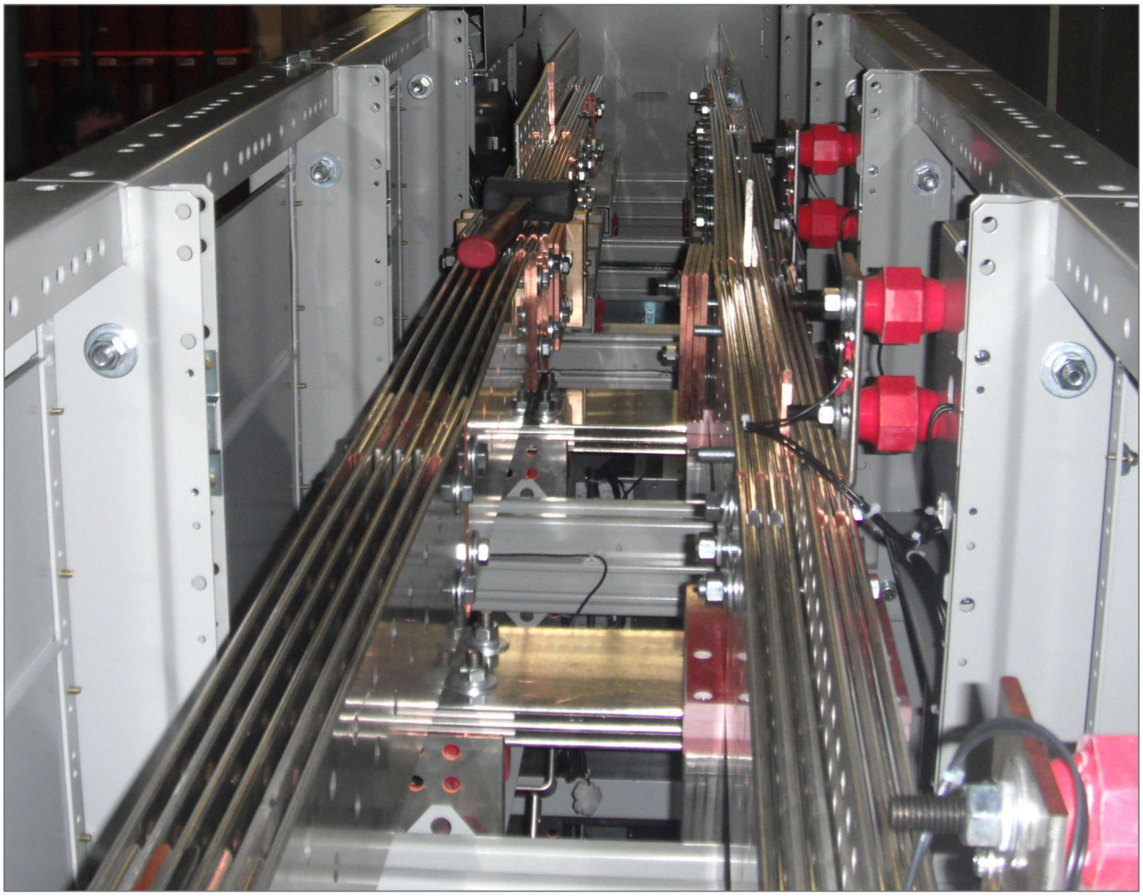


Figure 31 — Example of Installed Inter-bay Buswork

7.5 Connecting the Shunt and Inter-Bay 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.

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

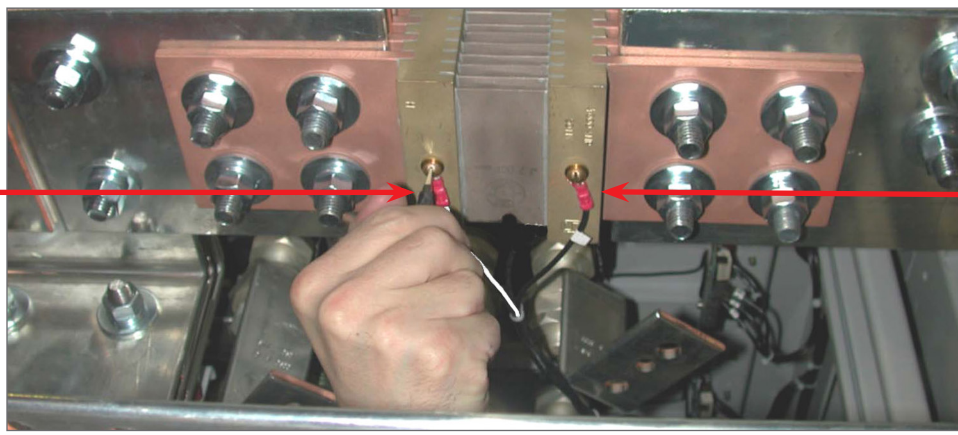


Figure 32 — Shunt Connections

3. Locate and connect the inter-bay alarm signal connectors.
4. Connect the inter-bay alarm signal connectors between the 2nd and 3rd frames, the 3rd and 4th frames, and so on.

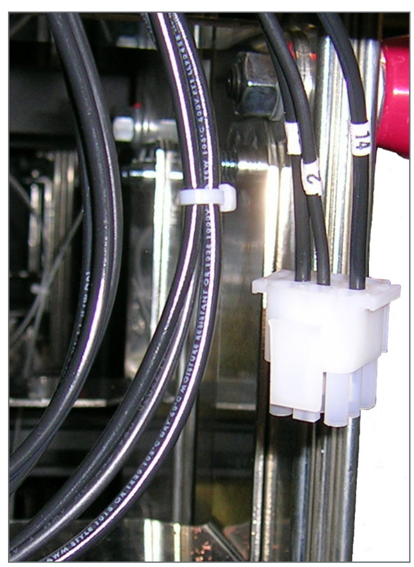


Figure 33 — Inter-bay Wiring Harness

7.5.1 Inter-bay CAN Bus Cables - Controller

CAN bus connection provides a communication path between the controller and rectifiers, ADIO Shelf/Bay ID, and shunt mux(es) if installed. CAN bus cabling is sequentially daisy-chained from the controller to the 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 mux installed in the distribution bays. If your system has no shunt mux, 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 mux in the outermost distribution bay.
3. Locate and connect CAN bus cables between the shunt mux 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 L-ADIO and connect the CAN bus from CAN OUT on the L-ADIO 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 34 or plug the removed terminator from the L-ADIO at step 6.

Remove the terminator in the CAN OUT port on the L-ADIO if connecting to an extension power bay(s).

Figure 34 — CAN OUT Port Terminator

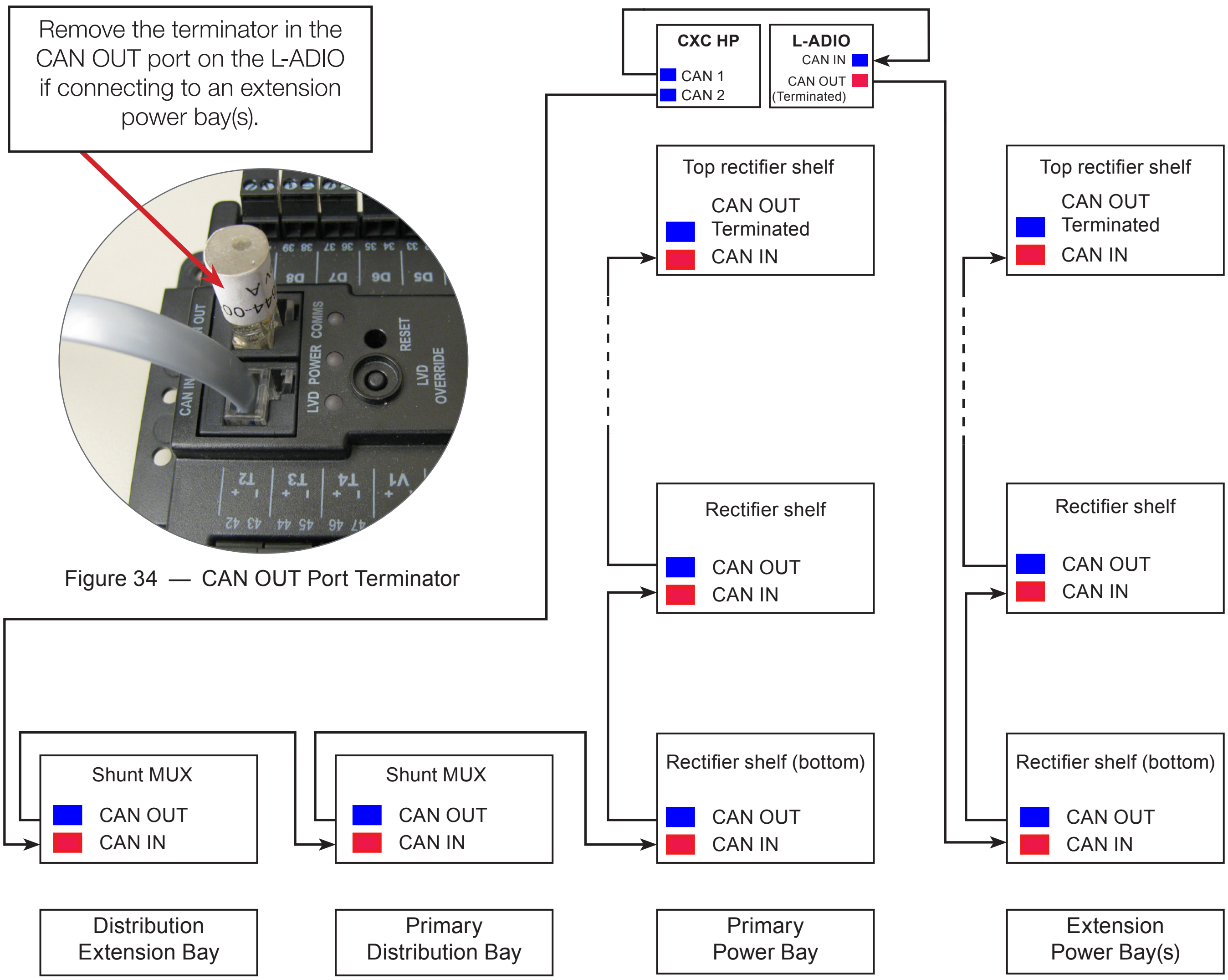


Figure 35 — Controller, CAN Bus cabling 4.0kW Power Bay

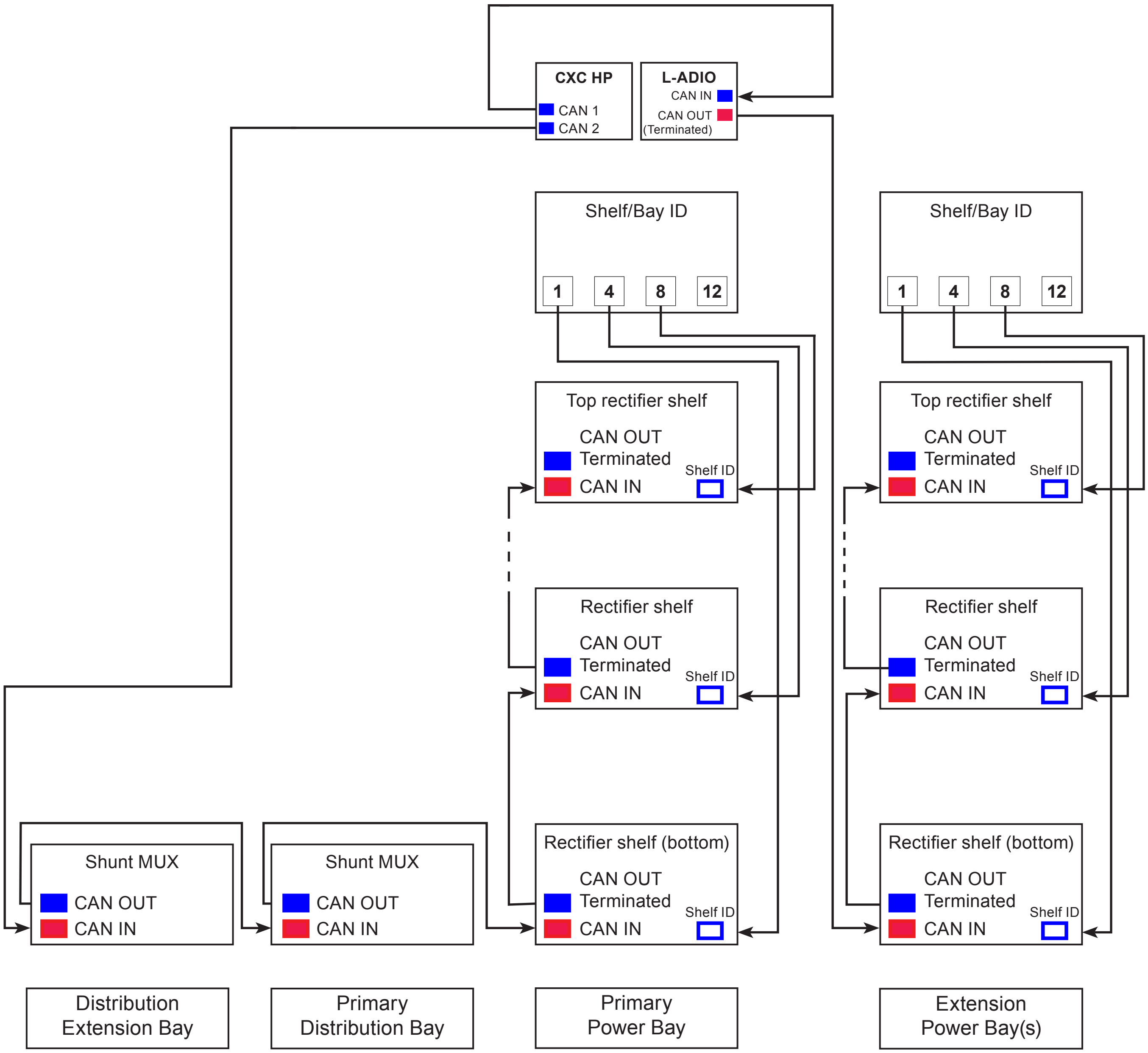


Figure 36 — Controller and Shelf/Bay ID, CAN Bus and Shelf ID cabling

Expanding and Existing System—CAN Bus Cables:

NOTE:

If your system has redundant rectifiers, it is recommended to power off the left most rectifier 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 35 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 in the top shelf of the existing power bay. (Refer to the Rectifier Shelf manual for the removal and re-insertion procedure.)
    b. Flip the DIP switches from Termination Enabled to Termination Disabled—see Figure 37.
    c. Replace the rectifier.

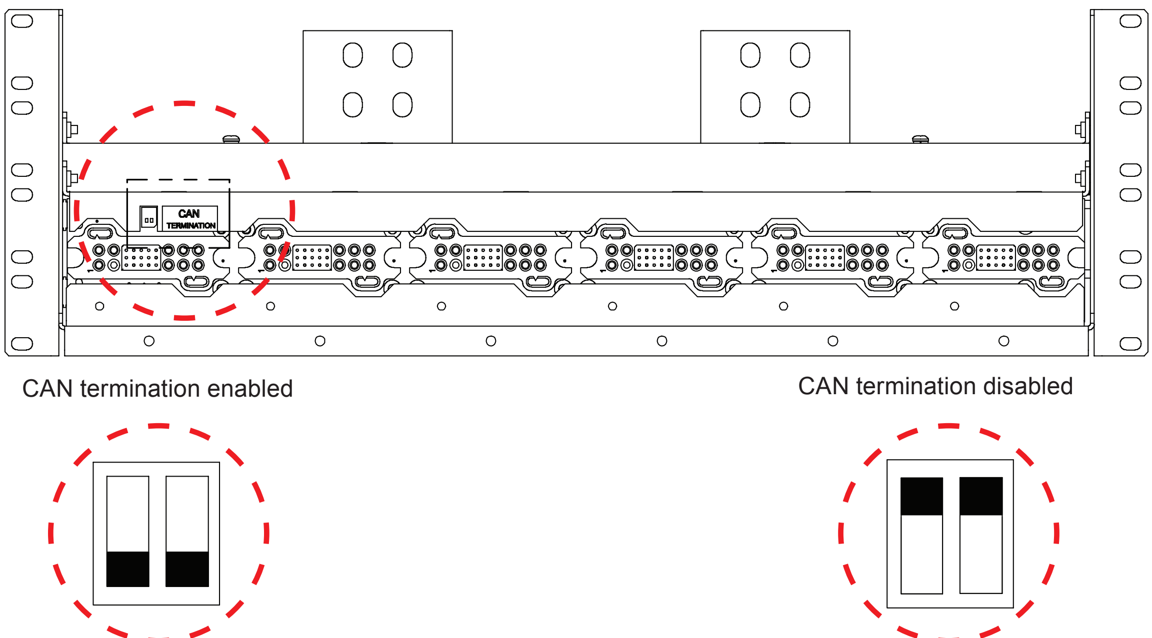


Figure 37 — CAN Bus Termination 4.0kW

2. Connect the inter-bay CAN bus cable, which ships with the expansion bay, to the CAN OUT connector of the top rectifier shelf of the expansion bay (Figure 38).

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 35.

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 35 using cables from the cable kit where necessary.

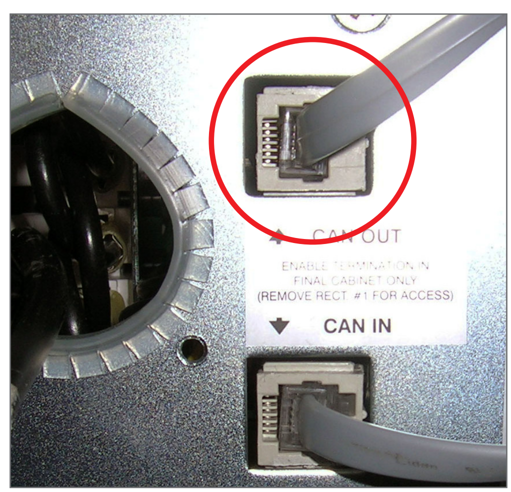


Figure 38 — CAN IN/CAN OUT Connection 4.0kW

7.5.2 LVBDs (purchased separately)

If battery disconnect contactors are used:

1. Connect a secondary power source, from either side of the LVBD, to the controller. (Refer to "4.6.3 Redundant Input Power Module" on page 30)
2. Connect battery disconnect panels to the controller's battery fuse alarm input and LVBD control.

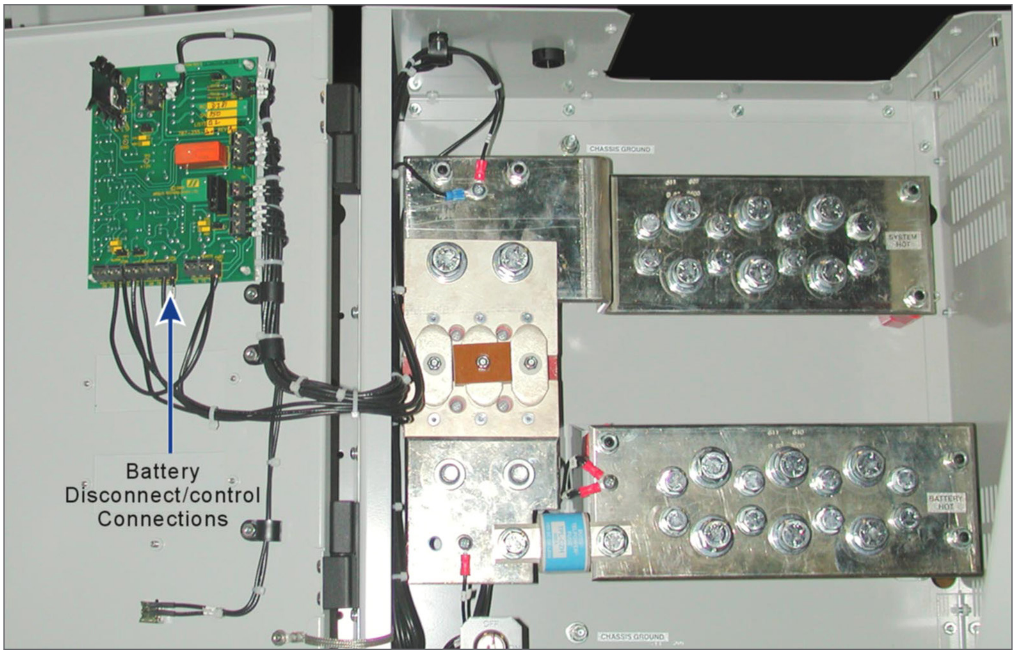


Figure 39 — Battery Disconnect Connections

7.6 Mounting the Optional External Return Bar

The expandable external return bar kit (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 batteries.

The base kit has a 4000A capacity.

1. Before joining return bar components together, ensure that all contact surfaces on the busbars are clean and coated with a thin coat of NO-OX-ID "A" compound (or approved equivalent).
2. Follow the instructions included with the kit (0380039-F0), to assemble and mount the kit on a customer-supplied auxiliary framing superstructure away from the system.

NOTE:

Requires customer supplied auxiliary frame (2" x 9/16").

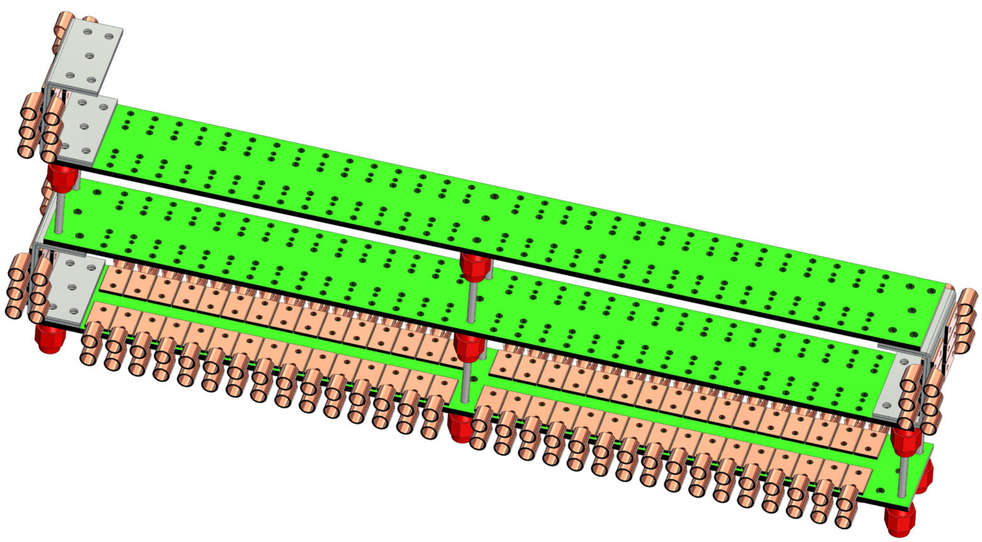


Figure 40 — External Battery Return Bar Kit

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

Figure 41 — Battery Installation

7.7.1 Preparation/Mounting

Batteries should be located in a temperature-controlled environment. The temperature should be regulated at approximately 25°C (77°F). 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 circuit breakers, and fuses on the distribution panels are either in the OFF position or removed.

Use a corrosion-inhibiting agent such as NO-OX or NCP-2 on all battery terminal connections.

1. Assemble battery rack (if required) and the cells or mono-blocks as per the installation instructions supplied with the batteries.
2. Ensure that the battery output cabling will reach the [+] and [–] 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 no-oxide "A" grease from battery terminals.
4. Burnish terminal posts with a non-metallic brush, polishing pad or 3M-type scotch pad.
5. Apply a light coating of no-oxide "A" grease to the terminal posts.
6. If lead plated inter-unit connectors are used, they should also be burnished and no-oxide "A" grease applied as above. Install the inter-unit connectors.
7. After all battery connections are completed, torque per battery specifications (typically 100 in-lbs).
8. See 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; i.e., away from heating or cooling sources.

NOTE:

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

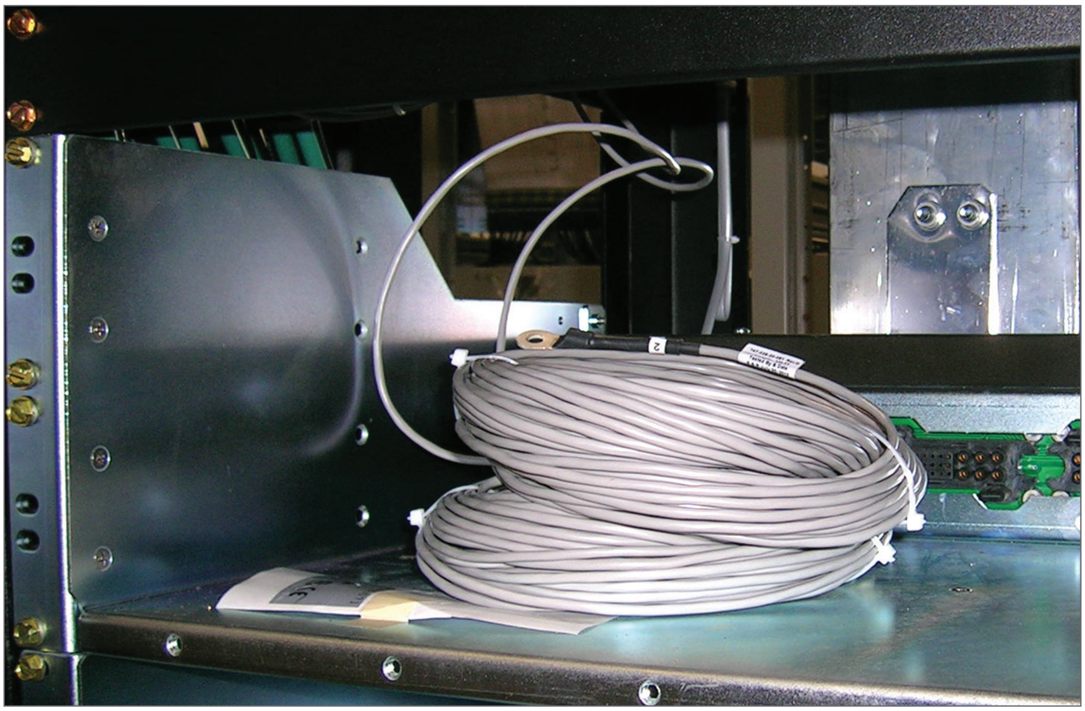


Figure 42 — Battery Temperature Probes

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 literature for guidelines. See the following table for typical maintenance report:

Company: ____________________ Date: ____________

Address: ____________________

Battery location and/or number: ____________________

No. of cells: __________ Type: ______________ Date new: ____________

Date installed: __________ Float voltage: ____________ Ambient temp.: __________

Table G — Typical VRLA battery maintenance report

Cell #	Serial #	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 Alpha CXPS-C series power system.

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

8.1 Installation Notes

8.1.1 Installer Responsibility

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

- Utility input to the system
- Battery strings
- System to the load
- Chassis and battery return to the reference ground
- Inter bay 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 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 code(s) 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.

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

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 (NEC, CEC, etc.) for guidelines. If required, increase the size of the cable to meet the code.

Refer to Table H for cable size equivalents.

Table H — Cable size equivalents (AWG to Metric)			
Cable size	**Circular mils**	**Square millimeters**	**Equivalent metric cable**
20 AWG	1020	0.519	1
18 AWG	1624	0.8232	1
16 AWG	2583	1.309	1.5
14 AWG	4107	2.081	2.5
12 AWG	6530	3.309	4
10 AWG	10380	5.261	6
8 AWG	16510	8.368	10
6 AWG	26250	13.30	16
4 AWG	41740	21.15	25
2 AWG	66370	33.63	35
0 AWG (or 1/0)	105600	53.48	50 or 70
00 AWG (or 2/0)	133100	67.42	70
0000 AWG (or 4/0)	211600	107.2	120
313 MCM (or kcmil)	313600	159	150 or 185
350 MCM (or kcmil)	350000	177.36	185
373 MCM (or kcmil)	373700	189	185 or 240
500 MCM (or kcmil)	500000	253.36	300
535 MCM (or kcmil)	535300	271	300
750 MCM (or kcmil)	750000	380.00	400
777 MCM (or kcmil)	777700	394	400

8.1.3 Recommended Torque Values

Recommended torque values for connection to the power system:

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

Table I — Recommended torque values	
1/4"	8.8 ft-lbs
3/8"	32.5 ft-lbs
1/2"	73 ft-lbs

Grade 5 rated hardware is required for these torque values.

8.2 Connecting the Frame and Reference Grounds

CAUTION!

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

NOTE: This power system is suitable for installation as part of a Common Bonding Network (CBN) and is intended to be used in a DC-C configuration (common DC return).

Internal battery return bus

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

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

Optional external battery return bar

Unless specifically instructed otherwise, the battery return reference (BRR) lead is usually connected at the external battery return busbar shown in Figure 43.

Frame ground

Connect a cable (typically a 2/0 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.

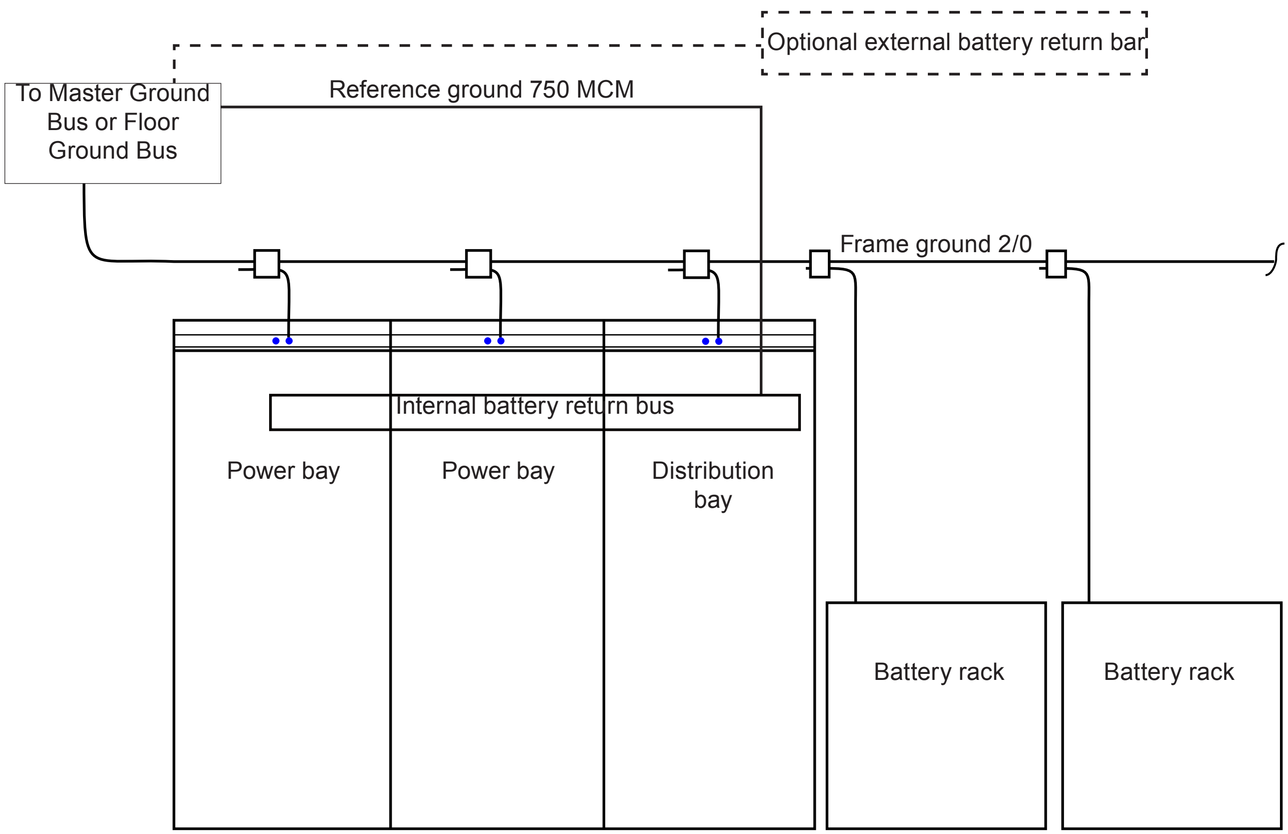


Figure 43 — Battery Return Busbars, Frame Ground and Battery Return Reference

8.3 AC Supply for the Rectifiers

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

Table J — AC Supply Specifications

Power Bay	Feed	Input AC Voltage (Nominal)	Recommended Breaker (A)	Connection Type	Recommended Wire Size (AWG)	Knockout Dimension (in)	Knockout Quantity
4.0kW Rectifier							
2000A/4000A	4/8	208	100	3W + PE	2	2.0 (1.5 KO)	8
2000A/4000A	4/8	277/480	50	3W + N + PE	6	1.5 (1.25 KO)	8
2000A/4000A	8/16	208	50	3W + PE	6	1.5 (1.25 KO)	16
2000A/4000A	8/16	277/480	30	3W + N + PE	8	1.5 (1.25 KO)	16
4000A	6	277/480	60	3W + N + PE	6	1.5 (1.25 KO)	8
12kW/480 Rectifier							
2000A/4000A	4/8	480	50	3W + PE	6	1.5 (1.25 KO)	8
2000A/4000A	8/16	480	30	3W + PE	8	1.5 (1.25 KO)	16
4000A	6	480	60	3W + PE	6	1.5 (1.25 KO)	8

Pre wired AC panel

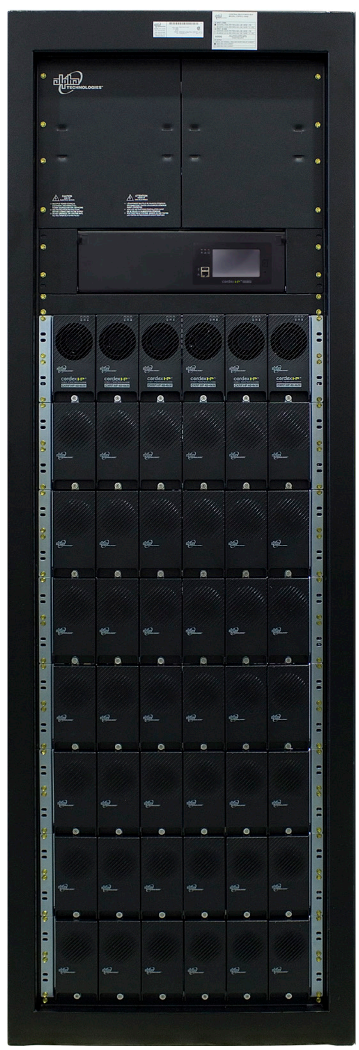


Figure 44 — AC Distribution

8.3.1 Wiring the AC Distribution Panel

WARNING!

Verify that AC breakers are off and locked out at the AC Input Panel.

NOTE:

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.

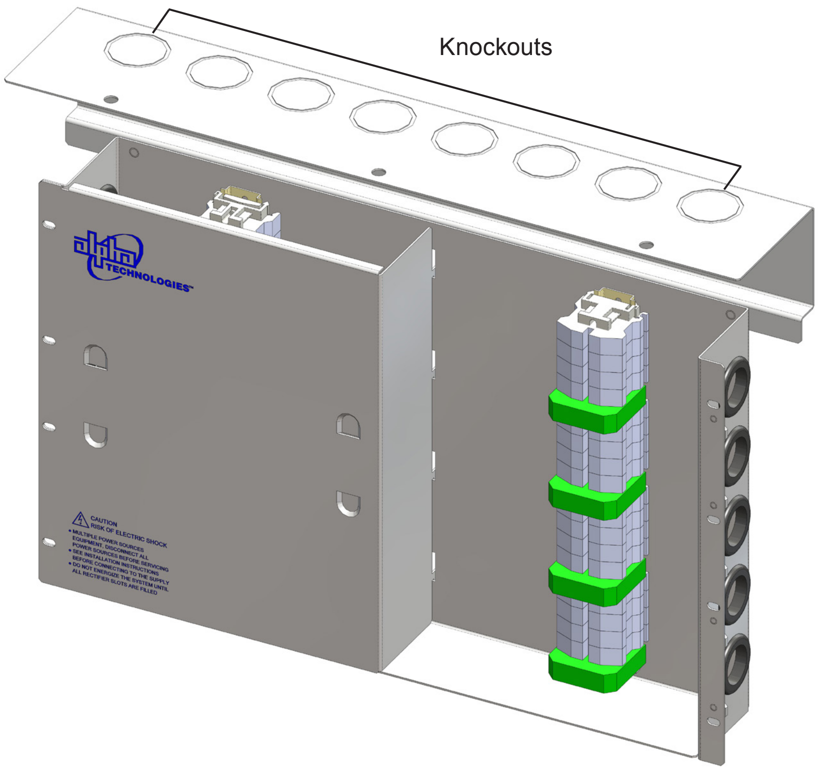


Figure 45 — Pre Wired 8-feed AC Panel - 3 Phase, 3 Wire 208/480 Vac

NOTE:

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

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

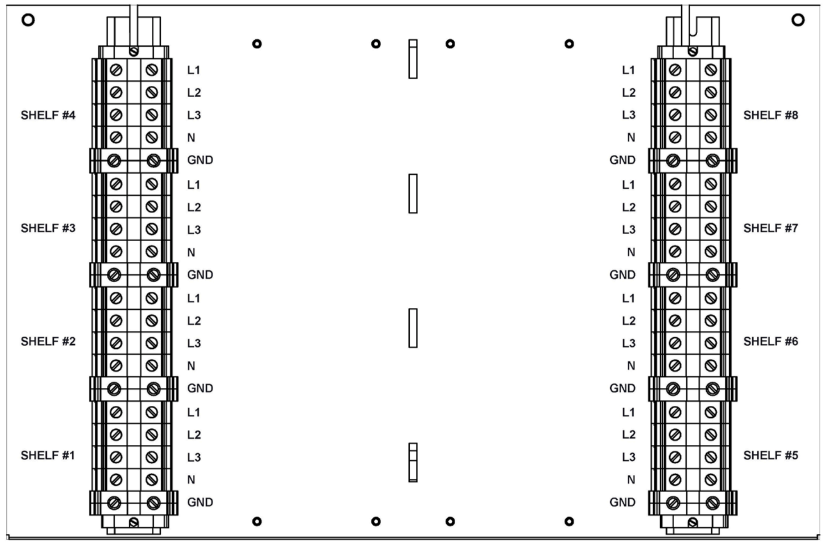


Figure 46 — Terminal Blocks for 8-feed 3 wire 208/480Vac input

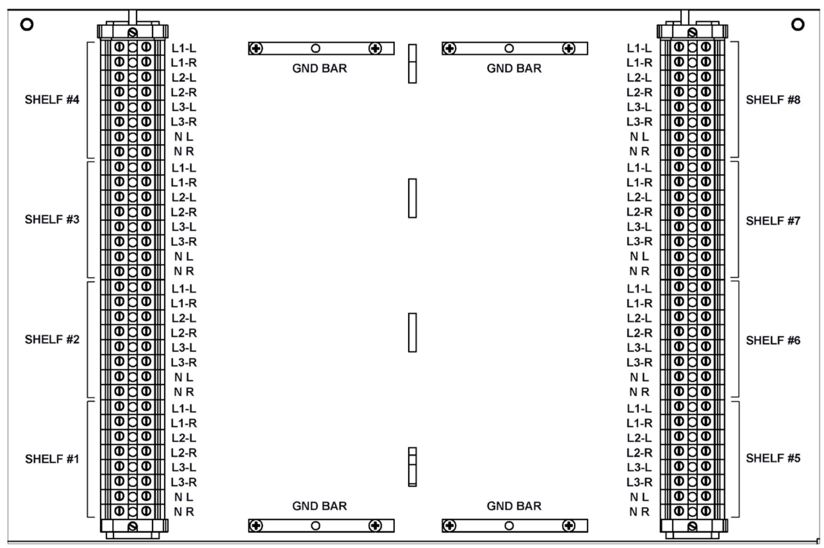


Figure 47 — Terminal Blocks for 16-feed 208/480Vac input

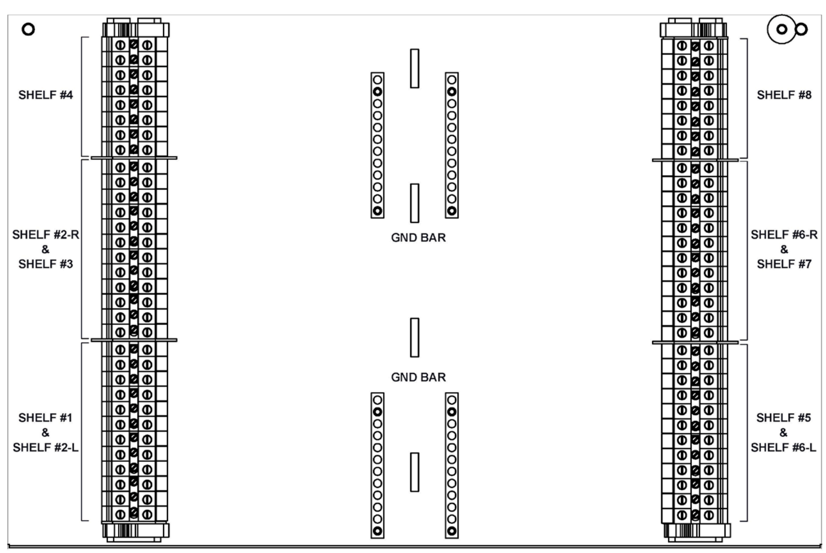


Figure 48 — Terminal Blocks for 6-feed 480Vac input

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 shelf. Connect the Normally Closed contact to the right terminal block located on the front bottom of the distribution shelf. See Figure 49.

NOTE:

Use #18-22 AWG Wires

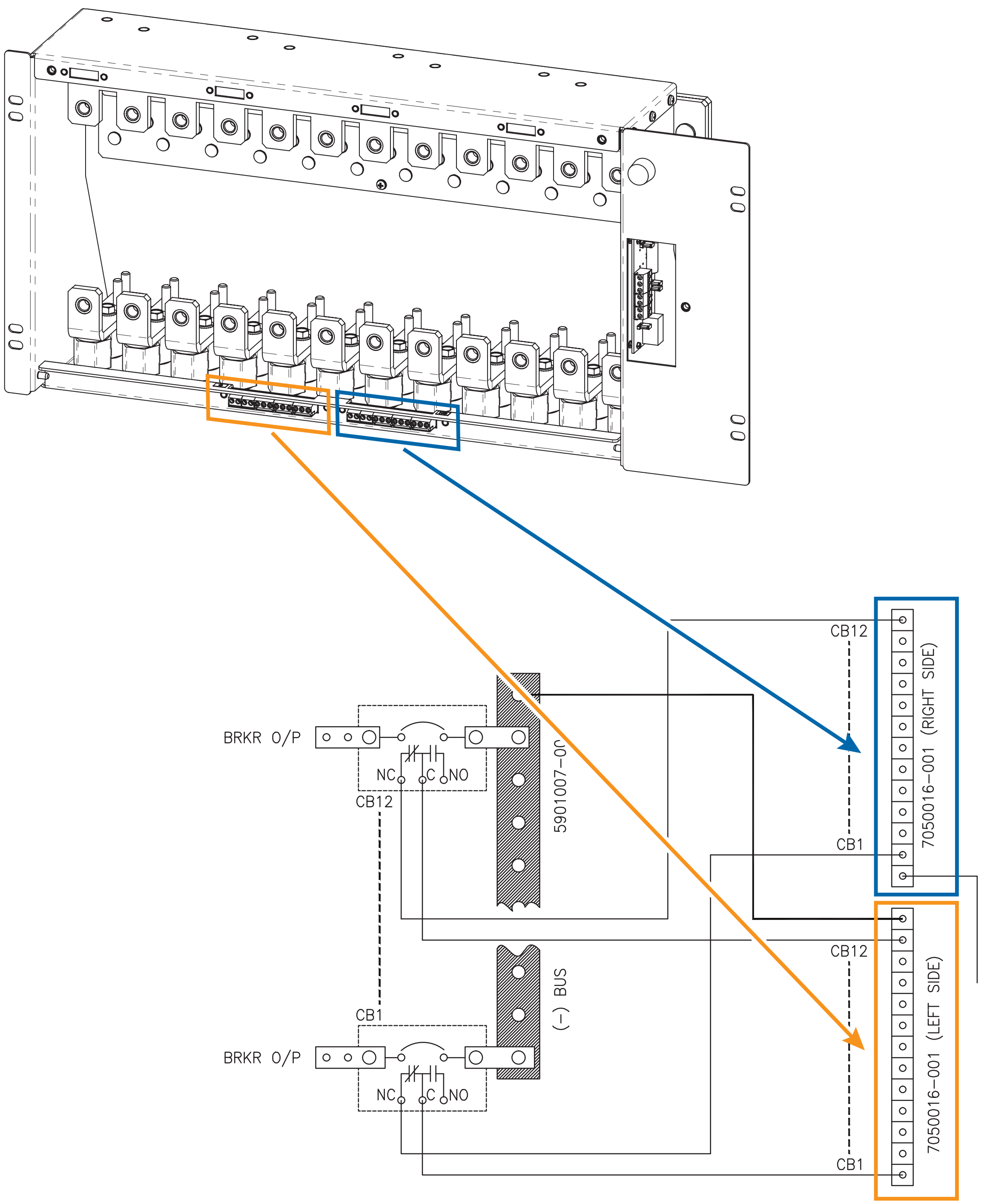


Figure 49 — High Capacity Breaker Panel Alarm Wiring

8.4.2 External Battery Return Bar Wiring

Connect the external battery return bar(s) to the associated power bay positive return detail as shown in Figure 50.

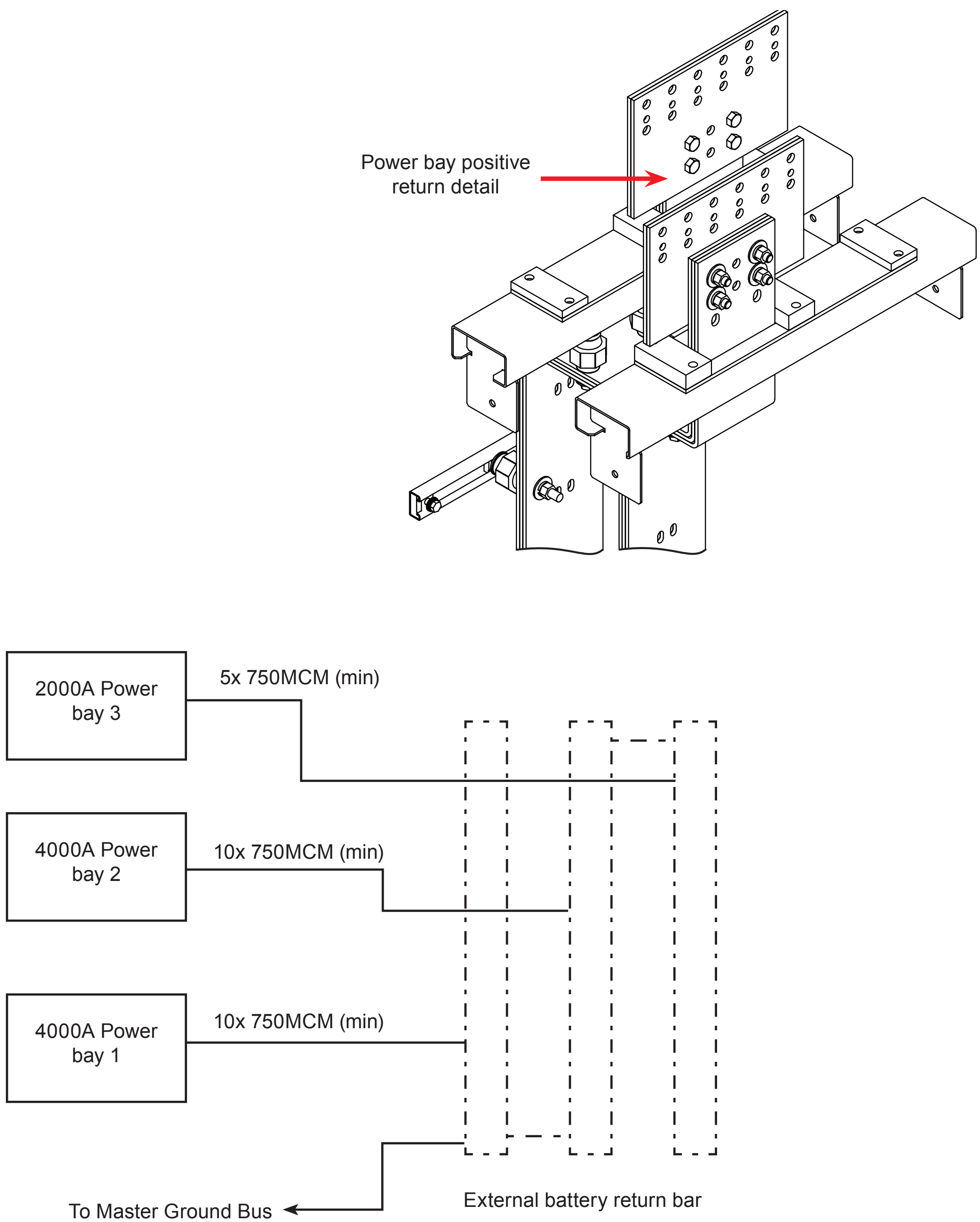


Figure 50 — External Battery Return Bar Wiring

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 0.25V 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:

- 1/2" holes on 1-3/4" centers
- 3/8" holes on 1" centers

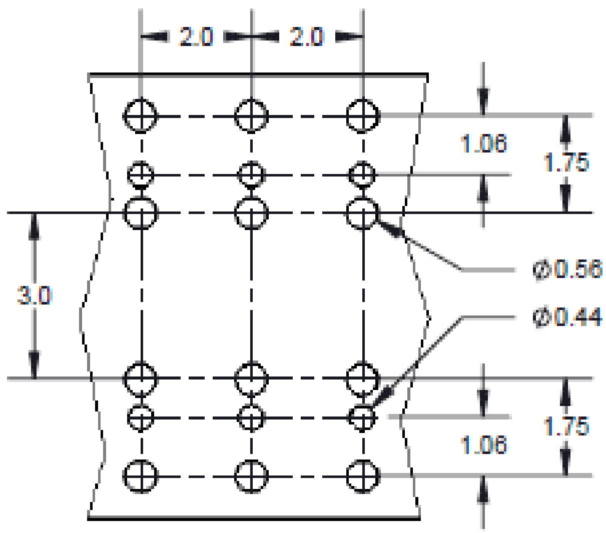


Figure 51 — Customer Connections Spacing

8.4.4 -48V Battery Cables

Connect directly to the -48V 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 0.5V loop drop at full load as well as meeting ampacity requirements of the protection fuse or circuit breaker.

Procedure:

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

8.4.6 External Alarms

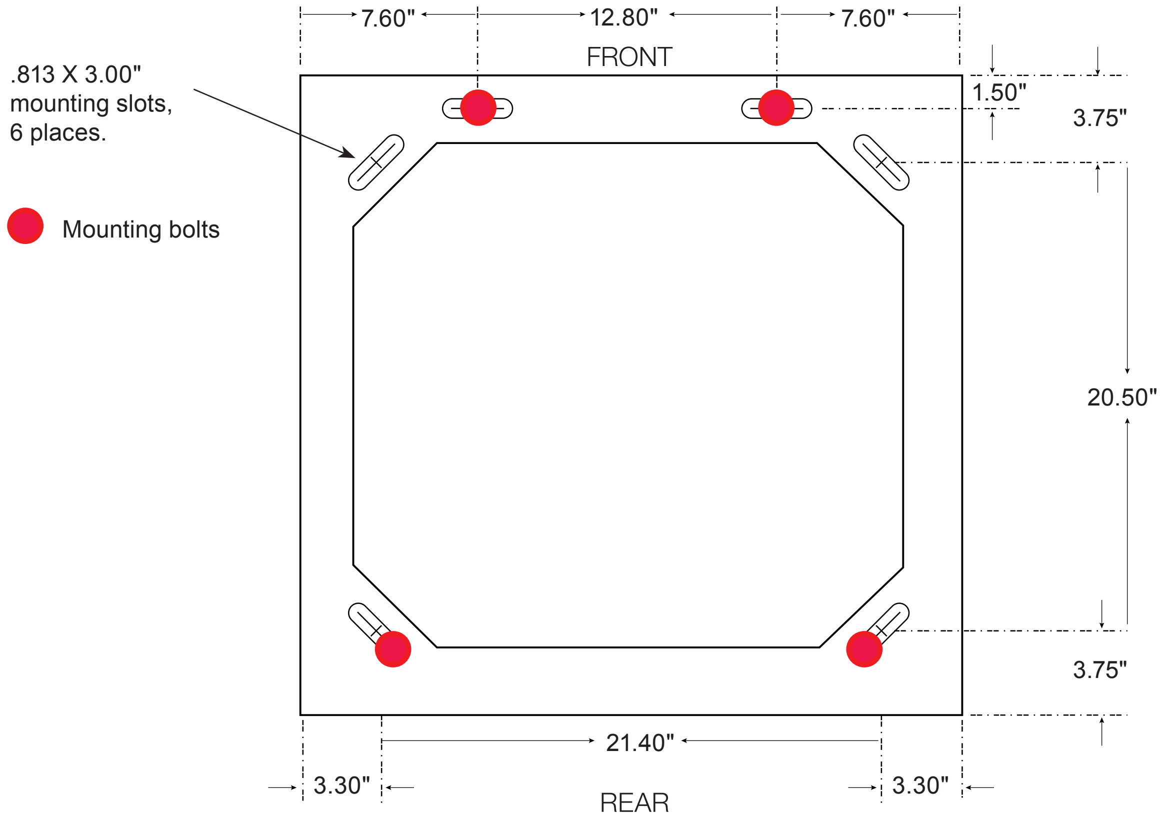
All applicable alarms should be connected to the local alarm-sending unit from the power system. The system controller provides form “C” relay contacts for interconnection.

9. Installing Standalone Power and Distribution Bays

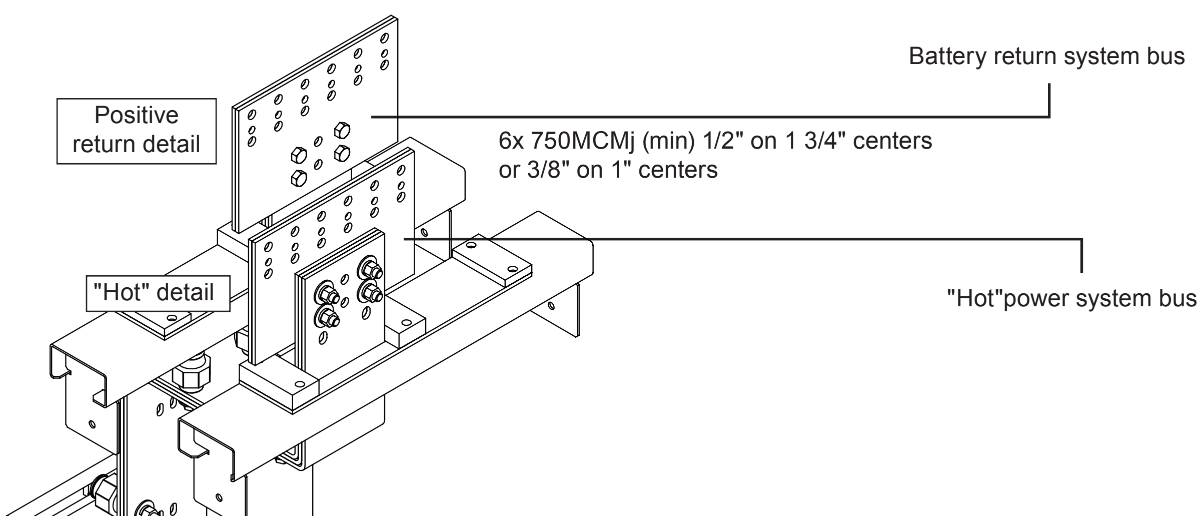
9.1 Standalone Power Bay

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

1. Secure the bay to the floor. Locate bolts in slots as shown for greatest stability.
2. Connect a cable (typically a 2/0 cable) between the frame of the bay and MGB or FGB.



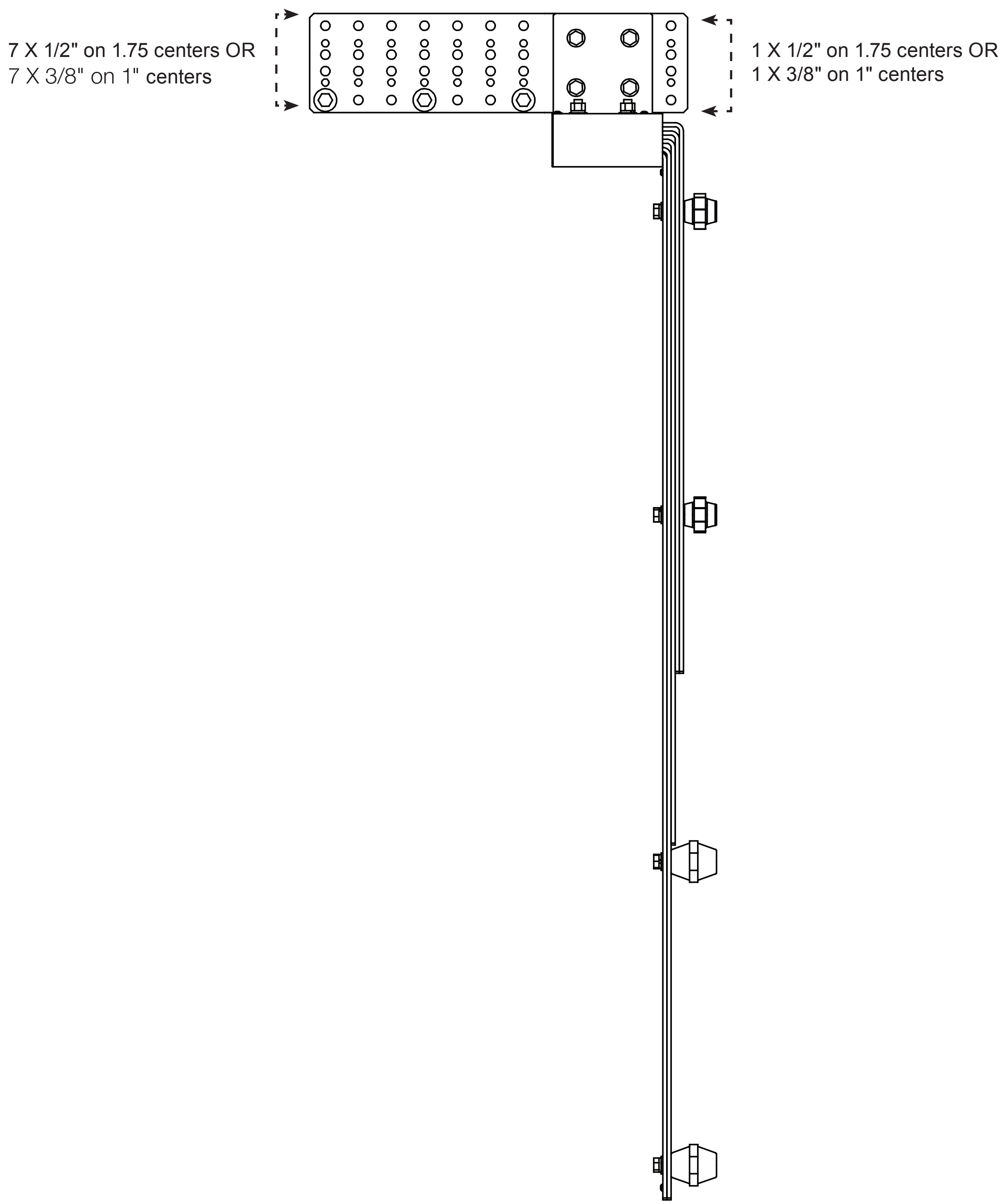
3. Refer to section 8.3 on page 51 to connect AC input to the AC distribution assembly at the top of the unit.
4. Connect the power bay positive return detail to the existing system overhead battery return bus.
5. Connect the power bay "Hot" detail to the existing system overhead "Hot" power bus.



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 57.)
2. Connect a cable (typically a 2/0 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.



10. System Startup

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

10.1 Check System Connections

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

10.2 Verify AC 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, open circuit voltage levels specified by the battery manufacturer.

10.4 Final Configuration and Test

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

Alarm	Test
Minor alarm	Pull one rectifier (leave in the shelf) and then reinsert to clear the alarm.
Major alarm	Pull two rectifiers (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, tap 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 (temp comp) 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 shelf/bay ID module comes factory installed. If shelves are installed in more than one bay, then set the Bay ID sequentially on each Shelf ID board.

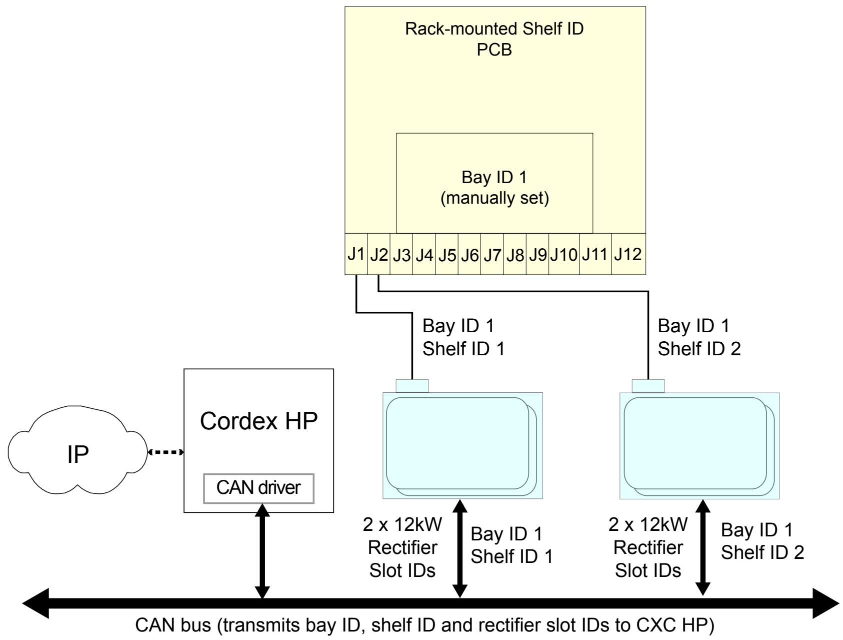
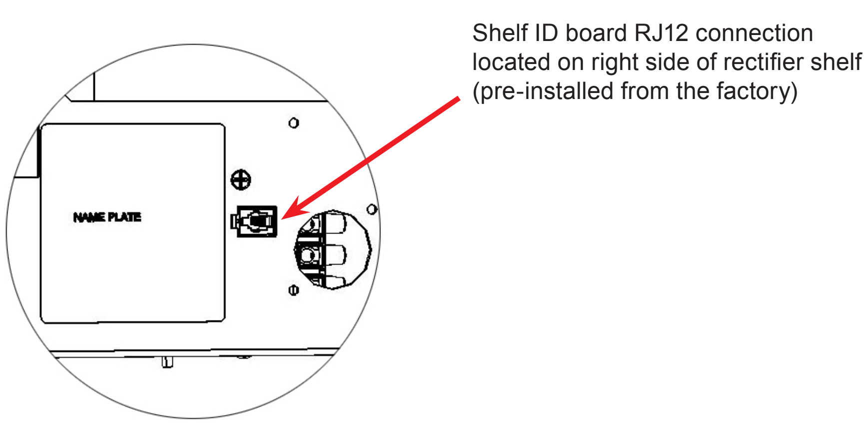


Figure 52 — Example of a Single Bay with Two Rectifier Shelves.



11. Test and Commissioning Overview

11.1 System

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

The individual system component manuals 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; i.e. specific gravity, cell voltage, charge current and temperature.

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

Some VRLA batteries do not require initial charging if placed on charge within 3-6 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 5 minutes.
- Check for overheating connections.

11.3 Documentation

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

12. Maintenance

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

WARNING!

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

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

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

Table K — Sample maintenance log

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

12.1 Rectifiers

It is recommended that every five years MOV surge suppressors are replaced (especially in areas of high lightning activity). See Cordex HP rectifier manual for general maintenance information.

12.2 Batteries

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

12.3 Controller Lithium Battery Replacement

NOTE:

Controller - If you remove the battery while the controller is not powered, the time and date will reset. If you remove the battery while the controller is powered, the date and time are maintained.

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.

WARNING!

Exercise extreme caution and do not touch any connected equipment.

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

13. Warranty Statement and Service Information

Technical Support

In Canada and the USA, call toll free 1-888-462-7487.

Customers outside Canada and the USA, call +1-604-436-5547.

Warranty Statement

For full information details review Alpha's online Warranty Statement at www.alpha.ca/support.

Product Warranty

Alpha warrants that for a period of two (2) years from the date of shipment its products shall be free from defects under normal authorized use consistent with the product specifications and Alpha's instructions, the terms of the manual will take precedence.

The warranty provides for repairing, replacing or issuing credit (at Alpha's discretion) for any equipment manufactured by it and returned by the customer to the factory or other authorized location during the warranty period.

There are limitations to this warranty coverage. The warranty does not provide to the customer or other parties any remedies other than the above. It does not provide coverage for any loss of profits, loss of use, costs for removal or installation of defective equipment, damages or consequential damages based upon equipment failure during or after the warranty period. No other obligations are expressed or implied. Warranty also does not cover damage or equipment failure due to cause(s) external to the unit including, but not limited to, environmental conditions, water damage, power surges or any other external influence.

The customer is responsible for all shipping and handling charges. Where products are covered under warranty Alpha will pay the cost of shipping the repaired or replacement unit back to the customer.

Battery Warranty

Note that battery warranty terms and conditions vary by battery and by intended use. Contact your Alpha sales representative or the Technical Support team at the above number to understand your entitlements under Battery Warranty.

Warranty Claims

Any claim under this Limited Warranty must be made in writing to Alpha BEFORE sending material back. Alpha will provide Product return instructions upon approval of return request. A Service Repair Order (SRO) and / or Return Authorization (RA) number will be issued ensuring that your service needs are handled promptly and efficiently.

Claims must be made online at: www.alpha.ca.

Service Information

For a list of international service centers, refer to the Alpha website: www.alpha.ca.

14. Acronyms and Definitions

AC	Alternating current
ANSI	American National Standards Institute
AWG	American Wire Gauge
BRB	Battery return bus
BTU	British thermal unit
CAN	Controller area network
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
CX	Cordex™ series; e.g., CXC for Cordex System Controller
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
EIA	Electronic Industries Alliance
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ERM	Electromagnetic Compatibility and Radio Spectrum Matters
ESD	Electrostatic Discharge
FCC	Federal Communications Commission (for the USA)
GSM	Group Speciale Mobile (global system for mobile communications)
HVSD	High voltage shutdown
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
LED	Light emitting diode
LVD	Low voltage disconnect
MIL	One thousandth of an inch; used in expressing wire cross sectional area
MOV	Metal oxide varistor
MTBF	Mean time between failures
NC	Normally closed
NEC	National Electrical Code (for the USA)
NO	Normally open
OSHA	Occupational Safety & Health Administration
OVP	Over voltage protection
RAM	Random access memory
RU	Rack unit (1.75”)
TCP/IP	Transmission Control Protocol / Internet Protocol
THD	Total harmonic distortion
UL	Underwriters Laboratories
VRLA	Valve regulated lead acid

15. Certification

About CSA and NRTL

CSA (Canadian Standards Association also known as CSA International) was established in 1919 as an independent testing laboratory in Canada. CSA received its recognition as an NRTL (Nationally Recognized Testing Laboratory) in 1992 from OSHA (Occupational Safety and Health Administration) in the United States of America (Docket No. NRTL-2-92). This was expanded and renewed in 1997, 1999, and 2001. The specific notifications were posted on OSHA's official website as follows:

- Federal Register #: 59:40602 - 40609 [08/09/1994]
- Federal Register #: 64:60240 - 60241 [11/04/1999]
- Federal Register #: 66:35271 - 35278 [07/03/2001]

When these marks appear with the indicator "C and US" or "NRTL/C" it means that the product is certified for both the US and Canadian markets, to the applicable US and Canadian standards. (1)

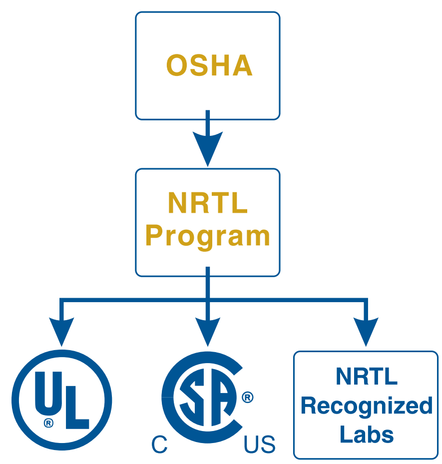
Alpha rectifier and power system products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 60950-01 and UL 60950-01. Alpha UPS products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 107.3 and UL 1778.

As part of the reciprocal, US/Canada agreement regarding testing laboratories, the Standards Council of Canada (Canada's national accreditation body) granted Underwriters Laboratories (UL) authority to certify products for sale in Canada. (2)

Only Underwriters Laboratories may grant a licence for the use of this mark, which indicates compliance with both Canadian and US requirements. (3)

NRTLs capabilities

NRTLs are third party organizations recognized by OSHA, US Department of Labor, under the NRTL program.



The testing and certifications are based on product safety standards developed by US based standards developing organizations and are often issued by the American National Standards Institute (ANSI). (4)

The NRTL determines that a product meets the requirements of an appropriate consensus-based product safety standard either by successfully testing the product itself, or by verifying that a contract laboratory has done so, and the NRTL certifies that the product meets the requirements of the product safety standard. (4)

Governance of NRTL

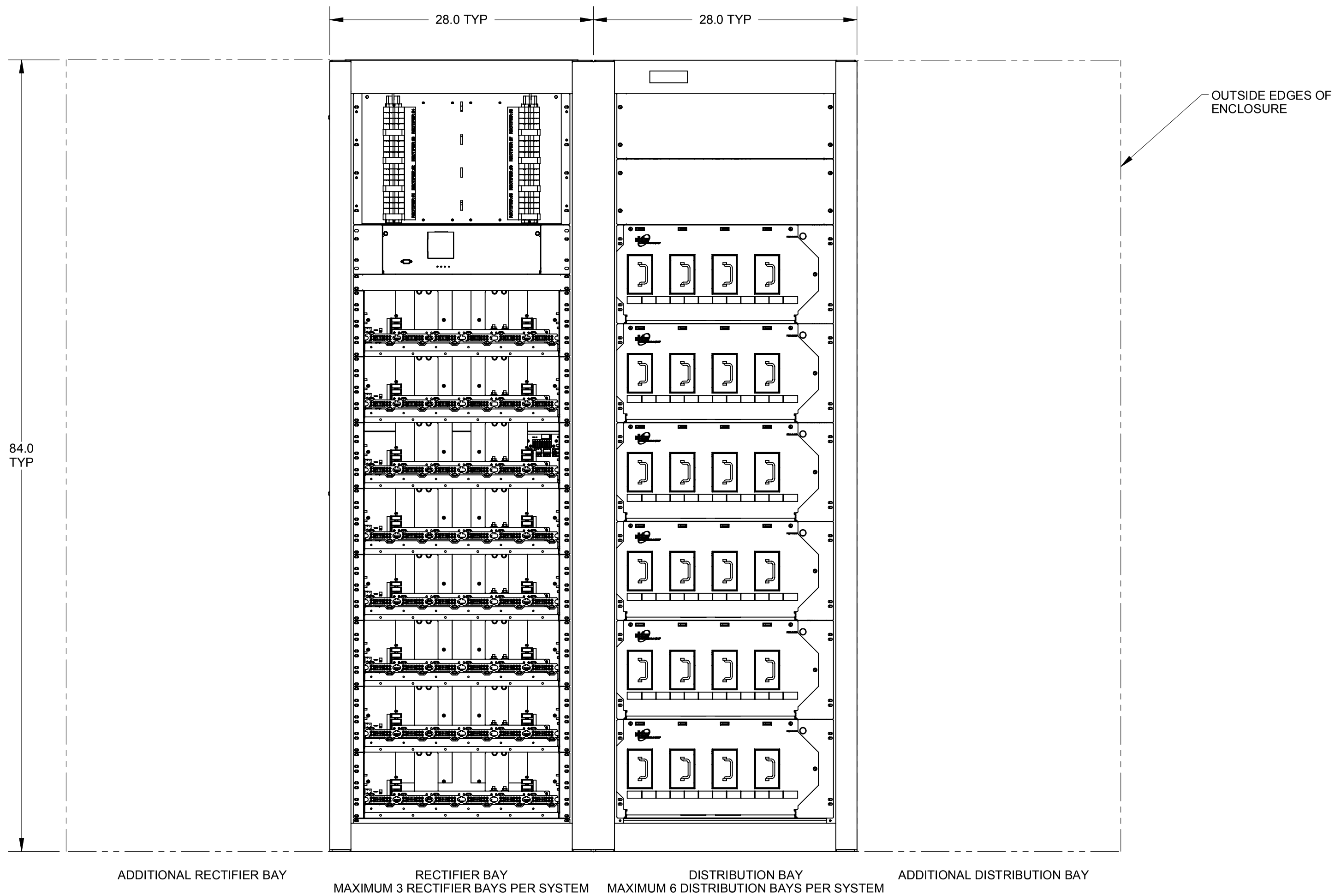
The NRTL Program is both national and international in scope with foreign labs permitted.

(1)www.csagroup.org

(2) www.scc.ca
(3) www.ulc.ca
(4) www.osha.gov

FRONT VIEW OF SYSTEM

DO NOT SCALE DRAWING



NOTES UNLESS OTHERWISE SPECIFIED:

1. PRODUCT TO BE FABRICATED ACCORDING TO ATL PRODUCTION STANDARD 0700001
2. 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

REVISIONS					
LTR	DESCRIPTION	BP	DWN	DATE	CHK

UNLESS OTHERWISE SPECIFIED
DIM ARE IN INCHES
X.X ±0.040
X.XX ±0.020
X.XXX ±0.010
ANGULAR: ±1°
INTERPRET DIM AND TOL PER ASME Y14.5-1994
THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	S. BIENKO	OCT-22-12
CHECKED	C. COOMBES	OCT-22-12

ALPHA TECHNOLOGIES™

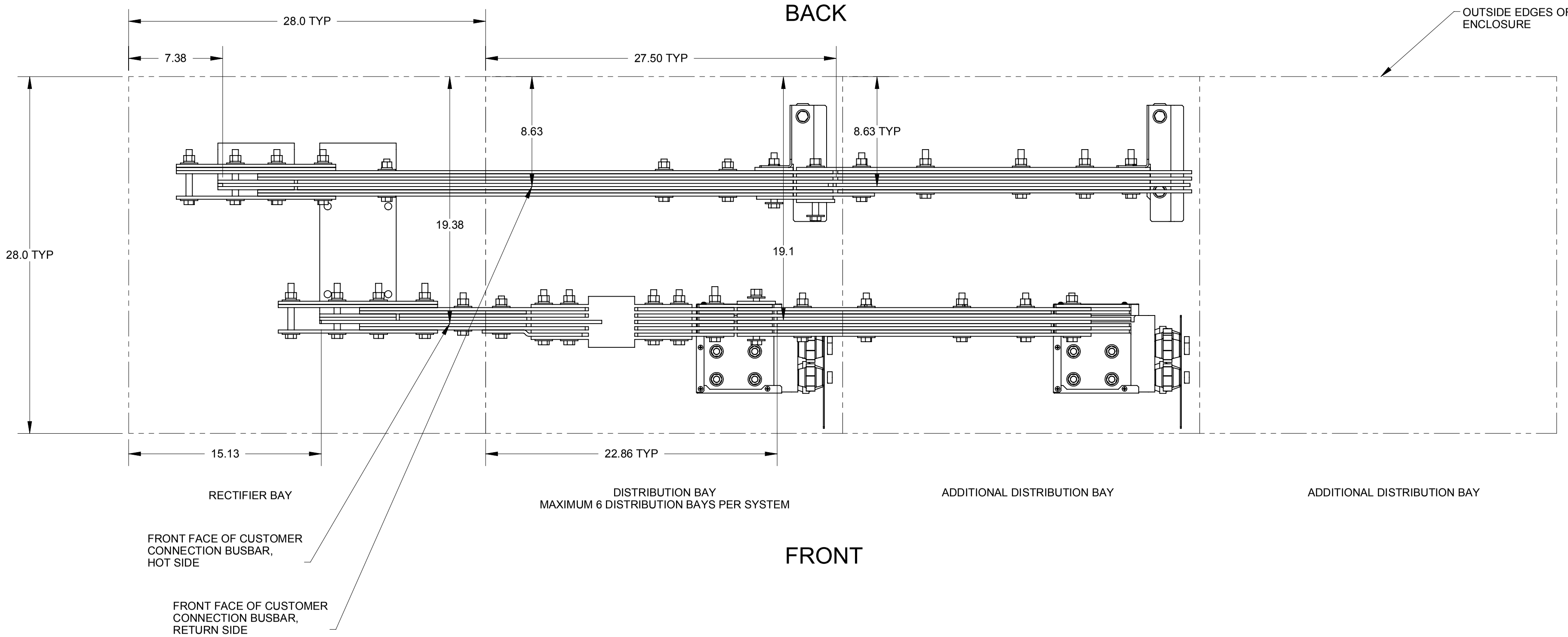
TITLE: CENTRALIZED PLANT DIST. OUTLINE DRAWING

SIZE: B | DWG NO. 0250002-06 | REV B

SCALE: 1:12 | SHEET 1 OF 4

TOP VIEW OF SYSTEM
8000A BUSWORK SHOWN

DO NOT SCALE DRAWING



REVISIONS					
LTR	DESCRIPTION	BP	DWN	DATE	CHK

NOTES UNLESS OTHERWISE SPECIFIED:

1. PRODUCT TO BE FABRICATED ACCORDING TO ATL PRODUCTION STANDARD 0700001
2. 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

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DIM ARE IN INCHES
X.X ±0.040
X.XX ±0.020
X.XXX ±0.010
ANGULAR: ±1°
INTERPRET DIM AND TOL PER ASME Y14.5-1994
THIRD ANGLE PROJECTION

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DRAWN	S. BIENKO	OCT-22-12
CHECKED	C. COOMBES	OCT-22-12

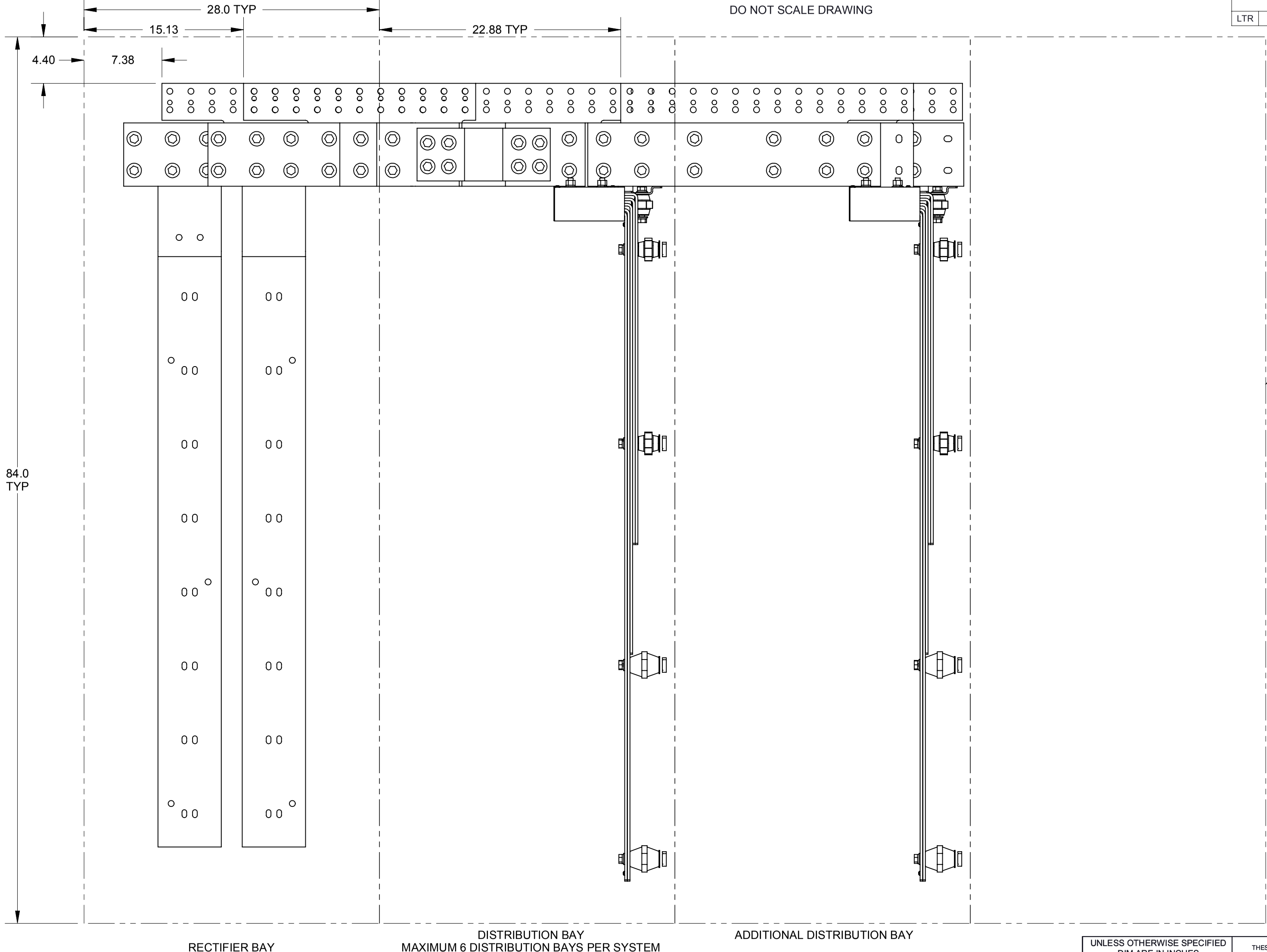
ALPHA TECHNOLOGIES™

TITLE: CENTRALIZED PLANT DIST. OUTLINE DRAWING

SIZE	DWG NO.	REV
B	0250002-06	B
SCALE: 1:8	SHEET 2 OF 4	

FRONT VIEW OF SYSTEM
8000A BUSWORK SHOWN

DO NOT SCALE DRAWING



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THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	S. BIENKO	OCT-22-12
CHECKED	C. COOMBES	OCT-22-12

TECHNOLOGIES™

TITLE: CENTRALIZED PLANT DIST. OUTLINE DRAWING

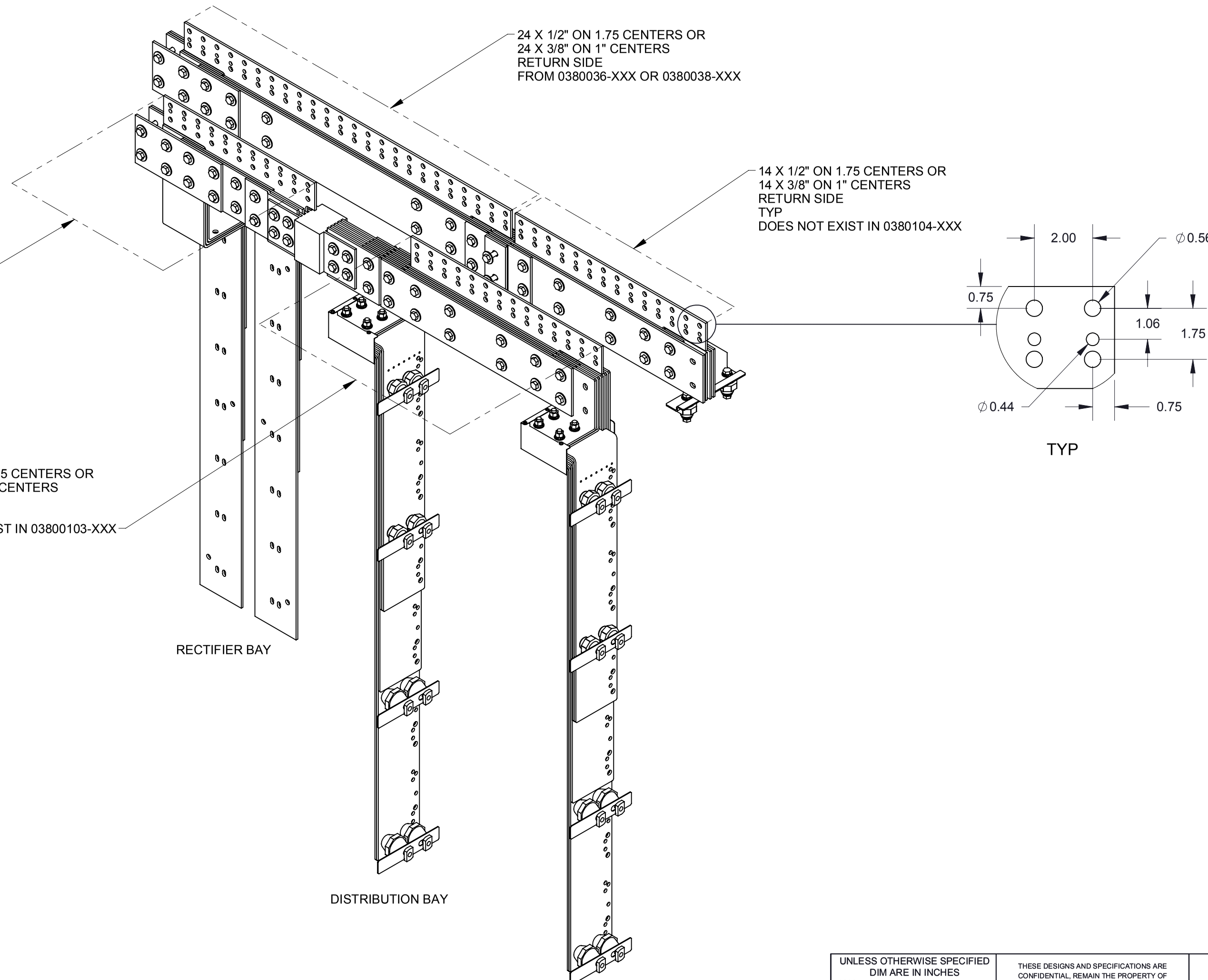
SIZE: B | DWG NO.: 0250002-06 | REV: B

SCALE: 1:10 | SHEET 3 OF 4

ISO VIEW OF SYSTEM
8000A BUSWORK SHOWN

DO NOT SCALE DRAWING

REVISIONS					
LTR	DESCRIPTION	BP	DWN	DATE	CHK



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DRAWN	S. BIENKO	OCT-22-12
CHECKED	C. COOMBES	OCT-22-12

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TITLE: CENTRALIZED PLANT DIST. OUTLINE DRAWING

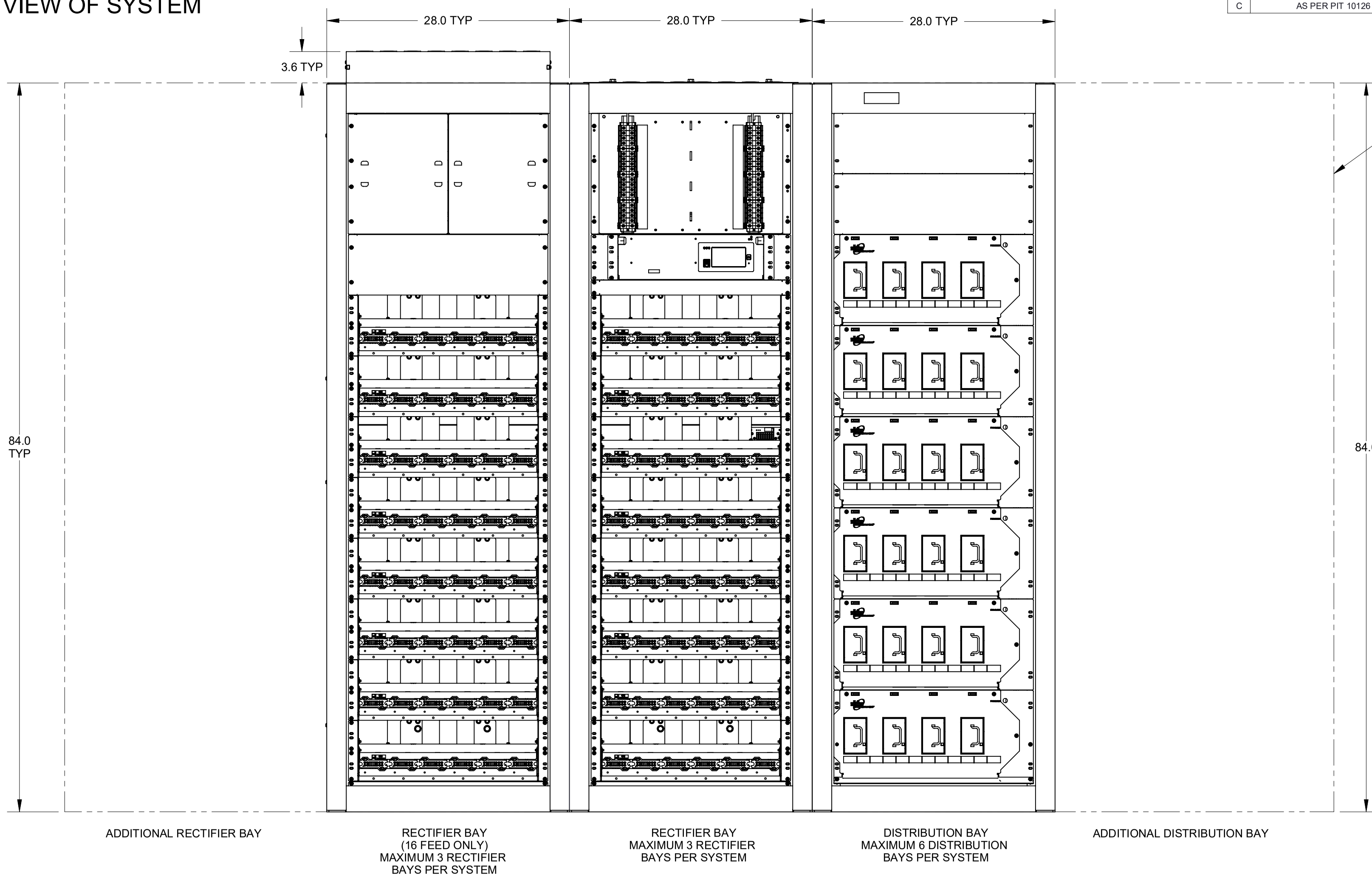
SIZE	DWG NO.	REV
B	0250002-06	B

SCALE: 1:12 SHEET 4 OF 4

FRONT VIEW OF SYSTEM

DO NOT SCALE DRAWING

REVISIONS				
LTR	DESCRIPTION	DWN	DATE	CHK
C	AS PER PIT 10126	LW	10/17/2018	JL



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THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	S. BIENKO	10/22/2012
CHECKED	C. COOMBES	10/22/2012

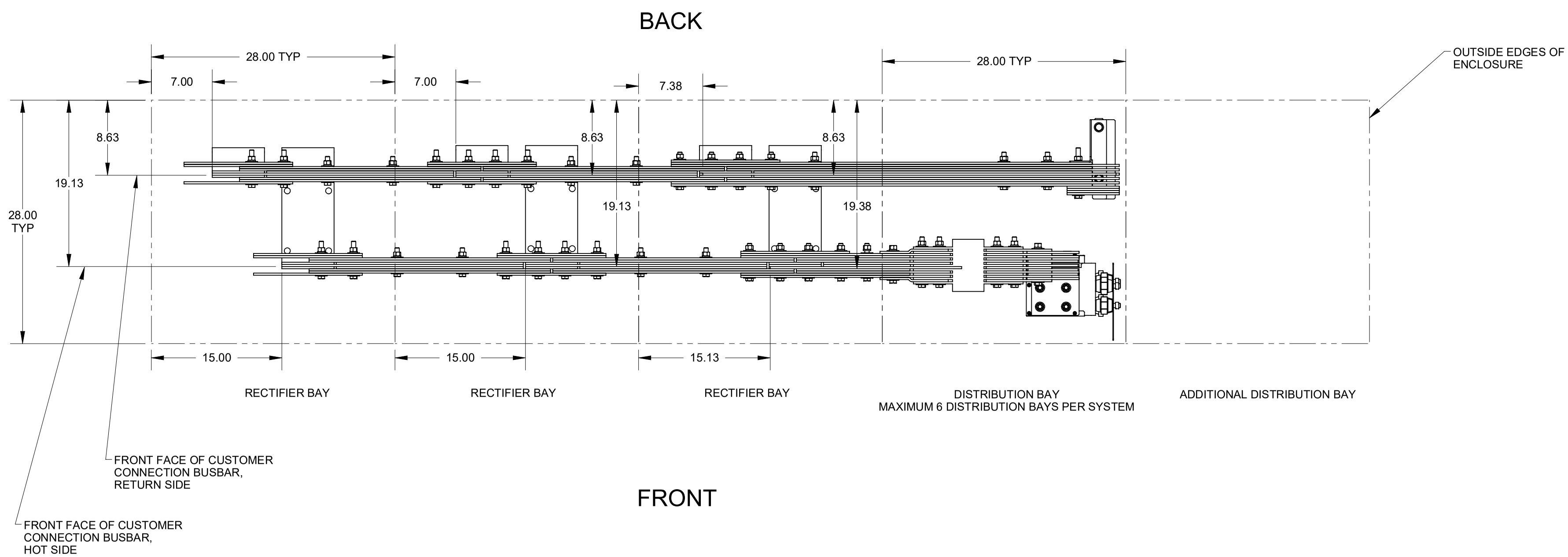
TITLE: CENTRALIZED PLANT RECT. OUTLINE DRAWING

SIZE	DWG NO.	REV
B	0250009-06	C

SCALE: 1:12 SHEET 1 OF 4

DO NOT SCALE DRAWING

TOP VIEW OF SYSTEM
10000A BUSWORK SHOWN



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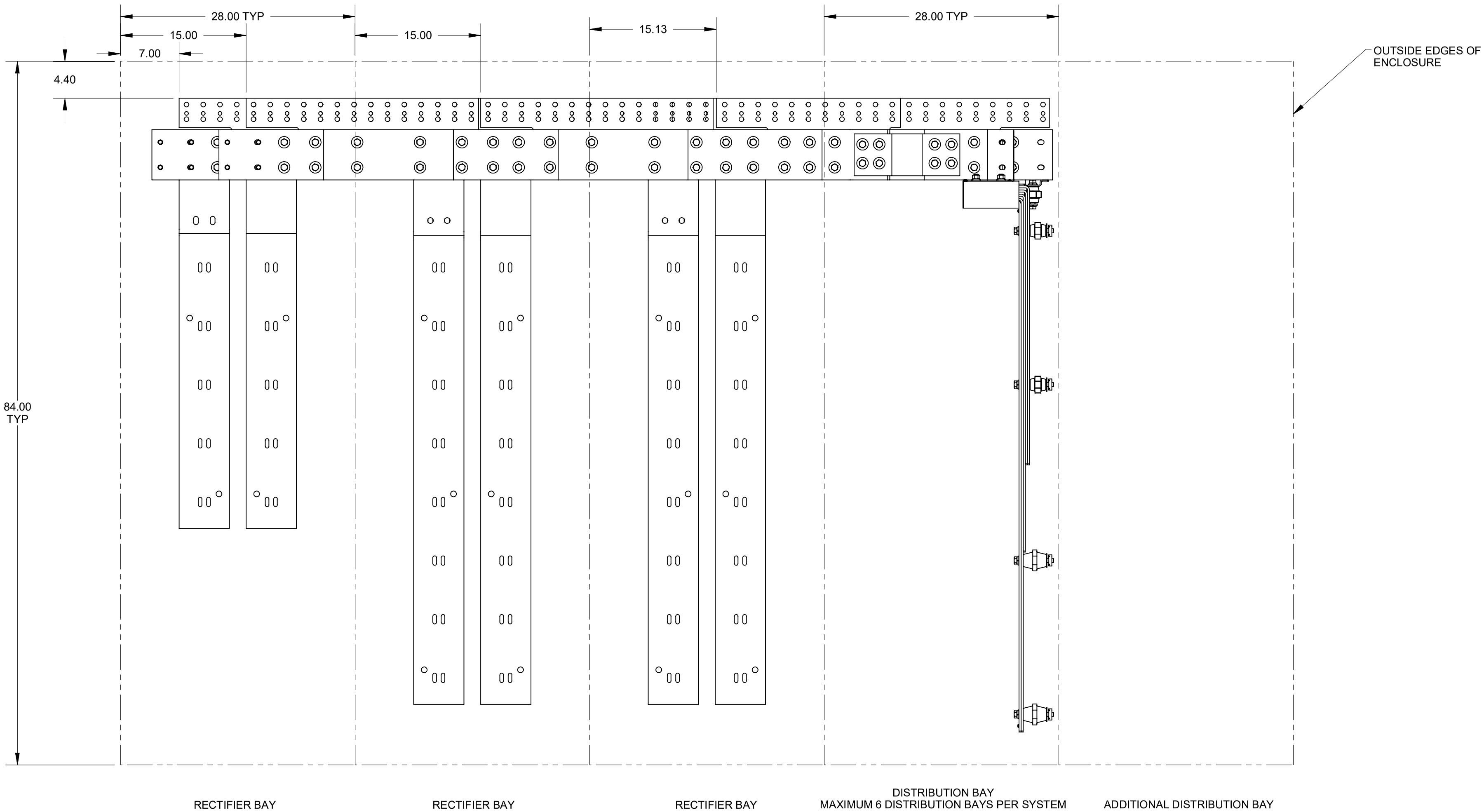
TITLE: CENTRALIZED PLANT RECT. OUTLINE DRAWING			
SIZE B	DWG NO. 0250009-06		REV C
SCALE: 1:12	SHEET 2 OF 4		

FRONT VIEW OF SYSTEM
10000A BUSWORK SHOWN

DO NOT SCALE DRAWING



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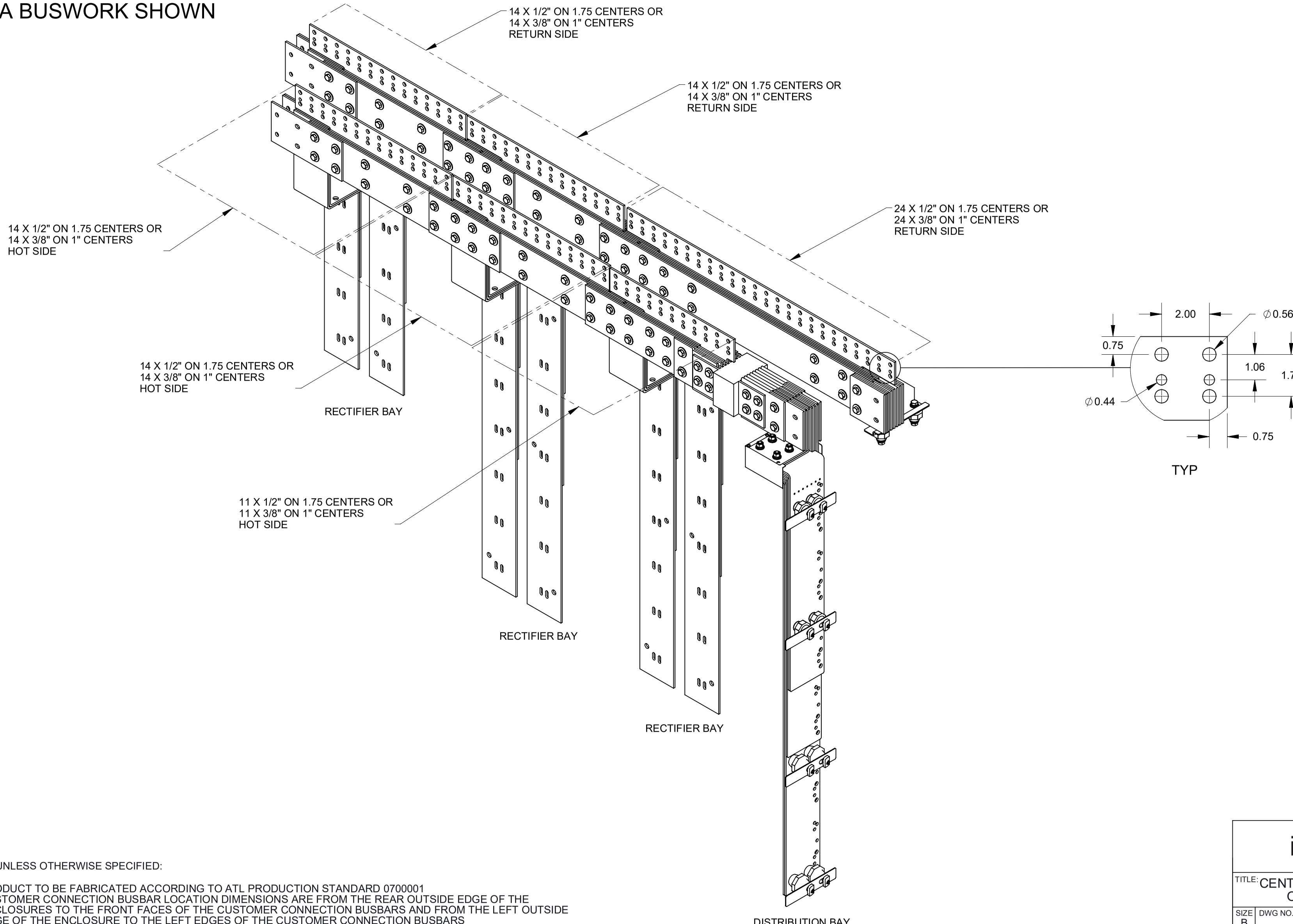
TITLE: CENTRALIZED PLANT RECT. OUTLINE DRAWING			
SIZE B	DWG NO. 0250009-06		REV C
SCALE: 1:12	SHEET 3 OF 4		

ISO VIEW OF SYSTEM
10000A BUSWORK SHOWN

DO NOT SCALE DRAWING



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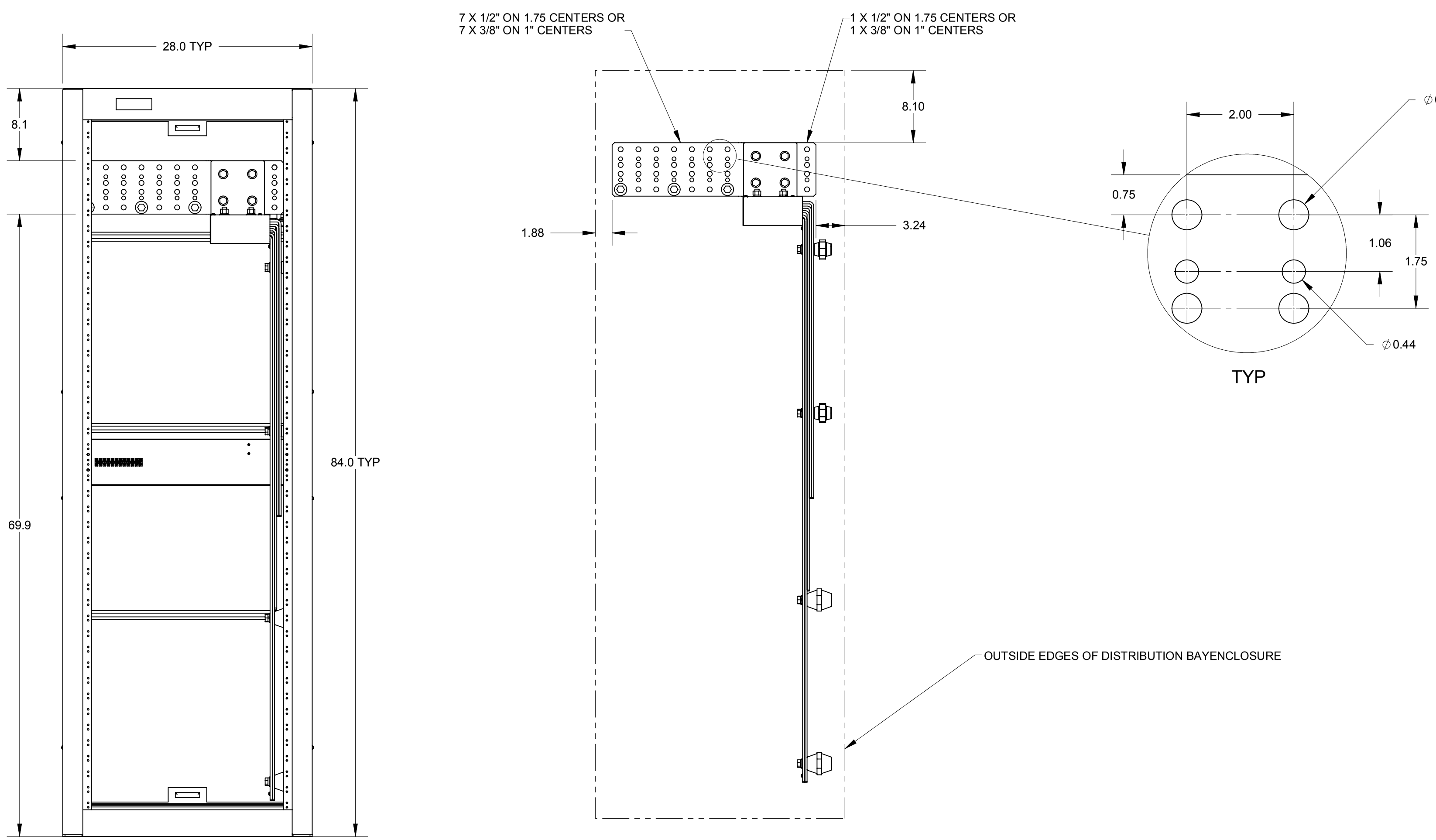
TITLE: CENTRALIZED PLANT RECT. OUTLINE DRAWING		
SIZE B	DWG NO. 0250009-06	REV C
SCALE: 1:12	SHEET 4 OF 4	

DO NOT SCALE DRAWING

FRONT VIEW OF SYSTEM



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REVISIONS					
LTR	DESCRIPTION	BP	DWN	DATE	CHK

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THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	S. BIENKO	OCT-22-12
CHECKED	C. COOMBES	OCT-22-12

ALPHA TECHNOLOGIES™

TITLE: CXPS-C STANDALONE DIST. OUTLINE DRAWING

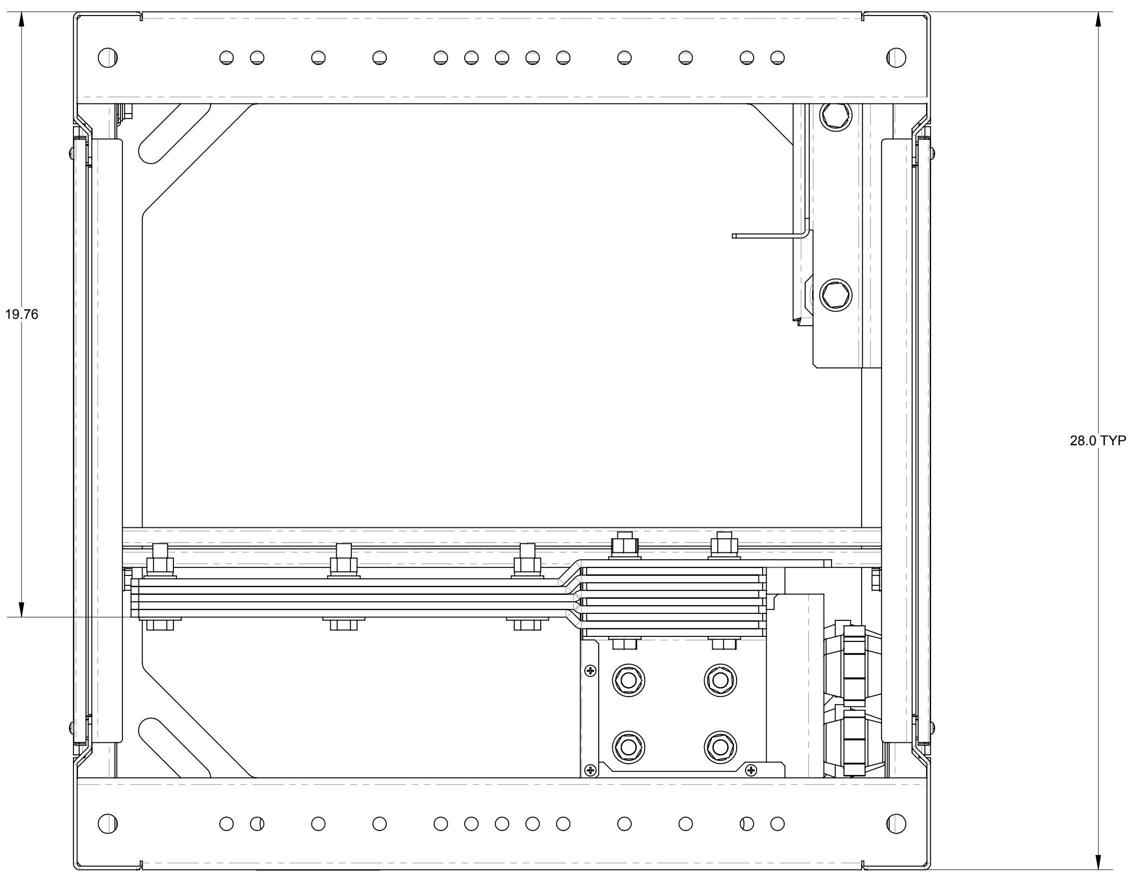
SIZE B | DWG NO. 0250002-702-06 | REV A

SCALE: 1:12 | SHEET 1 OF 2

DO NOT SCALE DRAWING

REVISIONS					
LTR	DESCRIPTION	BP	DWN	DATE	CHK

TOP VIEW OF SYSTEM



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THIRD ANGLE PROJECTION

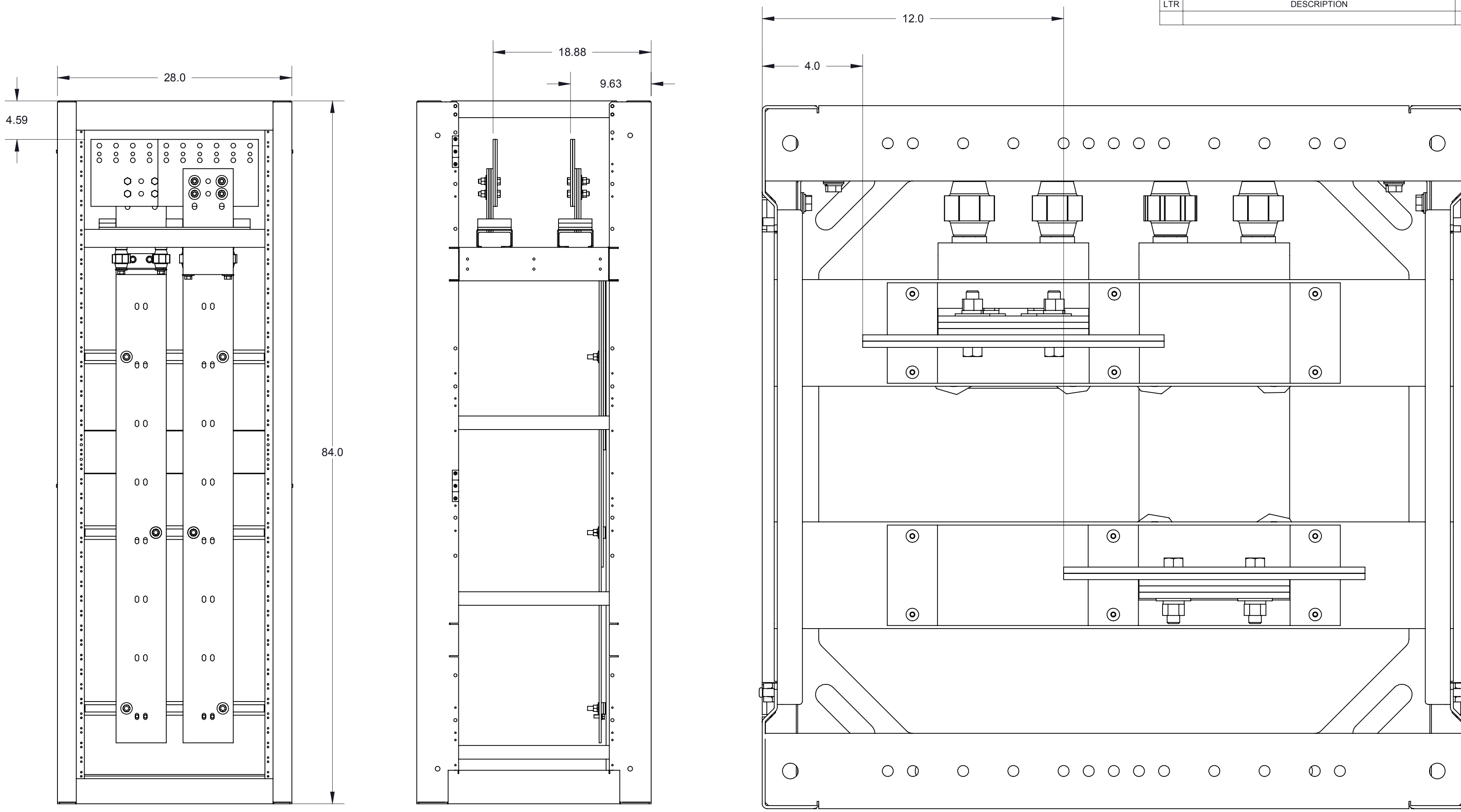
APPROVALS		DATE
DRAWN	S. BIENKO	OCT-22-12
CHECKED	C. COOMBES	OCT-22-12

ALPHA TECHNOLOGIES™

TITLE: CXPS-C STANDALONE DIST. OUTLINE DRAWING

SIZE	DWG NO.	REV
B	0250002-702-06	A
SCALE: 1:12	SHEET 2 OF 2	

REVISIONS				
LTR	DESCRIPTION	DWN	DATE	CHK



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ITEM
QTY

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THIRD ANGLE PROJECTION

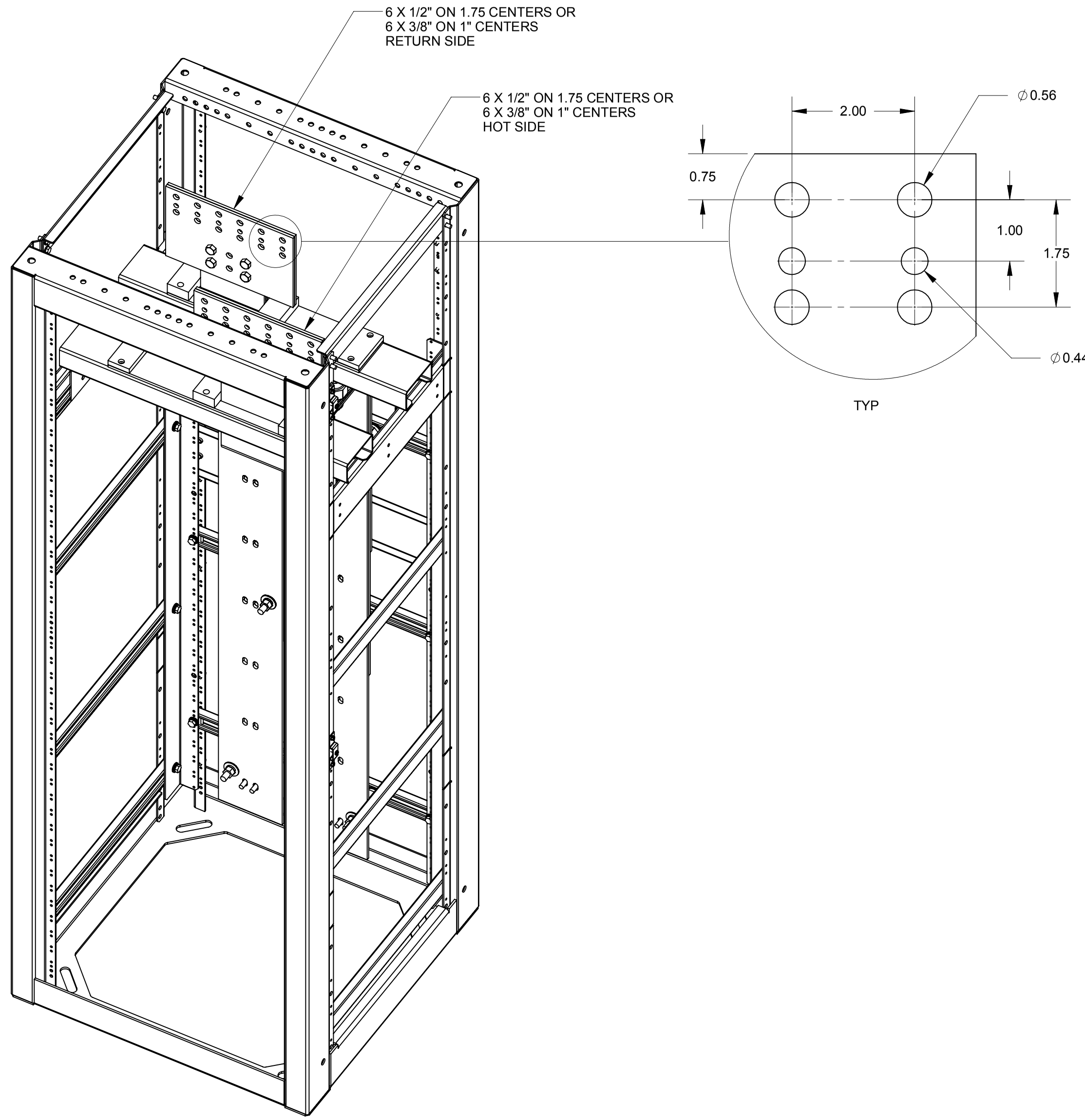
APPROVALS		DATE
DRAWN	SRB	AUG-07-12
CHECKED	VB	AUG-07-12

TECHNOLOGIES™

TITLE: 4000A STANDALONE OUTLINE DRAWING, CXPS-C

SIZE	DWG NO.	REV
B	0250009-701-06	A

SCALE: NTS 1:12 SHEET 1 OF 2



REVISIONS				
LTR	DESCRIPTION	DWN	DATE	CHK

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THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	SRB	AUG-07-12
CHECKED	VB	AUG-07-12

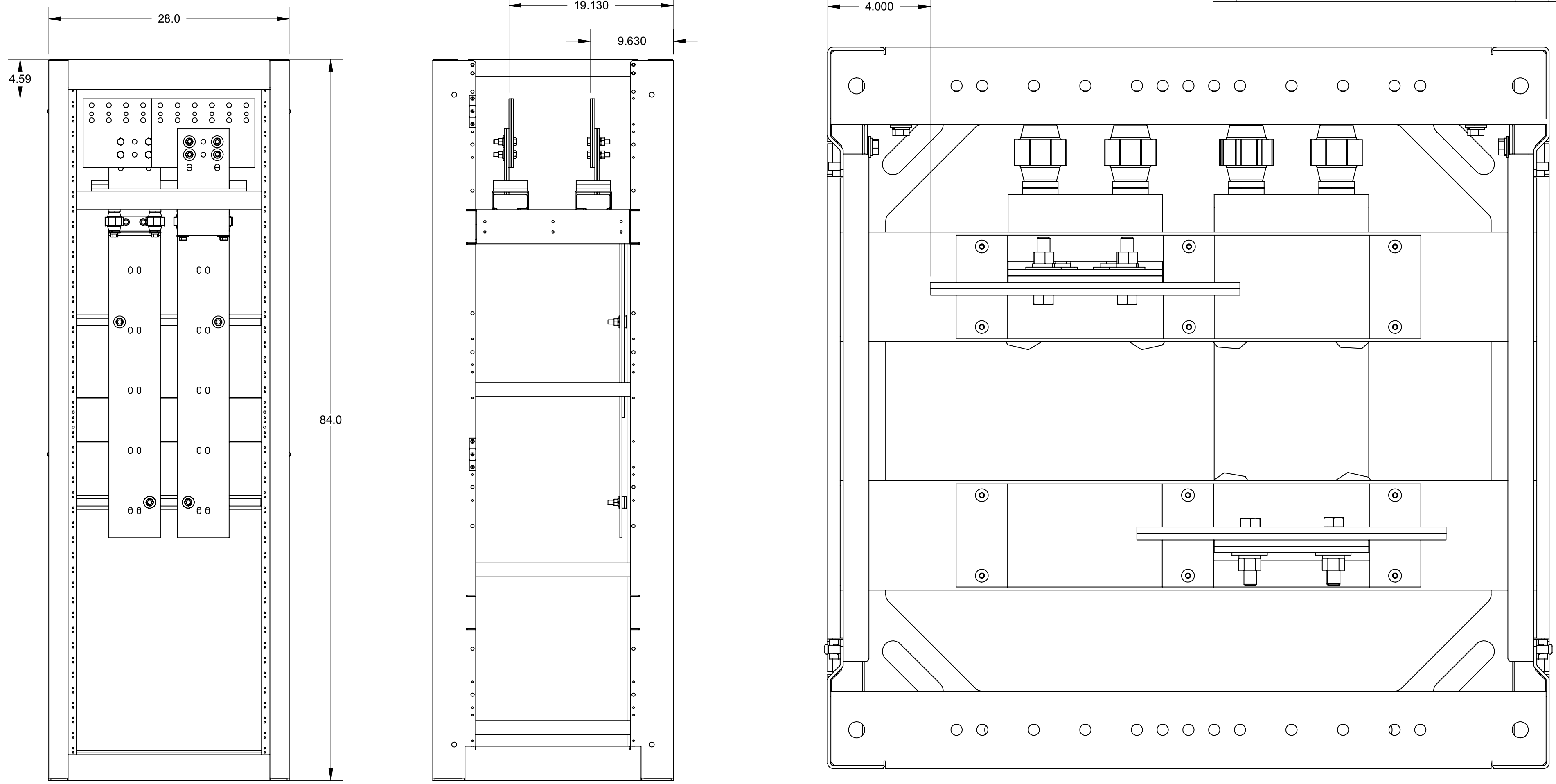
ALPHA TECHNOLOGIES™

TITLE: 4000A STANDALONE OUTLINE DRAWING, CXPS-C

SIZE B | DWG NO. 0250009-701-06 | REV A

SCALE: NTS 1:10 | SHEET 2 OF 2

REVISIONS				
LTR	DESCRIPTION	DWN	DATE	CHK



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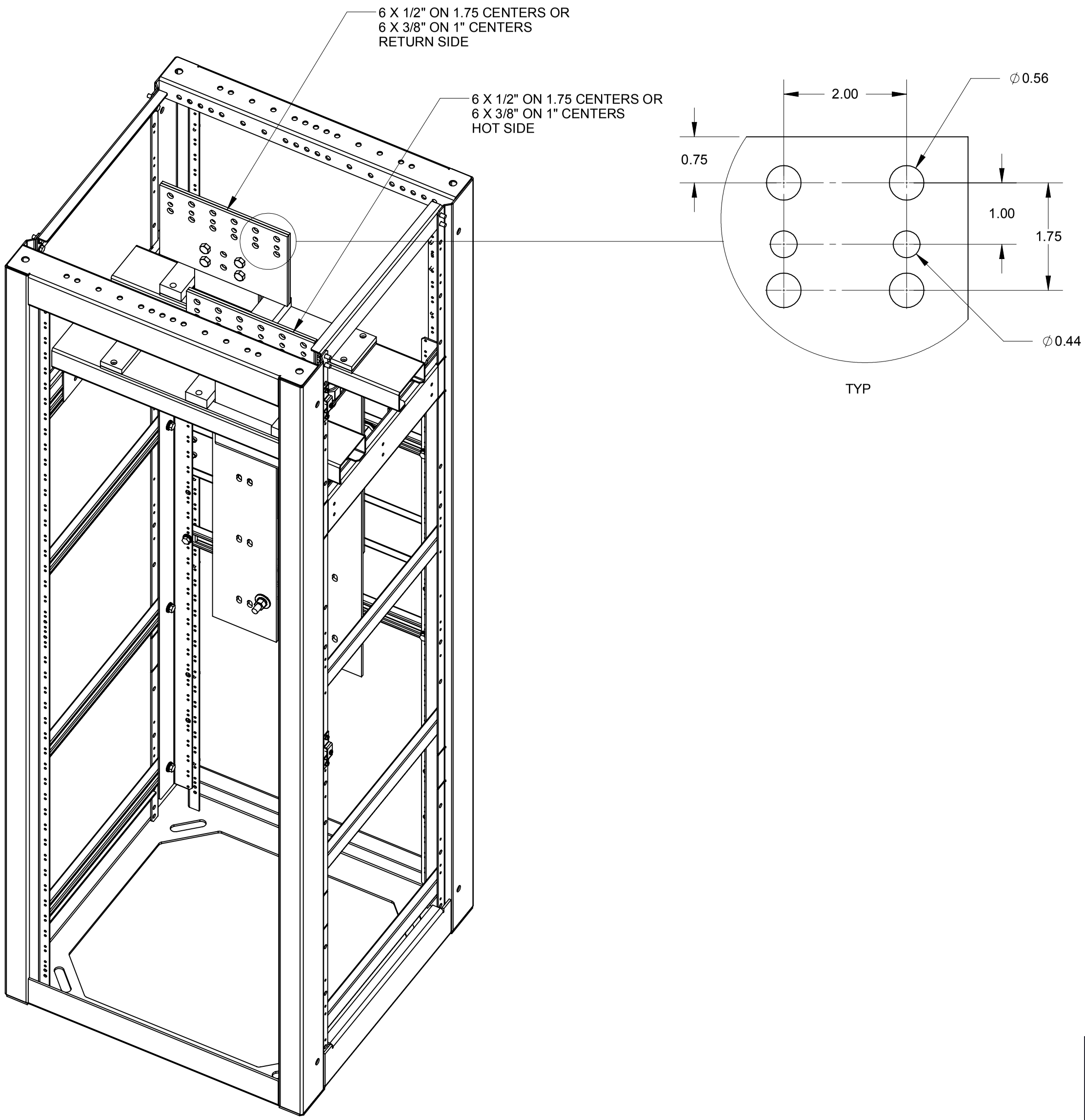
ALPHA TECHNOLOGIES™

TITLE: 2000A STANDALONE OUTLINE DRAWING, CXPS-C

SIZE B | DWG NO. 0250010-701-06 | REV A

SCALE: NTS 1:12 | SHEET 1 OF 2

REVISIONS				
LTR	DESCRIPTION	DWN	DATE	CHK



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TECHNOLOGIES™

TITLE: 2000A STANDALONE OUTLINE DRAWING, CXPS-C

SIZE B | DWG NO. 0250010-701-06 | REV A

SCALE: NTS 1:10 | SHEET 2 OF 2

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9400001-J1 (11/2018)