



CXPS-W Multi-Capacity Power System

Installation & Operation Manual

Part # 9400010-J0
Effective: 04/2017



CXPS-W Multi-Capacity Power System


Models: 600A – 2000A Power System

 **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.

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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. Save this document for future reference.

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 check mark, 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!

HOT symbol indicates safety information to PREVENT BURNS to the technician or user.

1.2 General Safety



WARNING!

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

1.3 Mechanical Safety

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

1.4 Electrical Safety



WARNING!

Hazardous voltages are present at the input of power systems. The DC output from rectifiers 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.



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 277 Vac. Ensure the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.



WARNING!

HIGH LEAK CURRENT. Earth connection is essential before connecting the supply.



CAUTION! and HOT!



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

1.5 Battery Safety

- Servicing and connection of batteries must be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Always wear eye protection, rubber gloves, and a protective vest when working near batteries. Remove all metallic objects from your hands and neck.
- Use OSHA approved insulated hand tools. Do not rest tools on top of batteries.
- 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 Scope of the Manual

This manual covers the features, options, installation and startup of Alpha Technologies CXPS-W power system. Images contained in this document are for illustrative purposes only and may not exactly match your installation.

In addition to this manual, the following documents may be included in the documentation package that ships with the CXPS-W:

- Cordex HP Controller Software manual: 0350058-J0
- Cordex HP Controller and I/O Peripherals Hardware manual: 0180036-J0
- Cordex HP 48-4.0kW Rectifier and Shelf manual: 9400000-J0
- Cordex DC/ DC Converter CXDF 48-24/2kW manual: 012-527-B2
- Cordex 48-2.4 kW Rectifier and Shelf manual: 0300040-J0

2.2 Product Overview

The CXPS-W is a compact multi capacity power system designed for cell site, small CO and cable head end applications. The systems can be factory equipped with DC to DC converters and a secondary distribution bus to distribute power at +24Vdc to secondary loads. The distribution options are extremely flexible; providing TPL fuse distribution, high capacity breaker distribution, TPS/TLS fuse distribution, and plug in breakers. Shunts are available for both tier and branch current monitoring.

The system may also be configured with either low voltage load disconnect (LVLVD) or low voltage battery disconnect (LVBD) functionality.

The system utilizes standard Cordex Power System (CXPS) components and is a perfect solution for space constrained applications due to the compact, front access design.

Systems are equipped with the CXC-HP system controller for single point control, advanced battery diagnostics, data logging plus local and remote monitoring, including SNMP alarming.

The CXPS-W system is suitable for installation in all following locations:

- Network Telecommunication Facilities
- Locations where the NEC applies

Wireless Applications

- Dual voltage power plant for wireless applications using 48V-24V converters
- Field convertible tiers provide flexibility in distribution for dual voltage applications
- High density of 2.4kW rectifiers, provide capability to add multiple battery trays below the power system

Wireline Applications

- System can be installed close to the equipment at the end of a line up, using high capacity circuits (TPL fuses/GJ style breakers) to feed remote distribution panels (RDPs) mounted in equipment bays.
- Can be equipped with AM style breakers or TPS/TLS fuses that directly feed the network equipment in a distributed architecture (DA)
- Larger rectifiers (4.0kW) provide the flexibility to configure economical higher ampacity systems



Figure 1 — Front angle view of the CXPS-W system

3. Specifications

Table A — Specifications CXPS-W	
Electrical	
Primary Output Voltage:	-48V
Secondary Output Voltage: (optional)	+24V
4.0kW Rectifier Shelf AC Input:	6x 30A, Single Phase, 208 to 277Vac 2x 50A, 3 Phase, 208Vac (w/o neutral) 2x 30A, 3 Phase, 277/480Vac (w/ neutral)
2.4kW Rectifier Shelf AC Input:	2x 40A & 1x 20A Single Phase, 208 to 277Vac
Distribution	
System Ampacity Ratings (Continuous):	1 Tier System Bus Capacity: 600A 2 Tier System Bus Capacity: 1200A 3 Tier System Bus Capacity: 1200A (or) 1800A 4 Tier System Bus Capacity: 1200A (or) 2000A
Fuses	
GMT:	30A, 10 positions (15A max. fuse)
TPL(HC*):	Up to 8 positions in a 4T Distribution, (800A max. fuse)
TPL (LC*):	Up to 16 positions in a 4T Distribution, (400A max. fuse)
TLS/TPS Plug-in Bullet:	Up to 96 positions
Breakers	
Plug-in Bullet:	Up to 96 positions in a 4T Distribution System
High Capacity Bolt-in:	Up to 24 positions in a 4T Distribution System
Output Termination	
GMT:	0.34 to 2.5mm ² (14 to 22AWG)
TPL(HC*):	2x 3/8" studs on 1" centers (Up to 2x 750 MCM Cables)
TPL (LC*):	1x 3/8" studs on 1" centers (Up to 1x 750 MCM Cables)
High Capacity Bolt-in:	1x 3/8" studs on 1" centers (Up to 1x 750 MCM Cables)
TLS/TPS/Plug-In Bullet:	1 pole are 1/4" studs on 5/8" centers, 2 pole and 3 pole are 3/8" diameter on 1" centers
Internal Ground Bar	1/4" studs on 5/8" centers
External Ground Bar:	Optional
Battery:	5x 3/8" hole on 1" centers per polarity
System Level Alarms and Controls	
Indicators:	LCD with touch screen: System OK (green LED) System minor alarm (yellow LED) System major alarm (red LED)
Alarm Connections:	>0.34 to 2.5mm ² (14 to 22AWG)
Mechanical	
Mounting:	Standard center mount 23" relay rack mm: 2133H x 660W x 560D inches: 84H x 26W x 22D

Weight:	System: 227kg (500lbs) approx 4.0kW Rectifier: 8.5kg (19lbs) per module 2.4kW Rectifier: 1.76kg (3.9lbs) per module
Environmental	
Operating Temperature:	0 to 40°C (32 to 104°F)
Storage Temperature:	
Humidity:	0 to 95% RH non-condensing
Elevation:	500 to 2800m (-1640 to 9186ft)
Compliance	
CSA:	CSA C22.2 No. 60950-1 UL 60950-1
The above information is valid at the time of publication. Consult factory for up-to-date ordering information. Specifications are subject to change without notice.	

4. Features

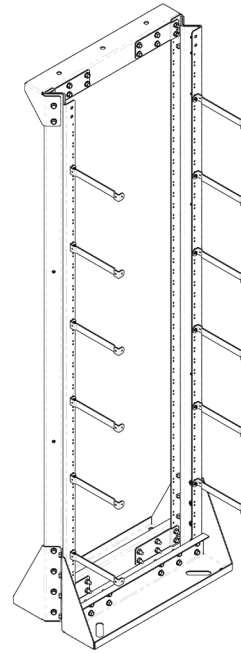
4.1 System Overview

4.1.1 Seismic Racks

The CXPS-W system can be installed in a variety of Alpha provided, 23" seismic racks. These racks have been Z4 rated and NEBS L3 certified. The racks vary in their Z4 seismic capabilities from 500. lb to 2500 .lb and in their heights from a 3.5' to 9' racks (standard 7' racks are available as well). For more ordering information, refer to the CXPS-W Ordering Guide on the Alpha website.

Certain list options on the one tier (1T), and the two tier (2T) systems can be purchased with system mounting brackets so that the systems can be installed into existing customer provided racks.

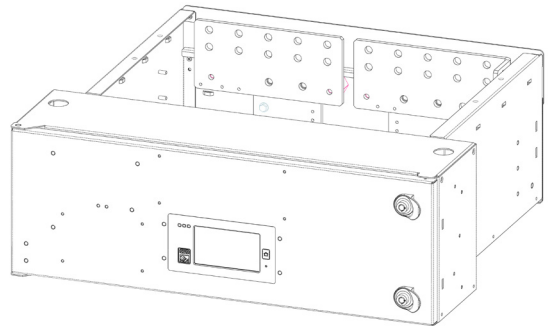
- 7RU = 1 Tier + 2x 2.4kW Rectifier Shelves
- 9RU = 1 Tier + 1x 4.0kW Rectifier Shelf
- 11RU = 2 Tier + 2x 2.4kW Rectifier Shelves
- 13 RU= 2 Tier + 1x 4.0kW Rectifier Shelf (or) 2 Tier + 4x 2.4kW Rectifier Shelves
- 17RU = 2 Tier + 2x 4.0kW Rectifier Shelves



4.1.2 Distribution Cabinets

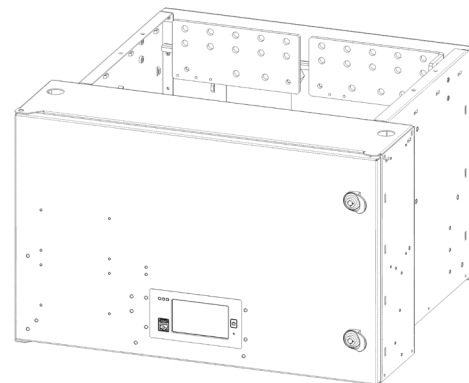
4.1.2.1 One Tier

- Accepts a maximum of one distribution tier
- Rated for a max of 600A
- 5RU in height
- Five battery landing positions (ten cables back to back) (return bar has one extra position for the site ground)
- Max lug tongue width: 1.63"



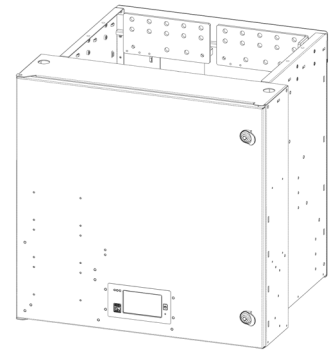
4.1.2.2 Two Tier

- Accepts a maximum of two distribution tiers
- Rated for a max of 1200A
- Option for a 1200A LVBD
- 9RU in height
- Five battery landing positions (ten cables back to back) (return bar has one extra position for the site ground)
- Max lug tongue width: 1.63"



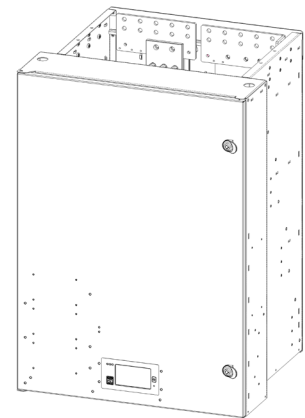
4.1.2.3 Three Tier

- Accepts a maximum of three distribution tiers
- Rated for a max of 1200A or 1800A
- Option for a 1200A or 2000A LVBD
- 14RU in height
- Five battery landing positions (ten cables back to back) (return bar has one extra position for the site ground)
- Max lug tongue width: 1.63"



4.1.2.4 Four Tier

- Accepts a max of four distribution tiers
- Rated for a max of 1200A or 2000A
- Option for a 1200A or 2000A LVBD
- 20 RU in height
- Five battery landing positions (ten cables back to back) (return bar has one extra position for the site ground)
- Max lug tongue width: 1.63"



4.1.3 Low Voltage Battery Disconnect (LVBD) Option

The Cordex CXC HP controller monitors battery voltage. If AC power is lost, the batteries continue to provide DC power to the load and the converters (if present). When the battery voltage reaches a predetermined (adjustable) level, the controller will disconnect the batteries to protect them from full discharge.

The LVBD option includes a manual disconnect switch and terminal block for field wiring an external switch to disconnect the batteries manually from either within the distribution unit or remotely. The LVD override switch provides users with the ability to inhibit or override LVD contactor operations as a safeguard during controller maintenance. A green LED lights up when the LVD is in normal operation mode (auto) and a yellow LED signals when the switch has been placed in the override position.

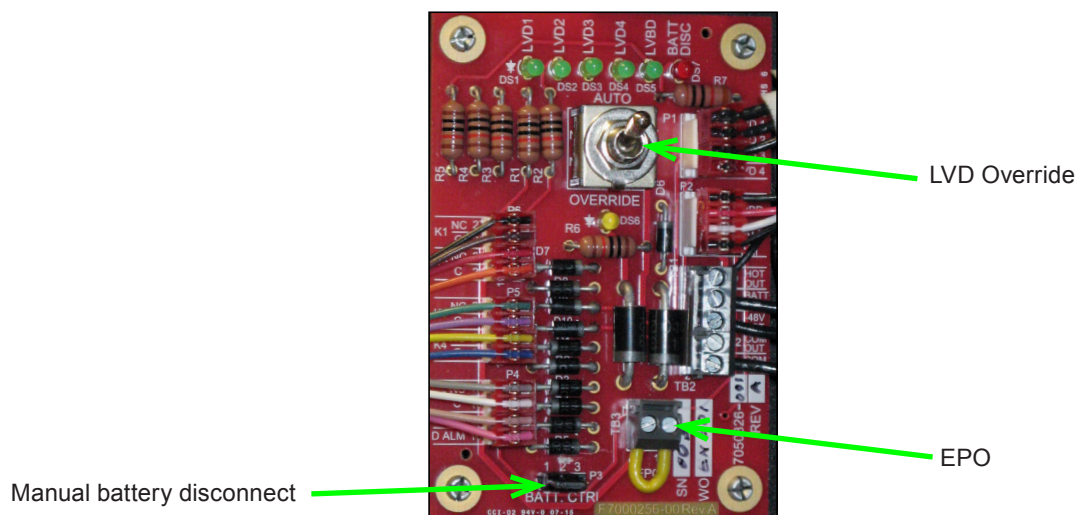


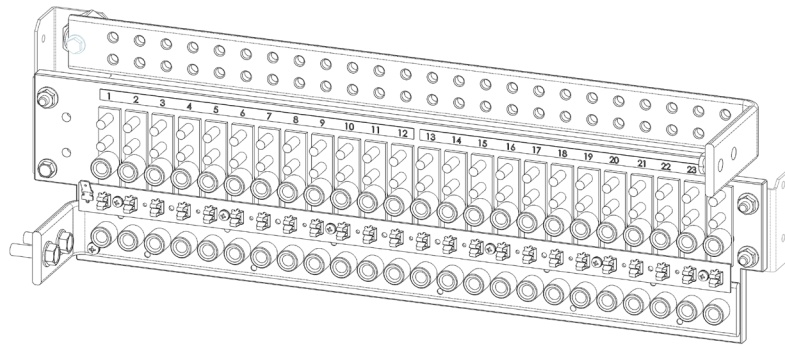
Figure 2 — LVD Override and Manual Battery Disconnect

4.1.4 24 Position Bullet Tier Features

- Occupies 1 tier position
- Can be installed in any location of the 'W' distribution cabinet
- 600A tier rating (Monitored by 800A shunt)
- Each tier accepts 1P (125A), 2P (200A), 3P (300A)
- 1P breaker/fuse (1/4" stud on 5/8" center)
- 2P & 3P breaker (3/8" stud on 1" center), via adapters
- Option for tier with internal return
- Max lug tongue width: 0.60" (1.06" with adapters)

 **NOTE:**

Any 1P Over Current Protection device, rated at 125A, requires an empty space on either side.



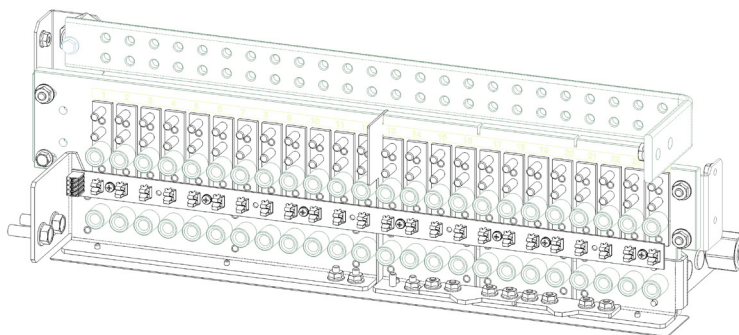
4.1.5 24 Position Staged Bullet Tier Features

Tier can be configured as 12 positions on primary bus and 12 positions on secondary bus (or) 16 positions on primary bus and 8 positions on secondary bus (or) 20 positions on primary bus and 4 positions on secondary bus (or) all 24 positions on primary bus.

- Occupies 1 tier position
- Can be installed in any location in any of the 'W' distribution cabinet
- 600A tier rating (Monitored by 800A shunt)
- The secondary to primary (or vice vers) can be converted in the field if required
- Each tier accepts 1P (125A), 2P (200A), 3P (300A)
- 1P breaker/fuse (1/4" stud on 5/8" center)
- 2P & 3P breaker (3/8" stud on 1" center), via adapters
- Option for tier with internal return
- Max lug tongue width: 0.60" (1.06" with adapters)

 **NOTE:**

Any 1P Over Current Protection device rated at 125A requires an empty space on either side.



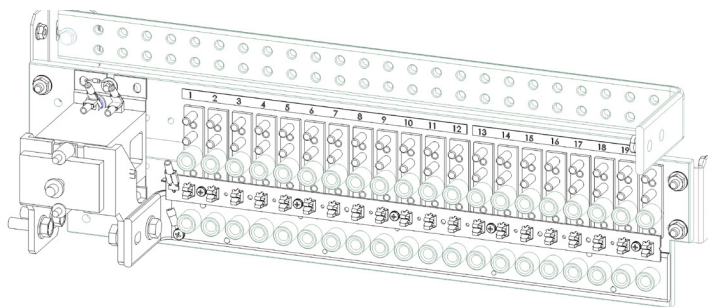
4.1.6 20 Position LVLD Bullet Tier Features

- Occupies 1 tier position
- Can be installed in any location in any of the 'W' distribution cabinet
- 600A tier rating (Monitored by 800A shunt)
- Load shedding via 600A contactor
- Each tier accepts 1P (125A), 2P (200A), 3P (300A)
- 1P breaker/fuse (1/4" stud on 5/8" center)
- 2P & 3P breaker (3/8" stud on 1" center), via adapters
- Option for tier with internal return
- Max lug tongue width: 0.60" (1.06" with adapters)



NOTE:

Any 1P Over Current Protection device rated at 125A requires an empty space on either side.

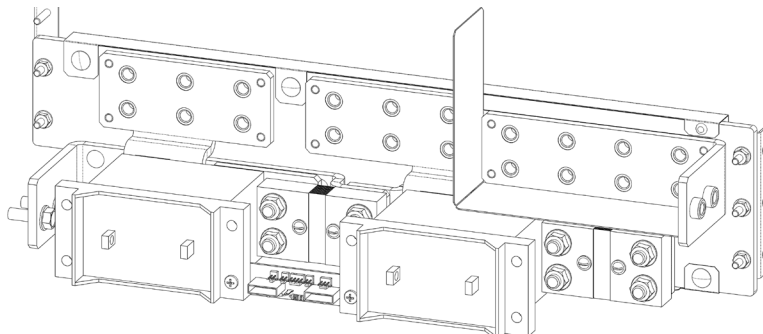


4.1.7 Low Voltage Load Disconnects (LVLD)

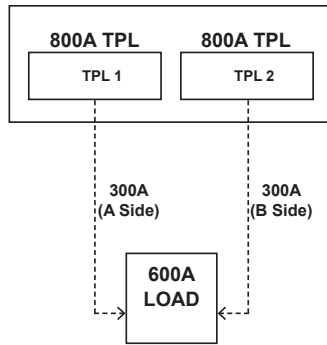
The Low Voltage Load Disconnect (LVLD) option controls a high capacity contactor that disconnects the load during predetermined low voltage conditions. Similarly the Low Voltage Battery Disconnect (LVBD) option disconnects battery at a preset disconnect voltage. The system loads and batteries are automatically reconnected once AC is restored and battery voltage has risen above a preset value.

4.1.8 2 Position TPL Tier Features

- Occupies 1 tier position
- Can be installed in any location in any of the 'W' distribution cabinet
- 600A tier rating (Monitored by 800A shunt)
- Each position accepts max 800A TPL fuse
- Current on each TPL is monitored via a 800A shunt
- 3x landings per fuse (3/8" nuts on 1" center)
- Option for tier with internal return
- Max lug tongue width: 1.63"



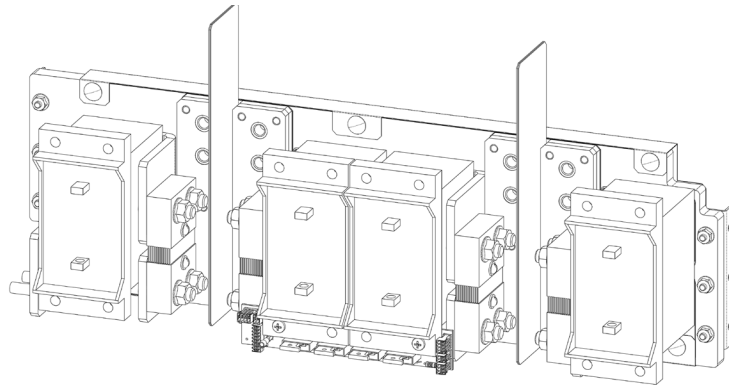
2 Position TPL Tier Theory of Operation



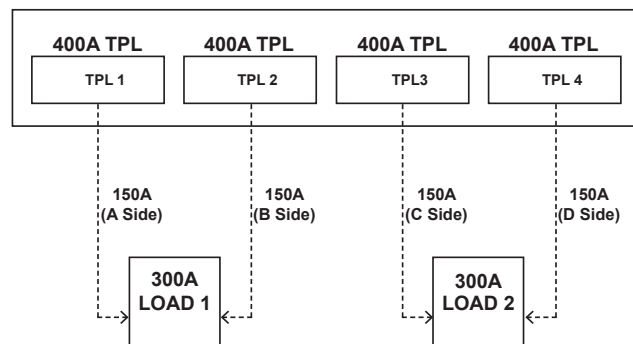
If TPL 1 (or) TPL 2 operate and open, then the other TPL will carry the entire load current and not exceed the 80% rating of the fuse and the 600A rating of the tier.

4.1.9 4 Position TPL Tier Features

- Occupies 1 tier position
- Can be installed in any location in any of the 'W' distribution cabinet
- 600A tier rating (Monitored by 800A shunt)
- Each position accepts max 400A TPL fuse
- Current on each TPL is monitored via a 400A shunt
- 1x landings per fuse (3/8" nuts on 1" center)
- Max lug tongue width: 1.63"



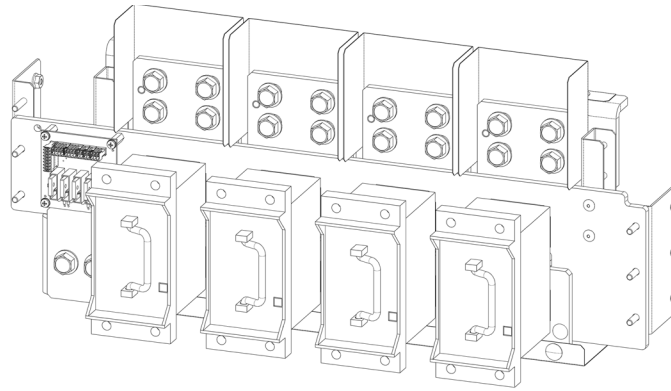
4 Position TPL Tier Theory of Operation



If TPL 1 (or) TPL 2 / TPL 3 (or) TPL 4 operate and open, then the other TPL will carry the entire load current and not exceed the 80% rating of the fuse and the 600A rating of the tier.

4.1.10 4 Position TPL Tier Features

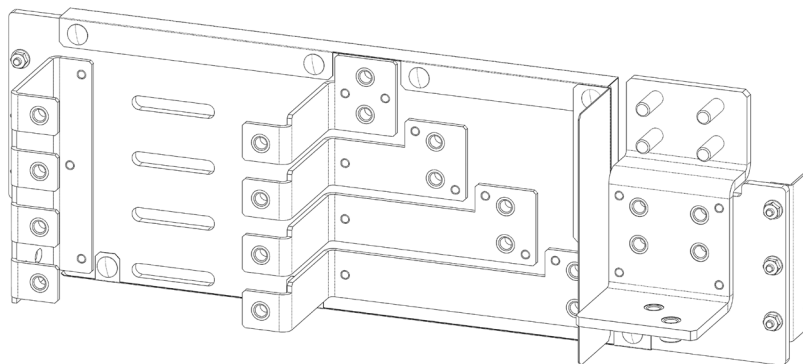
- Occupies 1 tier position
- Can be installed in only the top tier in any of the 'W' distribution cabinet
- 1200A tier rating (Monitored by 1500A shunt)
- Each position accepts max 800A TPL fuse
- Current on each TPL is monitored via a 800A shunt
- 2x landings per fuse (3/8" nuts on 1" center)
- Max lug tongue width: 1.75"



4.1.11 4 Position High Capacity Breaker Tier Features

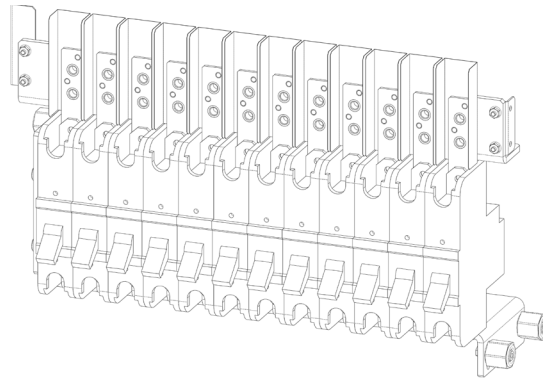
- Occupies 1 tier position
- Can be installed in any location in any of the 'W' distribution cabinet
- 600A tier rating (Monitored by 800A shunt)
- Can accept 1P-4P(800A Max) GJ style breaker
- Breakers could be ordered with built in shunts for individual load current monitoring
- 1x landings per position (3/8" nuts on 1" center)
- Option for tier with internal return
- Max lug tongue width: 1.63"

Limitation: Cannot land more than two 750 MCM cables on this tier option with an internal return.



4.1.12 12 Position High Capacity Breaker Tier Features

- Occupies 2 tier positions
- Can be installed only in specific location within the 'W' distribution cabinet
 - » Tiers 1 and 2, in a 2T distribution cabinet
 - » Tiers 1 and 2, in a 3T distribution cabinet
 - » Tiers 1 and 2 and tiers 3 and 4, in a 4T distribution cabinet
- 1800A tier rating (Monitored by 2500A shunt)
- Can accept 1P-4P (800A Max) GJ style breaker
- Breakers could be ordered with built in shunts for individual load current monitoring
- 1x landings per position (3/8" nuts on 1" center)
- Option for tier with internal return
- Max lug tongue width: 1 Pole: 1.06", 2 Pole: 1.06", 3 Pole: 1.63", 4 Pole: 1.63"



4.1.13 12 Position Internal Return Bar

- Can only be installed in specific locations of the 2T, 3T and 4T 'W' distribution cabinets
 - » Maximum of 1 return bar in a 2T distribution cabinet
 - » Maximum of 1 return bar in a 3T distribution cabinet
 - » Maximum of 2 return bars in a 4T distribution cabinet
- 1800A tier rating
- 12x landings (3/8" nuts on 1" center)

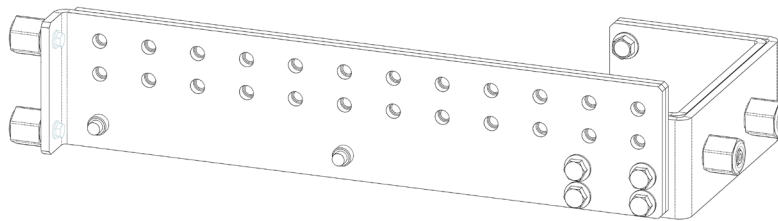


Figure 3 — 12 Position Internal Return (top of 4T and 2T)

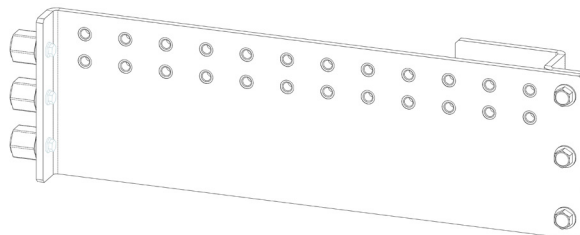


Figure 4 — 12 Position Internal Return (bottom of 3T and 4T)

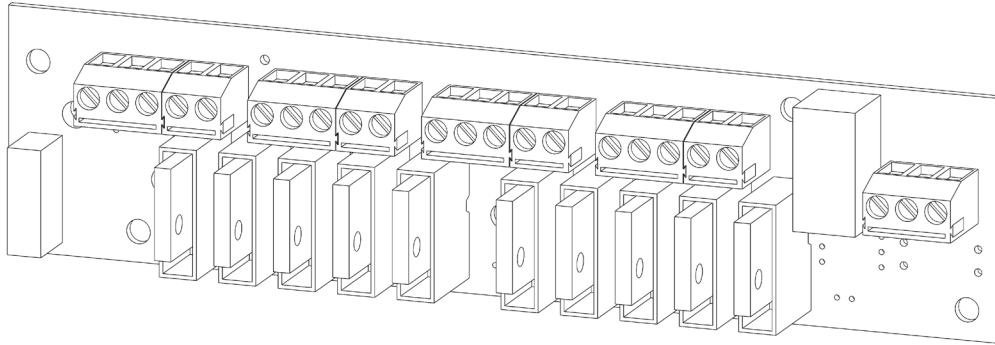
4.1.14 10 Position GMT Fuse block

- Mounted on the side of the distribution cabinet
- 30A max rating
- Can accept 15A GMT fuses



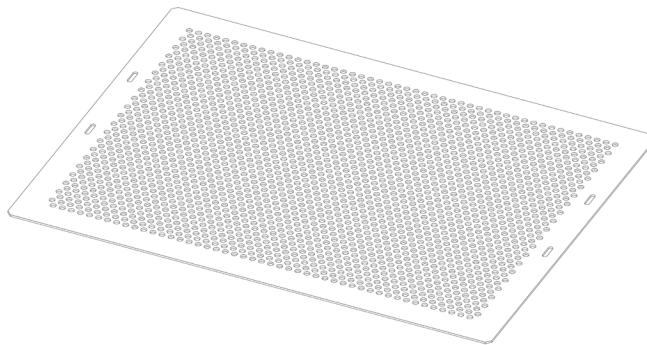
NOTE:

Only install a 15A fuse if the adjacent positions are empty. Otherwise install a 10A fuse maximum per position.



4.1.15 Top Cover for distribution cabinet

- The top cover is a flexible shield that is made of insulated material that can be ordered and installed on top of the distribution cabinet.
- The covers helps prevent metallic objects from falling into the distribution cabinet,
- Individual cutouts can be made on the cover to enable cable routing access



4.1.16 Cable Lacing Bar Kit

- The cable lacing bar kit is a metallic bar that can be ordered and installed on the top of the cabinet (as shown in pictures)
- This bar acts as a staging point for installers to lace cables that ‘waterfall’ from the ladder rack prior to being terminated within the distribution cabinet. This particularly helps if the ladder rack is installed several feet above the distribution section of the power system
- Multiple lacing bar kits could be installed (based on the distribution cabinet ordered)
- Maximum of 1 lacing bar for a 1T or 2T distribution cabinet
- Maximum of 2 lacing bars for a 3T distribution cabinet
- Maximum of 3 lacing bars for a 4T distribution cabinet

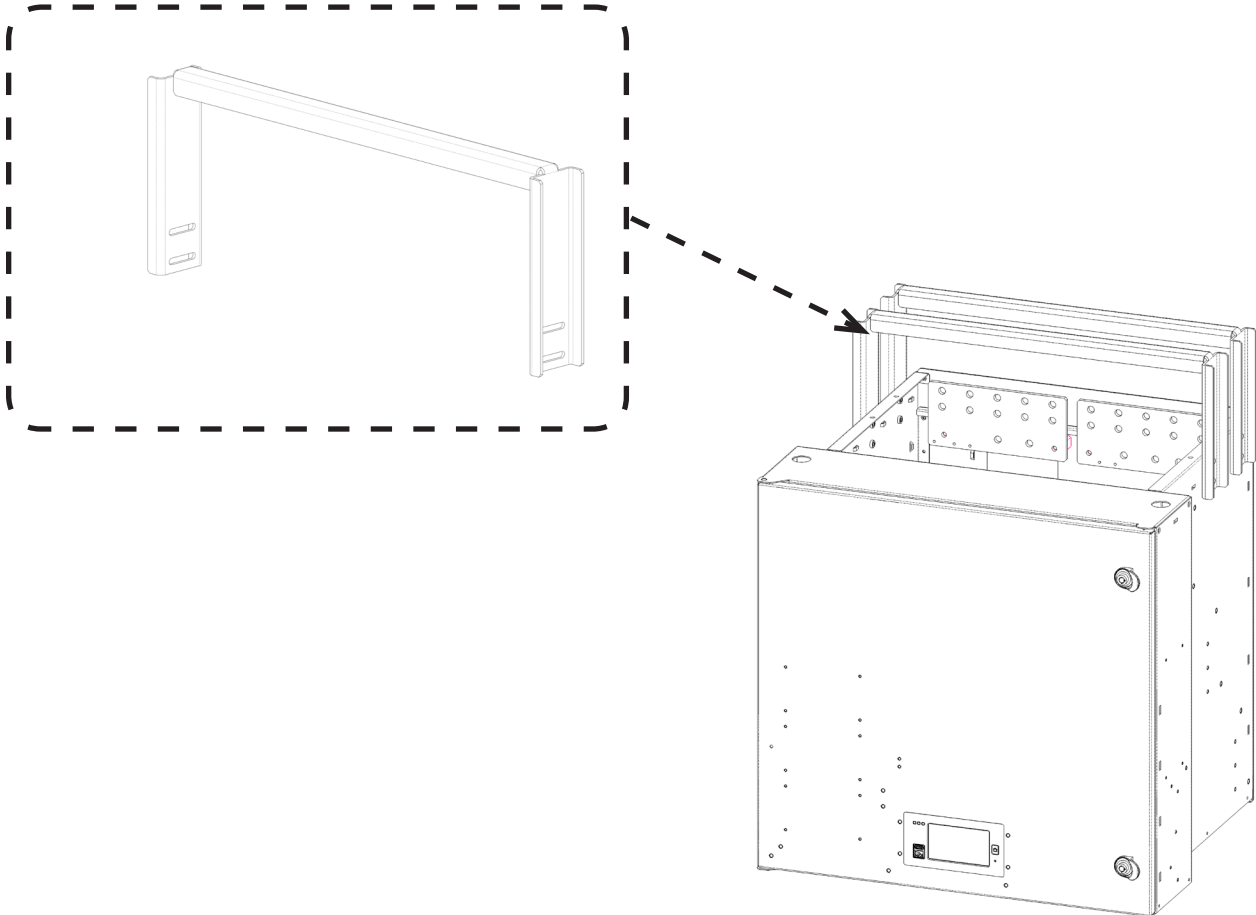


Figure 5 — Cable Lacing Bar Kit

4.2 Cordex HP Controller (CXC HP)

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 CXC HP 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 (temperature, voltage, temperature) and generate electrical signals through relays.

The most commonly used ADIO peripheral is the L-ADIO for low voltage systems which includes:

- 8 digital inputs
- 4 voltage sensors
- 4 temperature sensors
- 4 current sensors
- 12 Form C relay outputs

4.2.1 Controller Features

The CXC HP 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 CXC HP 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.

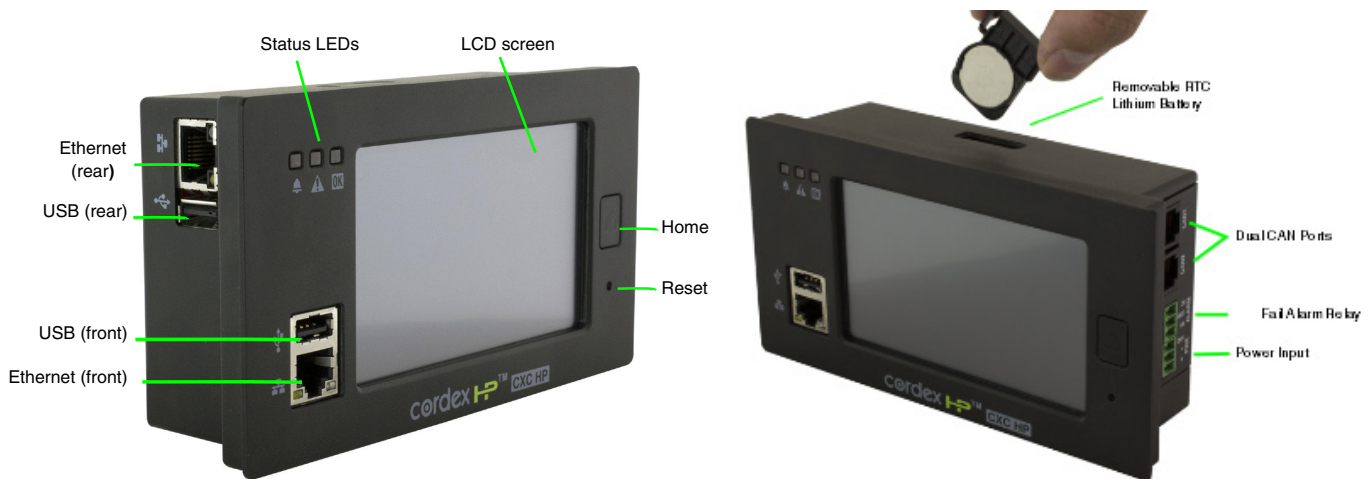


Figure 6 — Cordex CXC HP Controller (left and right side views)

- USB: dual ports on both 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.

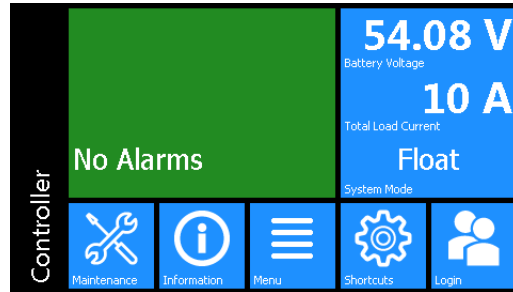


Figure 7 — LCD Color Touchscreen Display

4.3 External Peripherals

4.3.1 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 CXC HP controller.



Figure 8 — L-ADIO I/O Peripheral

4.3.1.1 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 CXC HP 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.

4.3.1.2 Digital Inputs

The L-ADIO can accommodate 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.

4.3.1.3 Alarm and Control Output Relays

Each L-ADIO contains twelve 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.

4.3.1.4 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 CXC HP

4.3.1.5 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.

4.3.1.6 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 CXC HP 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.

4.3.2 6I-ADIO

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

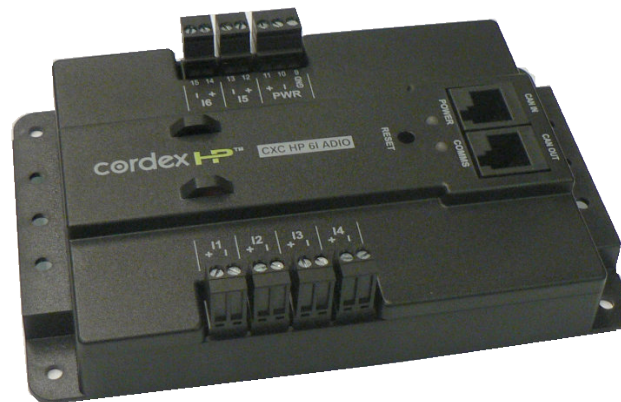


Figure 9 — 6I-ADIO Power Module

4.4 Cordex HP 4.0kW Rectifiers

4.4.1 Rectifier Features

- High performance 83.3A rectifier for 48V telecom applications
- 95.3% efficiency for increased OPEX savings and reduced carbon footprint
- High power density 4RU compact design delivering up to 24kW per 23" shelf
- Power limiting and wide range AC input for global installation requirements
- Extended operating temperature range up to 75°C for deployment in the harshest outdoor environments
- Backwards compatibility with Cordex 3.6kW rectifier shelves and power solutions providing cost effective upgrade path



Figure 10 — Cordex HP 4.0kW Rectifier

4.4.2 AC Wiring

The 4.0kW rectifier shelves used within the CXPS-W systems are 23" in width. The individual rectifier shelves are wired to the customer provided AC termination panel. The AC input is routed through a 1" knockout on the side of the shelf for a direct connection. The AC wiring size depends upon the rectifier shelf voltage configuration and the local electrical code.

The recommended AC breaker and wire gauge sizes are as follows:

Rectifier Shelf	Recommended AC Breaker Size (A)	Recommended AC Wire Size (AWG)
1Phase , 208Vac – 277 Vac	6x 30A AC breakers	#10 AWG
3 Phase, 208Vac (w/o neutral)	2x 50A AC breakers	#6 AWG
3 Phase, 277/480 Vac (e/w neutral)	2x 30A AC breakers	#10 AWG

4.4.3 LED status

The three LEDs on the rectifier front panel indicate status (see Figure 10):

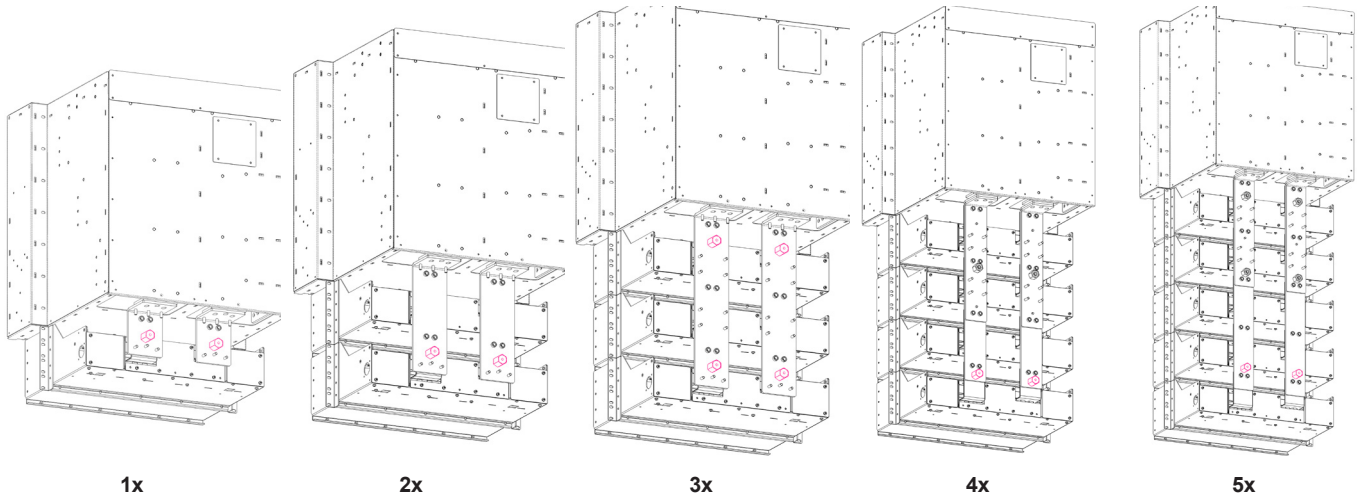
- AC Input Voltage present (1)
- DC Output Voltage present (2)
- Rectifier Alarm (3)

4.4.4 4.0kW Rectifier Shelf Busing

The CXPS-W system can accept from a single 4.0kW rectifier shelf up to five shelves as shown in the following pictures.

- 1x 4.0kW Rectifier Shelf Kit
- 2x 4.0kW Rectifier Shelf kit
- 3x 4.0kW Rectifier Shelf kit
- 4x 4.0kW Rectifier Shelf kit
- 5x 4.0kW Rectifier Shelf kit

The rectifier shelf busing kit includes the busbars to connection the rectifier shelves to the distribution module and the Kydex cover to insulate the busbars.



4.5 2.4kW Rectifier Shelf

4.5.1 Rectifier Features

- High performance compact 50A rectifier for 48Vdc telecom application
- High efficiency (96 +%) for reduced OPEX and carbon footprint
- High temperature operating range for installation in non-controlled environments
- Multiple configurations providing 250A or 12kW in a compact 1RU shelf
- High power density (28W/in³) yields more space for revenue generating equipment
- Wide AC input operating range for global installation requirements
- Extended operating temperature range up to 75°C for deployment in the harshest outdoor environments

4.5.2 AC Wiring

The 2.4kW rectifier shelves used within the CXPS-W systems are 23 inches in width. The individual rectifier shelves are wired to the customer provided AC termination panel. The AC input is routed through a one inch knockout on the side of the shelf for a direct connection. The AC wiring size can vary based on local electrical codes.

The recommended AC breaker and wire gauge sizes are as follows:

Rectifier Shelf	Recommended AC Breaker Size (A)	Recommended AC Wire Size (AWG)
1Phase , 208Vac – 277 Vac	2x 40A & 1x 20A AC breakers	#8 AWG for 40A Breaker #12 AWG for 20A Breaker

4.5.3 LED Status

The three LEDs on the rectifier front panel indicate status

- AC Input Voltage present (1)
- DC Output Voltage present (2)
- Rectifier Alarm (3)



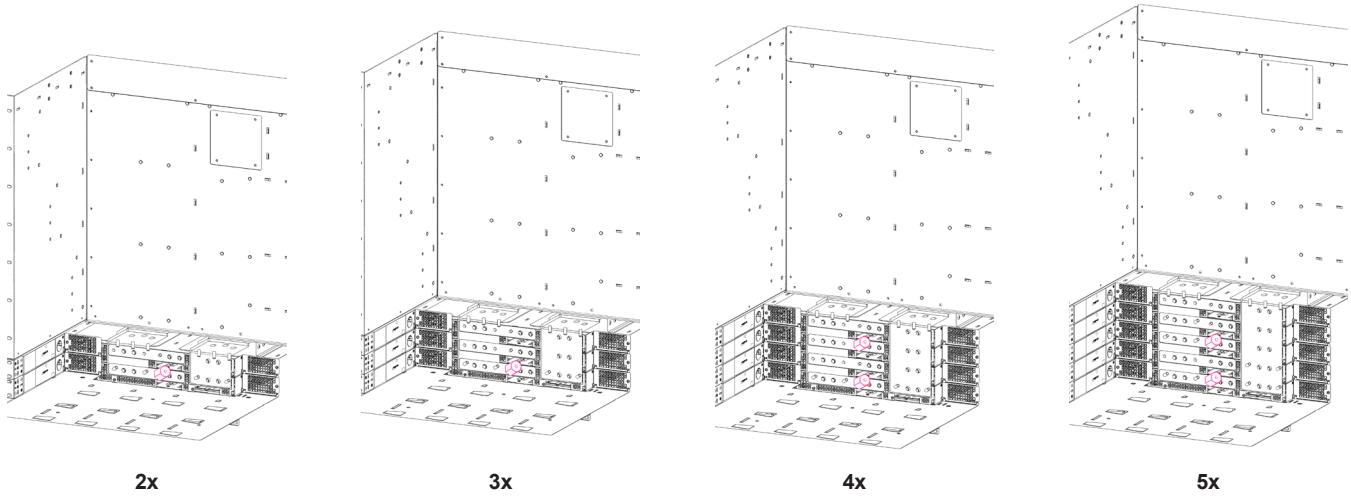
Figure 11 — Rectifier Front Panel LEDs

4.5.4 2.4kW Rectifier Shelf Busing

The CXPS-W system can accept from two 2.4kW rectifier shelves, up to five shelves. Additional rectifier shelves can be added in the field live. The 2, 3 and 4 rectifier shelf bus options are expandable in the following manner:

- 2x 2.4kW Rectifier Shelf Kit
- 3x 2.4kW Rectifier Shelf Kit
- 4x 2.4kW Rectifier Shelf Kit
- 5x 2.4kW Rectifier Shelf Kit

The rectifier shelf busing kit includes the busbars to connection the rectifier shelves to the distribution module and the Kydex cover to insulate the busbars.



4.6 2.0Kw 48V to 24V Converter Shelf

The CXPS-W system accepts up to a maximum of one 23" module 48V to 24V converter shelf.

4.6.1 Converter Features

- Supports small to medium 24Vdc loads from a 48Vdc power system
- High power density modular design, 2kW output per module
- Advanced monitoring and control capability including remote accessibility
- Internal low voltage shutdown for cost effective integration into existing systems

4.6.2 Converter Shelf Wiring

The busing for the converter shelf from the main 48Vdc power system and the wiring from the converter shelf to the 24Vdc distribution points are done at the factory.

4.6.3 LED Status

The three LEDs on the converter shelf indicate status

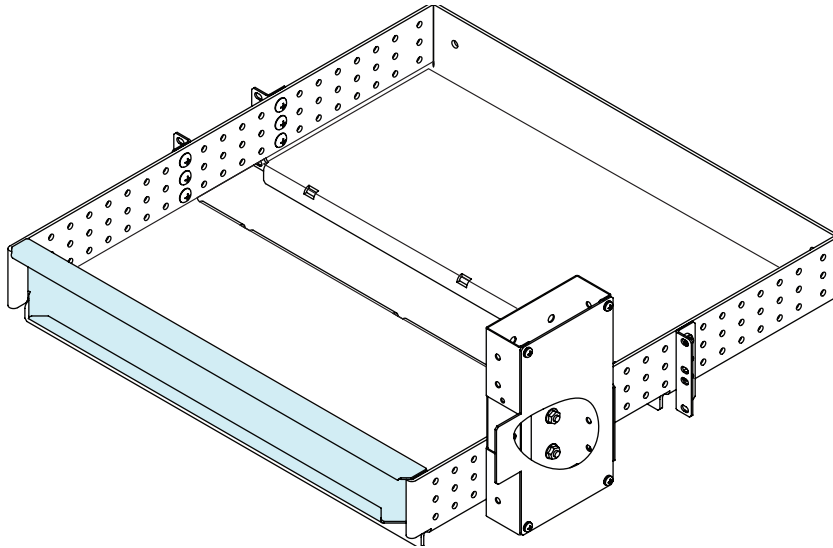
- AC Input Voltage present (1)
- DC Output Voltage present (2)
- Rectifier Alarm (3)



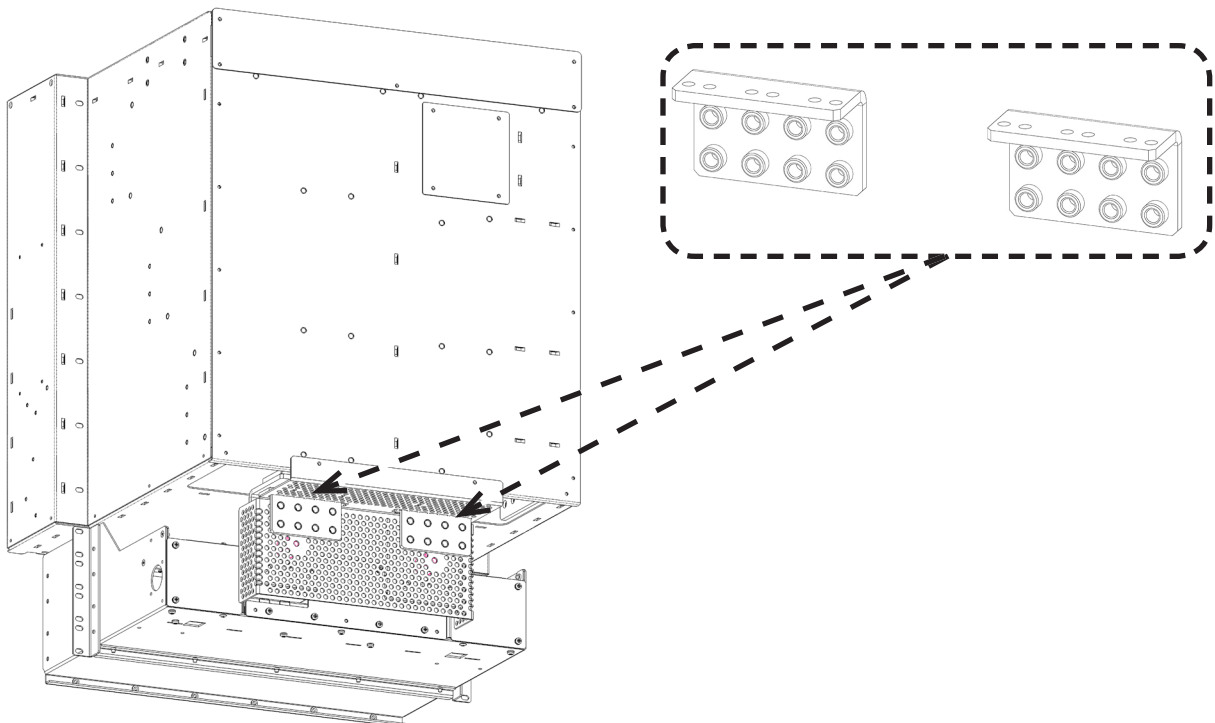
Figure 12 — Rectifier Front Panel LEDs

4.7 Integrated Battery Trays

The CXPS-W system is designed to integrate battery trays below the power system. These battery trays can accept standard 12V mono-blocks ranging in height from 6RU-8RU. The battery trays are factory installed and pre-wired for ease of installation. They can be configured for with or without battery breakers as Over Current Protection Devices (OCPD). The battery breakers are installed within a breaker housing on the side of each battery tray. The breaker sizes and its associated cabling can range from 100A- 250A.



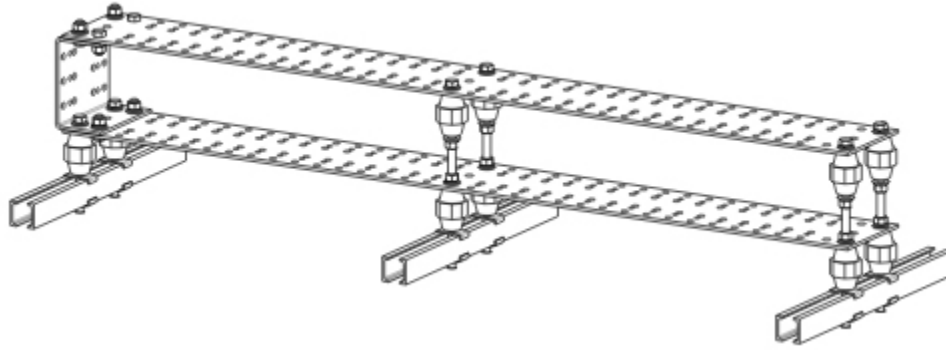
When battery trays are ordered for systems without a Low Voltage Battery Disconnect (LVBD), the battery cable landing bus bar kit will need to be ordered. This kit provides a secure location to terminate each individual battery tray cable to the main power system bus enabling a neat and clean install. In addition, this kit provides sufficient access to customers in the event that a battery tray and its associated cabling needs to be added in the field on a live plant.



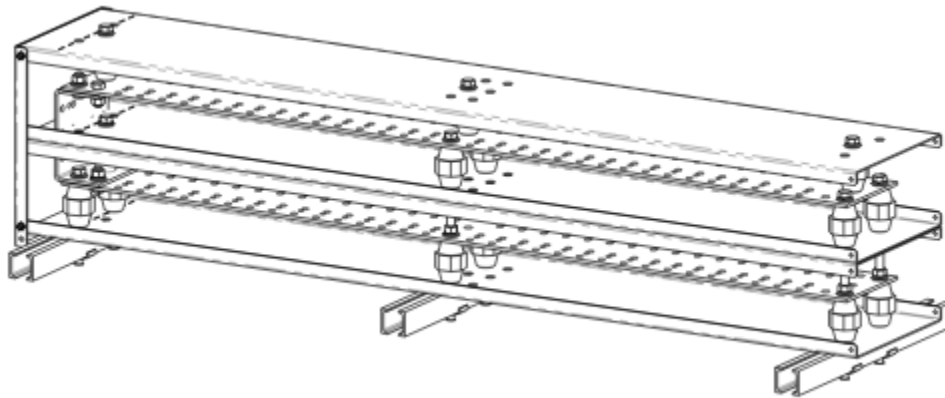
4.8 Remote Return Bar Kit

The external return bar kit is an alternate option for landing return connections from the loads. It serves as the common connection point for the positive side of the power section and the batteries. The CXPS-W Remote Return Bar has a capacity of 2500A per kit. Adder kits with a capacity of 2500A can be installed onto the base kit to increase its total capacity.

Each bar provides 62 of 1/2" on 1.75" centers, 62 of 3/8" on 1.00" centers, and 60 of 1/4" on 5/8" centers.



The kits can be ordered with optional insulation covers as shown in the following picture.



4.8.1 Interbay Busing

- The interbay busing option provides the user the capability to field expand a 1200A or a 2000A CXPS-W system to a 2400A or 4000A system.
- The new, higher capacity system will still maintain one centralized controller in the primary bay.
- The supplemental expansion bay can be added either to the left or right of the primary power and distribution bay.
- This interbay busing option can be added live without loss of service.
- A maximum of one supplemental bay can be added for each primary bay.

Limitation: The interbay busing cannot be used on systems that utilize the 'Rectifier shelf field expansion kit'.

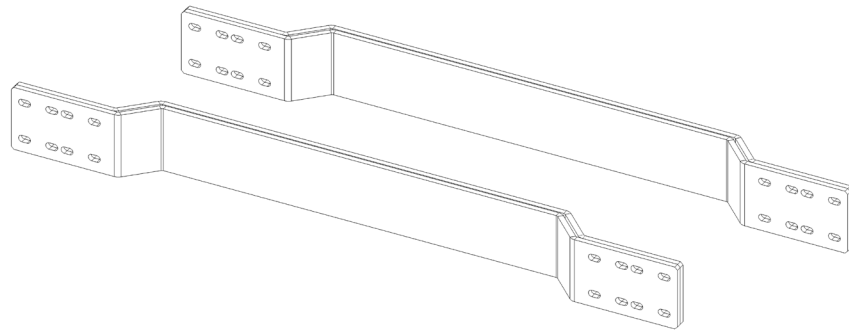









Figure 13 — Interbay Busing (2000A shown here)

5. Inspection

5.1 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. Packaging assemblies and methods are tested to International Safe Transit Association standards. 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.

 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

5.1.1 Returns for Service

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.

5.2 Check for Damage

Prior to 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.

5.3 General Receipt of Shipment

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

5.3.1 Racks

Consult the packing slip and power system bill of materials to verify that you have the correct number of racks per your order.

5.3.2 Rectifiers (Purchased Separately)

Consult the packing slip to verify that you have received the correct number of rectifiers per your order.

5.3.3 Miscellaneous Small Parts

Review the packing slip and bill of materials to determine the part number of the "configuration kits" included with your system. Review the bill of materials to verify that all the small parts are included.

5.3.4 Batteries (Purchased Separately)

Verify that you have the correct number of batteries if applicable. Refer to the packing list. Verify that you have all the necessary parts per your order.

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

6. Installation

Only qualified personnel should install and connect the power components within the Alpha power system. For the battery installation, refer primarily to the manufacturer's manual.

Frequent reference is made to drawings located at the rear of this manual. Layout and schematic drawings are provided with the power system.

6.1 Safety Precautions

Refer to the Safety section near the front of this manual.

6.2 Tools Required

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

- Battery lifting apparatus if required
- Electric drill with hammer action, 1/2" capacity
- Various crimping tools and dies to match lugs used in installation
- Load bank of sufficient capacity to load largest rectifier to its current limit
- Digital voltmeter equipped with test leads
- Cable cutters
- Torque wrench: 1/4" drive, 0 - 150 in-lb
- Torque wrench: 3/8" drive, 0 - 100 ft-lb
- Torque wrench: 1/2" drive, 0 - 100 ft-lb
- Insulating canvases as required (2' x 2', 1' x 1', 3' x 3', etc.)
- Various insulated hand tools including:
 - Combination wrenches - Ratchet and socket set
 - Various screwdrivers
 - Electricians knife
- Battery safety spill kit required for wet cells only:
 - Protective clothing
 - Face shields
 - Gloves
 - Baking soda
 - Eye wash equipment
- Cutters and wire strippers (#14 to #22 AWG) [2.5 to 0.34 mm²]

6.3 Installation of External Batteries

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



WARNING!

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

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

Provide adequate ventilation. VRLA batteries, though not requiring the special ventilation requirements of a flooded battery, should not be installed in an airtight enclosure. Hydrogen gas can be emitted from a failed battery.

If applicable, clean the cells before assembly according to the battery manufacturer's recommendations. First neutralize any acid with a baking soda and water solution; then wipe the cells with clean water.

6.3.1 Installation

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

Apply a corrosion-inhibiting agent, such as NO-OX-ID "A", on all battery terminal connections.

1. If required, assemble the battery rack and the cells or mono-blocks as per the installation instructions supplied with the batteries.
2. Ensure that the battery output cabling can 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-OX-ID "A" grease from battery terminals.
4. Burnish the terminal posts with a non-metallic brush, polishing pad or 3M Scotch Brite scouring pad.
5. Apply a light coating of NO-OX-ID "A" grease to the terminal posts.
6. If lead plated inter-unit connectors are used, they should also be burnished and NO-OX-ID "A" grease applied as above. Install the inter-unit connectors.
7. After all battery connections are completed, torque the connections as per the battery specifications (typically 100 in-lbs).

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

6.4 Power System Assembly and Mounting

The power system must be mounted in a clean and dry environment. Sufficient free space must be provided at the front and rear of the power system. This is to meet the cooling requirements of the rectifiers and to allow easy access to the power system components.

6.4.1 Weight and Dimensions

The weight of the system with no rectifiers or converters installed is approximately 650 lb or 295 kg.

6.4.2 Floor Mounted Systems

Secure the system to a concrete floor using either heavy duty anchors ($\frac{1}{2}$ " x $2\frac{1}{2}$ "), or for wooden floors, heavy-duty lag screws ($\frac{5}{8}$ " x $2\frac{1}{2}$ "). Use appropriately sized flat washers.

If required, use isolation kits to isolate system from the floor.

Secure the relay rack to the overhead cable tray. Alpha does not supply the mechanical details necessary for overhead support.

NOTE:

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

1. Place the bay in position over the anchoring holes (and the isolation pad if necessary).
2. Install the anchoring hardware for each anchor FINGERTIGHT.
3. Check that the bay is level front to back and side to side. Install shims if necessary.
4. Once the bay is level, tighten all bolts to the appropriate torque.

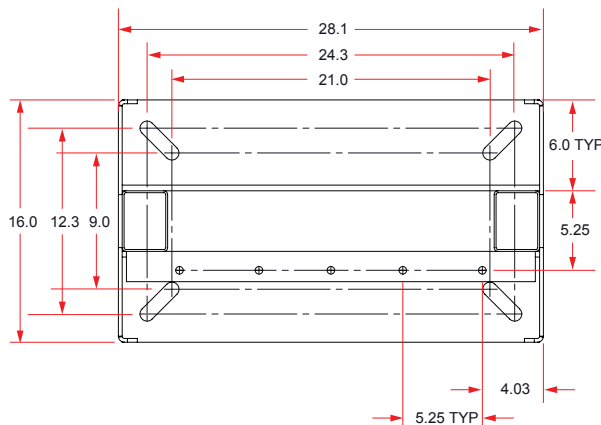


Figure 14 — Rack Mounting Details (top view), Welded Rack

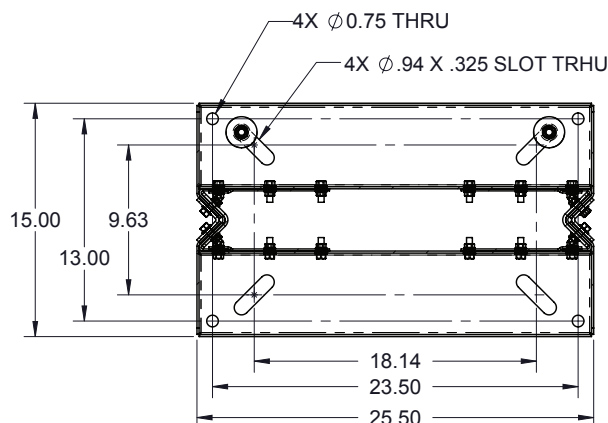


Figure 15 — Rack Mounting Details (top view), Bolted Rack

7. Wiring

This chapter provides cabling details and notes on cable sizing for DC applications with respect to the product.



WARNING!

Ensure that the power is switched off by switching off rectifiers and removing battery line fuses, turn off battery breakers before attempting work on the wiring. Use a voltmeter to verify the absence of a voltage. Clearly mark the correct polarity of the battery leads before starting work on DC connections.

7.1 Installation Notes

Refer to the Installation section for safety precautions and tools required.

7.1.1 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.

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

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 C for cable size equivalents.

Table C — Cable size equivalents (AWG to Metric)

Cable size (see notes 1 and 2)	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

Cable size (see notes 1 and 2)	Circular mils	Square millimeters	Equivalent metric cable
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

7.1.2 Recommended Torque Values

Table D lists the recommended torque values for connection to the power system with the following hardware:

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

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.

7.2 Grounding

The CXPS-W system is suitable for installation as part of the Common Bonding Network (CBN).

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

The cable from the power system to the MGB or FGB must be sized to provide sufficient ampacity to clear the largest fuse or breaker on the power system, excluding the battery protection fuse or circuit breaker. This is the minimum requirement. Other factors including length of cable and special grounding requirements of the load must also be factored in. The insulated cable must be equipped with two-hole crimp type lugs and must not have any tight bends or kinks.

Power system ampacity	Recommended ground reference conductor size
< 30A	#10
30 – 100A	#6-2
100 – 400A	0000
400 – 800A	350 MCM
>800A	700 MCM

The power system frame must also be connected to the MGB or FGB. This is done for personnel safety and to meet many telecom grounding requirements. Each bay must have its own frame or site ground connection. Refer also to the customer connections drawing at the back of the manual.

7.2.1 Frame Ground

The power plant frame must be connected to the MGB or FGB. This connection is necessary for personnel safety and to meet many telco-grounding requirements.

Use #2/0 for frame ground.

Remove paint in lug contact area to ensure a good electrical connection.

Connection to Overhead Trays

The rack upper crossbar (figure) has three-five 5/8" diameter holes to accommodate threaded rod attachment to the overhead trays.

5 x 5/8" diameter holes for connections to the overhead trays

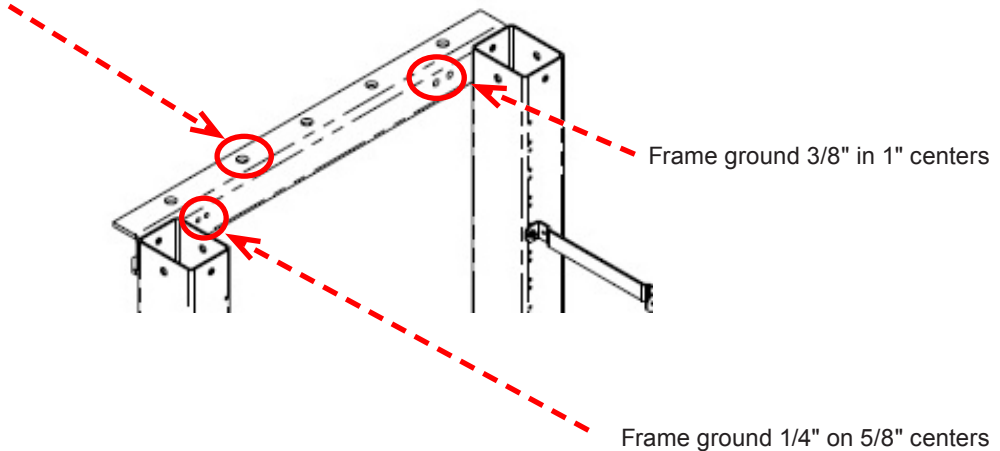


Figure 16 — Connecting the Frame Ground

7.3 AC Supply for the Rectifiers

To ease future access issues, connect the AC circuits to all rectifier shelves at the time of initial installation.

 **NOTE:**
Verify NO rectifiers are installed in the rectifier shelves at this time.

7.3.1 AC Wiring-4.0kW Rectifier Shelf

Figure 17 shows the AC connections for one of the rectifier shelves. For other AC connection options (e.g. single phase), refer to the rectifier shelf manual that ships with your system.

Terminate flex conduit at rectifier shelves—one connection each side.

AC wireway 1.313"
(33.4mm) for 1"
conduit

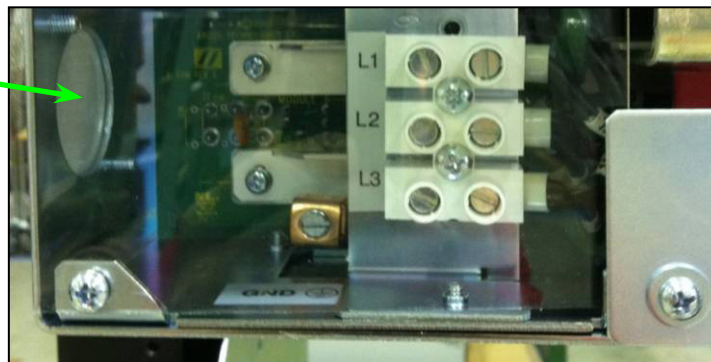


Figure 17 — Shelf AC Connection (3-phase, 3-wire shown with rear cover removed)

7.3.2 CAN Bus Termination - 4.0kW Rectifier Shelf

The CAN bus provides a communication path between the controller and rectifiers. In a single bay, the CAN bus cabling is daisy-chained from the L-ADIO, to the top rectifier shelf. The cable is then daisy-chained from the top shelf, to lower shelves, in sequence. At the last shelf, termination is enabled— see Figure 18.

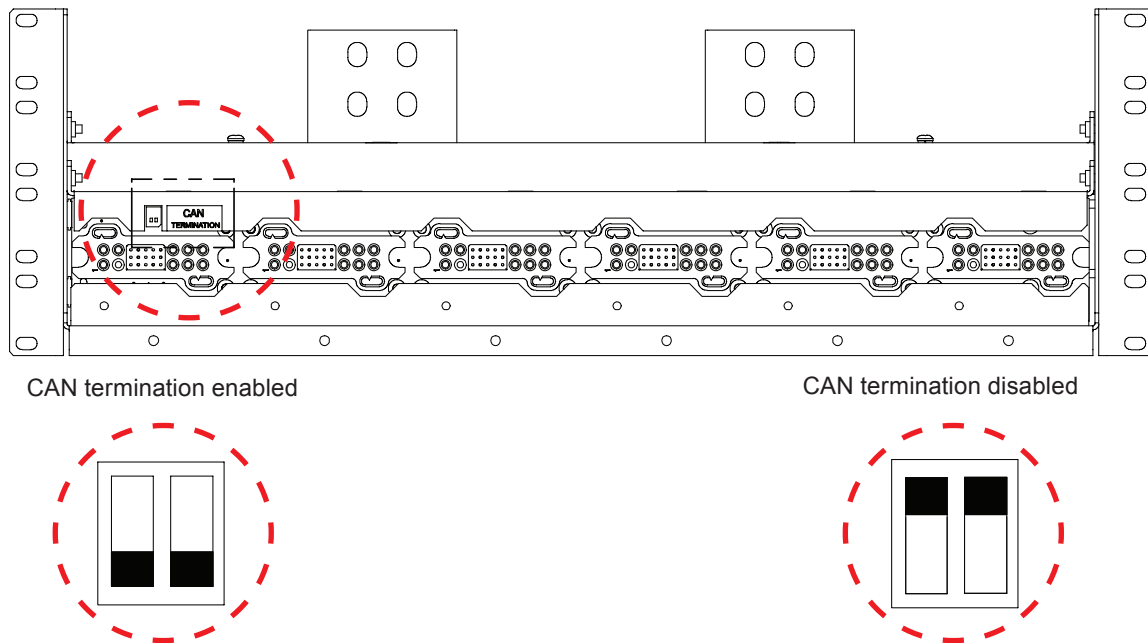


Figure 18 — CAN Bus Termination

NOTE:
If your system has redundant rectifiers, it is recommended to power off the left most rectifier in the bottom shelf of the existing bay during this procedure.

1. Remove the left most rectifier in the bottom shelf of the existing bay. (Refer to the Rectifier Shelf manual for the removal and re-insertion procedure.)
2. Flip the DIP switches from Termination Enabled to Termination Disabled—see Figure 18.
3. Replace the rectifier.
4. Connect the CAN bus cable to the CAN OUT connector of the top rectifier shelf of the expansion bay, see Figure 19.



Figure 19 — CAN OUT Connection

7.4 AC Wiring 2.4kW Rectifier Shelf

7.4.1 AC Feeder Protection/Sizing

To maximize system reliability, each feed should have a dedicated protection feeder breaker located at the AC distribution panel. The feeder breaker can also act as the disconnect device for the connected modules. Refer to the specifications at the back of this manual for Alpha breaker and wire size recommendations.

AC Input Connections



CAUTION!

To minimize EMI disturbances, route the AC input wires in flexible or rigid conduit and located as far away as possible from the DC power wires.



WARNING!

Use care when removing or replacing the covers for the AC input connections. Never assume that an electrical connection or conductor is not energized.

1. Ensure that all modules are removed from the shelf.
2. At the rear of the shelf, remove screw and flip the cover down (two places) to access the AC input terminal blocks: each terminal pair corresponds to either two rectifiers or a single rectifier as shown in Figure 20.
3. The wire way is designed for two customer-supplied, 1" conduit fittings for the AC supplies located on each side of the shelf. Attach the conduit retainers to the wire way hole(s) and route the AC cables through them.
4. Secure the wires to the AC input and AC ground terminals. Refer to the customer connection drawing at the end of the manual.
5. Tighten the cable connector to the AC cable (conduit similar).
6. Replace rear cover(s) once all connections have been completed.

NOTE: Rectifier slots are numbered 1 to 5 from the left front of the shelf.

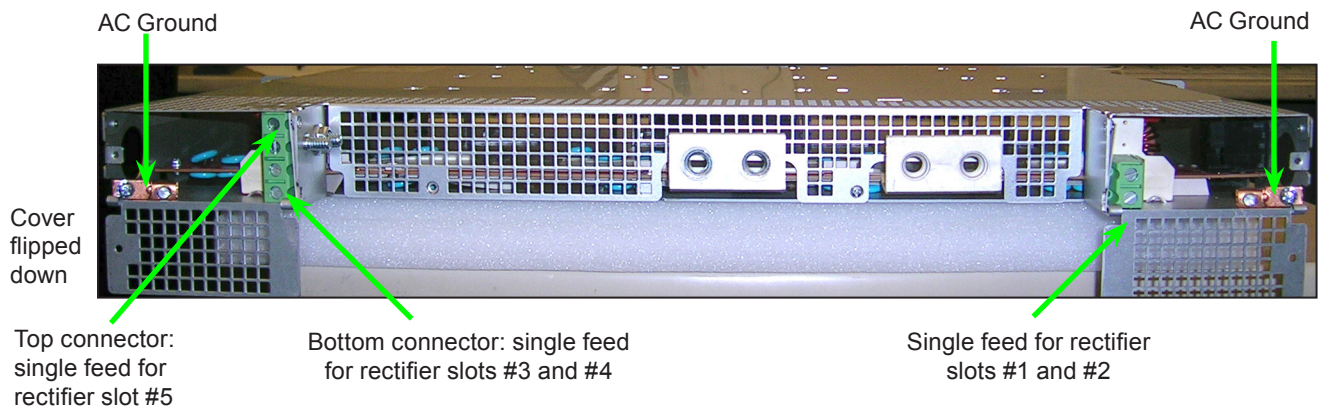


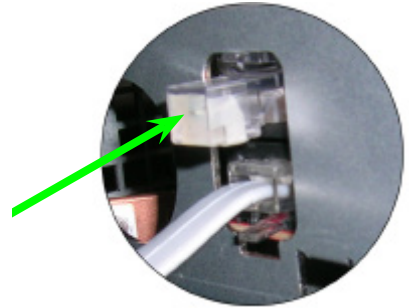
Figure 20 — AC Input and Ground for 23" Shelf

7.4.2 Can Bus Termination - 2.4kW Rectifier Shelf

Two CAN serial ports (modular jacks with offset latches), are provided for communications with Alpha Cordex rectifiers and other CAN-enabled equipment. These are located on the left-side of the rectifier shelf as viewed from the front.

1. Daisy-chain from shelf to shelf (CAN OUT of one shelf to CAN IN of another).
2. Insert a terminator (P/N # 5450228-001), in the last CAN position at the end of the daisy-chain.
3. If using an expansion bay to expand the system, remove the terminator and connect the CAN bus cable to the CAN OUT connector of the top rectifier shelf of the expansion bay.

Figure 21 — Terminator



7.5 DC Wiring



WARNING!

Leave cables or busbars disconnected at the battery and verify the output polarity using a voltmeter. Make battery connections only after all other wiring is completed.

DC output wire must be UL approved XHHW or RHH/RHW (for Canadian users, RW90 Type). Control and sense wires must be UL approved Style 1015 (for Canadian users, TEW type).

The common output leg of the rectifier system must be connected to ground, typically at the battery return bus.

7.5.1 External Battery Bay Output Connections

Battery cables must be sized for a 0.25 V drop from the battery to the power system at full load including anticipated growth. The cables must also meet ampacity requirements. Cables terminating directly on the battery posts or connection details must be secured so that there is no stress on the battery posts. Lead plated lugs and lead plated or stainless steel hardware must be used on all terminations at vented batteries to reduce corrosion.

1. Prepare, route, and connect cables from the power system to the battery termination details— five 3/8" on 1" center lug connections are available for both hot and return.
2. Burnish the terminating points and apply a corrosion-inhibiting agent, such as NO-OX-ID "A", to all battery terminal connections.
3. Do not complete the final live connections to the battery. Leave open and insulate the final connections or remove the battery fuses. Switch off the battery contacts if used.

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

7.5.3 Connecting the External Battery Alarm

These instructions apply to the following Alpha's 0912xxx-xxx series of battery bays.

1. Connect a #18AWG wire (black recommended) to the terminal block "ALARM" on the battery bay.
2. Connect to the L-ADIO; D2 (pos. 26).
3. Connect the two #18 AWG (black and white recommended) twisted wires (about 2 turns per 1") to an available current input position on the L-ADIO or 6I-ADIO.

For information on configuring the L-ADIO or 6I-ADIO refer to the ADIO Maintenance section of the CXC HP software manual (0350058-J0).

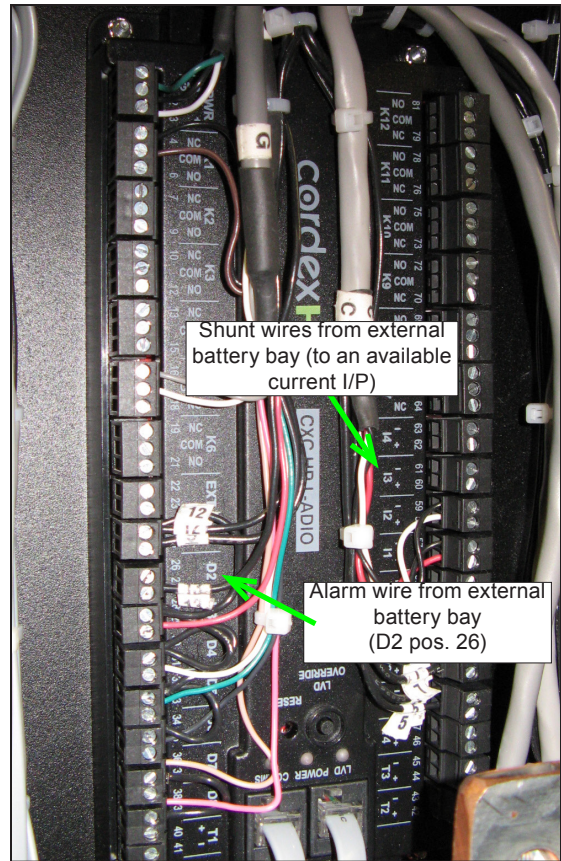


Figure 22 — Distribution and I/O Interface Board

7.5.4 Connecting Battery Temperature Probes

1. Locate the battery temperature probes from the L-ADIO coiled below the distribution center.
2. Uncoil and connect the temperature probes to a battery termination post negative in each battery tray.

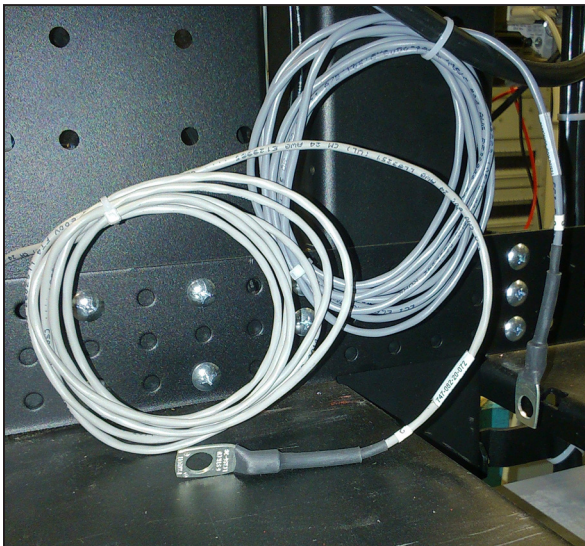


Figure 23 — Battery Temperature Probes

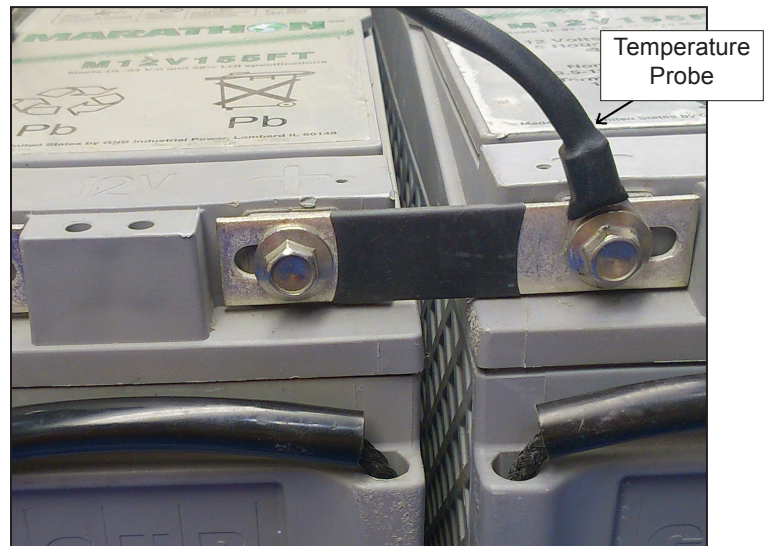


Figure 24 — Battery Temperature Probes—battery bay

7.5.2 Load Distribution

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

7.6 Dual Voltage Conversion

The staged tier is split in four sections. It is factory configured to supply two voltages: -48 Vdc on the left section (positions 1 through 12), and +24 Vdc on the right three sections (positions 13-24). The +24 Vdc sections are joined by a link bar (see Figure 25). This link bar can be relocated to change the number of -48 V and +24 V positions available. If +24 Vdc is not required, the +24 Vdc supply cables can be removed and an extra link bar can be added to turn the entire tier to -48 Vdc. Please see steps below to reconfigure the convertible tier.

1. Turn off or remove breakers in positions 13-16.
2. Loosen nuts in positions 15 -18.
3. Remove link bar that occupies positions 15-18.

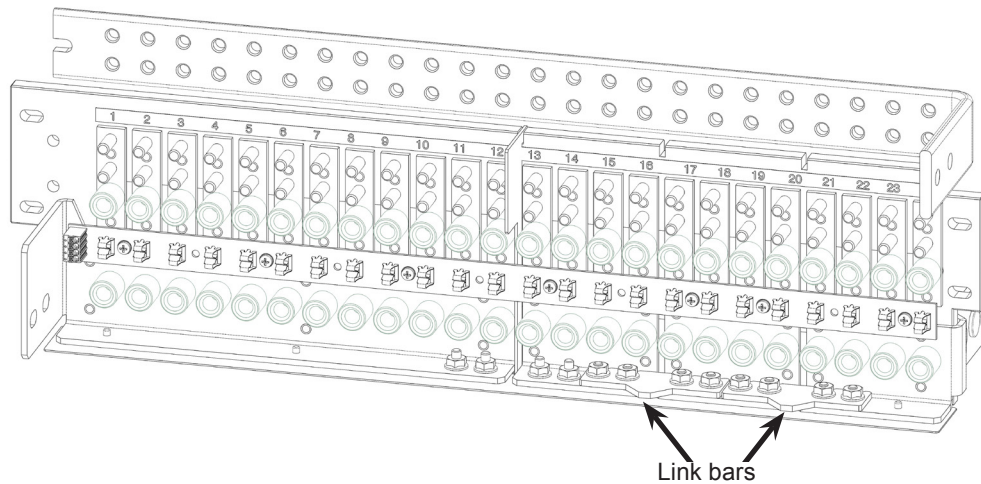


Figure 25 — Dual Voltage Tier, Factory Configured

4. Tighten nuts in positions 15-18.
5. Loosen nuts in positions 11-14.
6. Remove voltage divider insulator/marker between positions 12 and 13 and place it between positions 16 and 17.
7. Insert link bar from step 3 above so that it occupies positions 11-14.
8. Tighten nuts onto link bar in positions 11-14.
9. Turn on/insert breakers into positions 13-16.

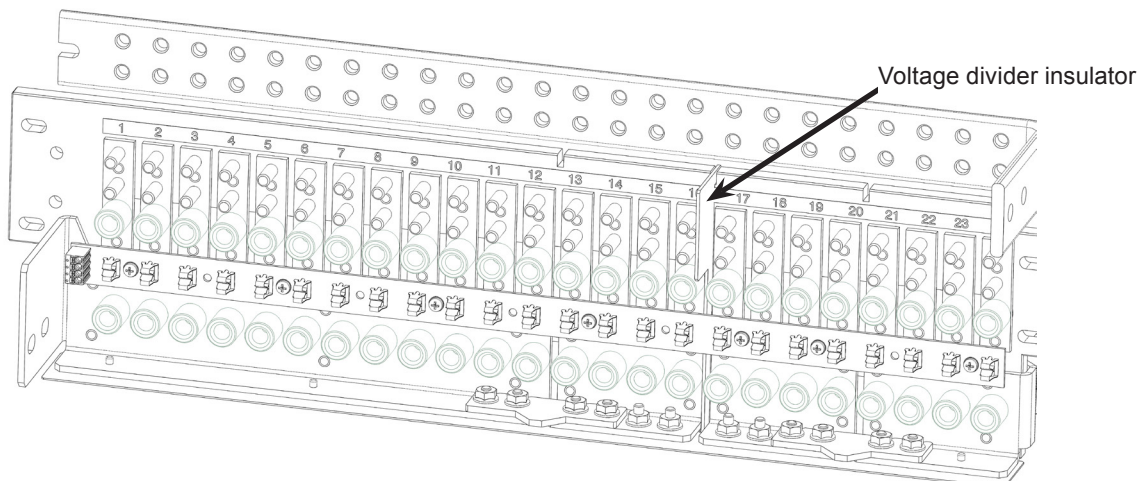


Figure 26 — Dual Voltage Tier Converted

7.7 High Capacity Breaker Alarm and Shunt Wiring

1. Connect the alarm wire (-HOT) from position NC on the breaker, to one of the available digital inputs on the L-ADIO.
2. Add a (+ RETURN) jumper from the digital input.
3. Connect the shunt wires "Black" and "White" to (-) and (+) current input respectively to a nearest L-ADIO or 6i-ADIO.

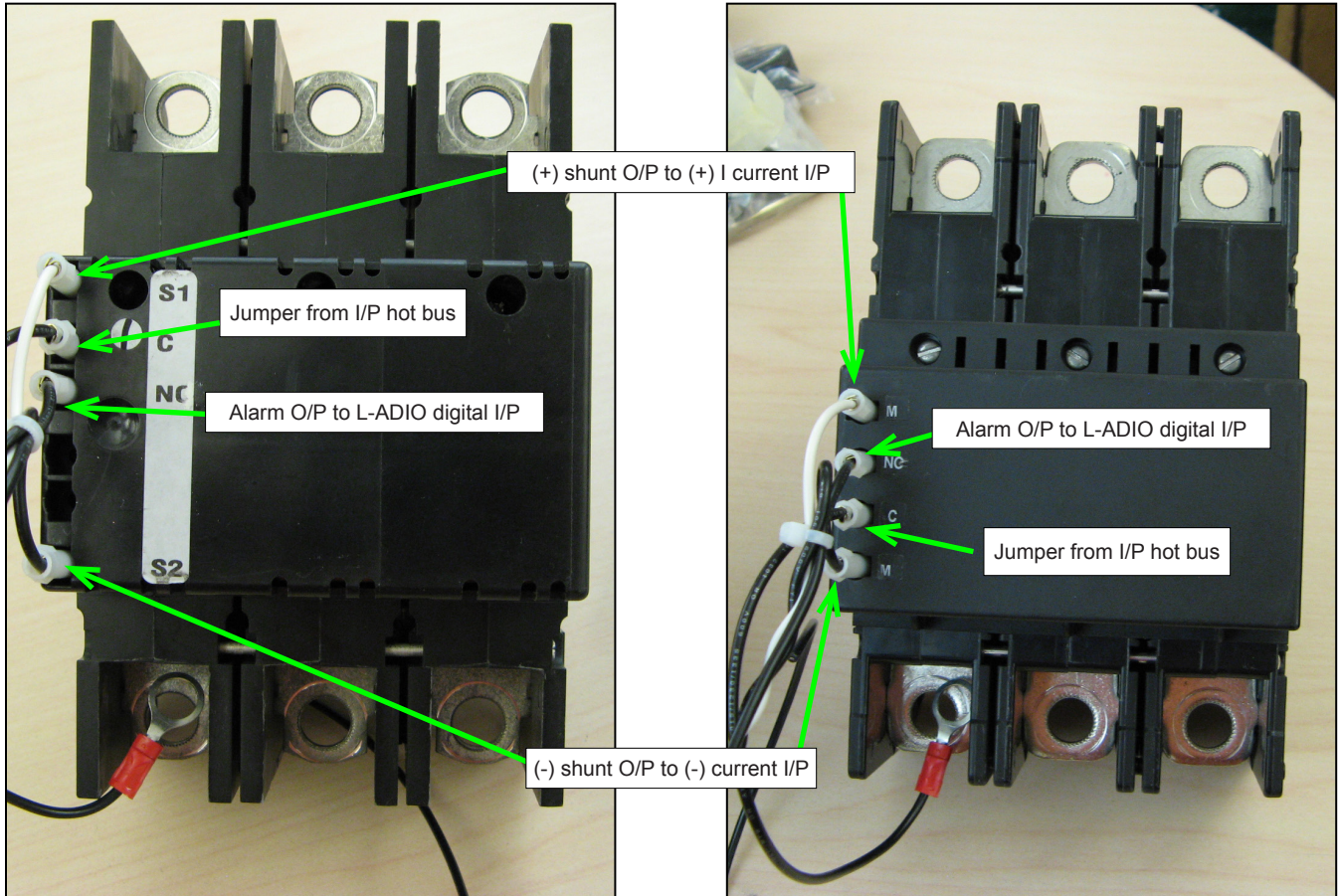


Figure 27 — High Capacity Breaker Alarm and Shunt Wiring

7.8 Signal Wiring

1. Use the Form C relay contacts on the L-ADIO to extend various alarm or control signals to an external site monitor. Figure 29 shows the L-ADIO module layout table F lists the factory default settings.
2. Use 0.129 mm² (#26 AWG) or larger wire.
3. Bundle signal wires together and route through the top of the bay.

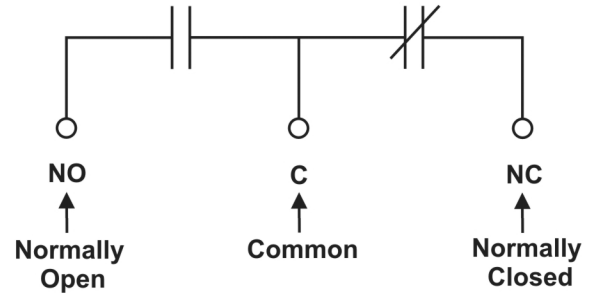


Figure 28 — Relay Connections, Not Energized State

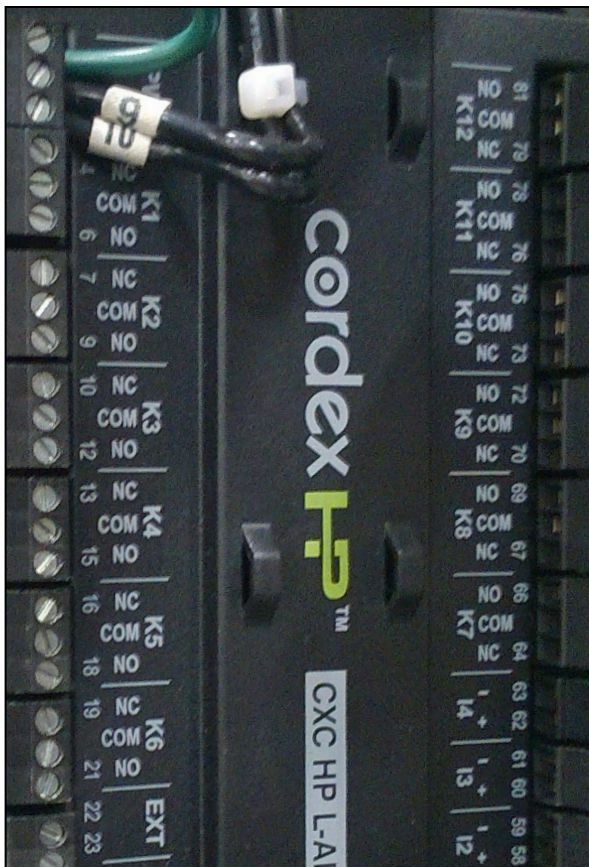


Figure 29 — Alarm Relay Pinouts

Table F — Relay assignments

Channel Description	Factory Default Designation
Relay K1 -K5	LVD or not used
Relay K6-K8	Not used
Relay K9	AC MAINS HIGH/LOW alarm
Relay K10	SYSTEM MINOR alarm
Relay K11	SYSTEM MAJOR alarm
Relay K12	SYSTEM CRITICAL alarm

7.8.1 Relays

Relays can be programmed to be energized or not energized during an alarm condition (see Figure 28 and the controller software manual). Relays can be reassigned in the Relays table. From the controller's main dashboard go to **Modules > ADIOs > L-ADIO**.

For more information refer to the ADIO maintenance section of the controller software manual.

7.8.2 Analog Inputs



WARNING!

Ensure that the correct polarity is used for all input cable terminations.

The analog input channels are used to monitor various types of electrical signals. Some of the analog channels are reserved for specific signals, while others are designated as general-purpose inputs, which accommodate various types of analog signals. The input cables should be bundled together and routed through the entry holes.

Default configurations and terminal numbers described below have been summarized in the drawings located at the rear of this manual.



CAUTION!

To reduce risk of fire, use only 0.129 mm² (#26 AWG) or larger wire.

7.8.3 Digital Inputs

The digital input channels are used to monitor various alarm and control signals. All input channels are voltage activated and accept a bipolar (negative or positive) DC signal directly.

7.8.4 Connection Method

Typical Alpha systems use the “reset with Hot and trigger with Ground” (common) connection. The digital input is wired in such a way that Hot is wired directly into one of the input terminals. For example, positive input for +24 V systems. The other input terminal is wired to the Ground (common) of the system through a dry contact relay usually located on the equipment requiring monitoring. This method (Figure 30) allows the digital input to receive or not receive a Ground signal on an alarm.

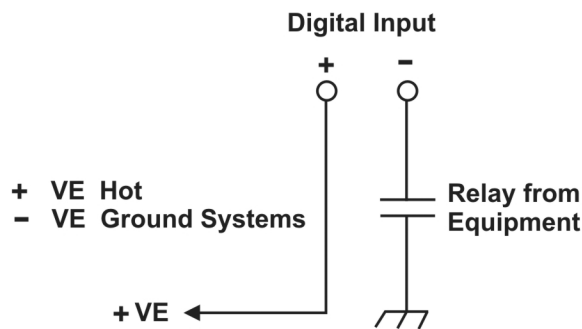


Figure 30 — Digital Input Connection Method

7.8.5 Programming the Digital Input

The digital input channels can be programmed for “active high” or “active low.” Active high indicates “alarm on the presence of a ground signal” and active low indicates “alarm on the removal of a ground signal.” See controller software manual for detailed instruction on programming.

Table G — Voltage level definitions for digital inputs

Voltage Range (Vdc)	Voltage Level (Vdc) Considered As “0” (Off)	Voltage Level (Vdc) Considered As “1” (On)
-60 to +60V (system voltage setting)	-1 to +1V	(-60 to -5V) or (+5 to +60V)

8. System Startup

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

1. Visually inspect the installation thoroughly.
2. Verify:
 - » AC input power is off.
 - » Batteries are disconnected.
 - » All breakers are off and no fuses installed if any loads are connected.
 - » All power modules are removed from the shelves.
3. Triple-check the polarity of all connections.
4. Install one rectifier module into the front left-most position using the side of the shelf as a guide.

For a 2.4kW Rectifier Module:

- » Place the rectifier module on the shelf.
- » Lift the handle and slide the module into the rear connector inside the shelf.
- » Apply pressure on the module front panel to engage the rear connector in the shelf receptacle.
- » Flip the handle down to lock the module into place.

For a 4.0kW Rectifier Module:

- » Slide the module into the rear connector inside the shelf.
- » Apply pressure on the module handle to engage the rear connector in the shelf receptacle.
- » Tighten the screw on the bottom of the faceplate to secure the module in the shelf.

5. Verify that the AC input voltage is correct and that the breaker switch for the corresponding feeder breaker is ON.
 - » The power module green LED will illuminate after a preset start delay.
6. Test the functionality of various module alarms and controls using the controller's LCD screen or web interface.
7. Verify the correct battery polarity using a voltmeter. Ensure that no cells or batteries are reversed.
8. Connect the batteries to the output of the system.
9. Install the remaining power modules.
10. Configure the battery parameters according to the battery manufacturers recommendations. See the CXC HP software manual for detailed instructions on how to configure the batteries.
11. From the **Power System> System Functions> Battery Maintenance> Equalize** menu of the controller, set the float and equalize voltage to the levels specified by the battery manufacturer.
12. Use the controller to test the functionality of various module alarms and controls especially the battery breaker alarm test. Verify alarms are transmitted to site monitor.
13. Perform a load test with the system using a resistive load box.
14. Enable the temperature compensation feature in the **Power System> System Functions> Temperature Compensation** menu. Program the settings for slope and breakpoints (upper and lower) with respect to the specific batteries used.

8.8.1 Factory Ranges and Defaults

Table H shows the rectifier settings/ranges/defaults. Changes are made through the CXC HP controller interface.

Table H — Rectifier factory ranges and defaults (TBD)		
Setting	Range (minimum to maximum)	Default
Float (FL) Voltage	47.5 – 58.2 V	54 V
Equalize (EQ) Voltage	49.8 – 60.2 V	55 V
Battery Test (BT) Voltage	44 – 52 V	46 V
Over Voltage Protection (OVP)*	63 V	63 V
Current Limit (CL)	23 – 100%	100%
Power Limit (PL)	0 – 100%	100%
Module Start Delay	0 – 250 s	1 s
System Start Delay	0 – 600 s	0 s
Low Voltage Alarm (LVA)	42 – 52 V	44 V
High Voltage Alarm (HVA)	52 – 63 V	55.5 V
EQ Timeout	1 – 2399 h	30 h
BT Timeout	1 – 250 h	8 h
Softstart Ramp-rate	Normal/Fast	Normal
CL/PL Alarm	Enable/Disable	Enable
Remote Shutdown	Enable/Disable	Enable
Ramp Test	Enable/Disable	Enable

*The OVP cannot be set below the present system FL/EQ/BT voltage setting or the safe mode voltage of 51.4 V.

9. 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 I — Sample maintenance log

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

10. Acronyms and Definitions

AC	Alternating current
ANSI	American National Standards Institute
AWG	American Wire Gauge
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

11. Warranty and Service Information

11.1 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.

11.2 Warranty Statement

For full information details review Alpha's online Warranty Statement at <http://www.alpha.ca/warranty>.

11.3 Limited Hardware 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, unless otherwise specified in the product manual, in which case, 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.

11.4 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.

11.5 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: <http://www.alpha.ca/web2/service-and-support>.

11.6 Service Centers

For a list of international service centers, refer to the Alpha website:

<http://www.alpha.ca/web2/services-and-support>

12. Certification

12.6.1.1 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. 60950-1 (2nd Ed) and UL 60950-1 (2nd Ed). 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)

12.6.1.2 NRTLs capabilities

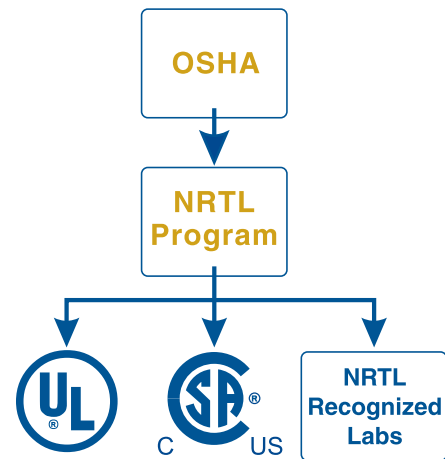
NRTLs are third party organizations recognized by OSHA, US Department of Labor, under the NRTL program.

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)

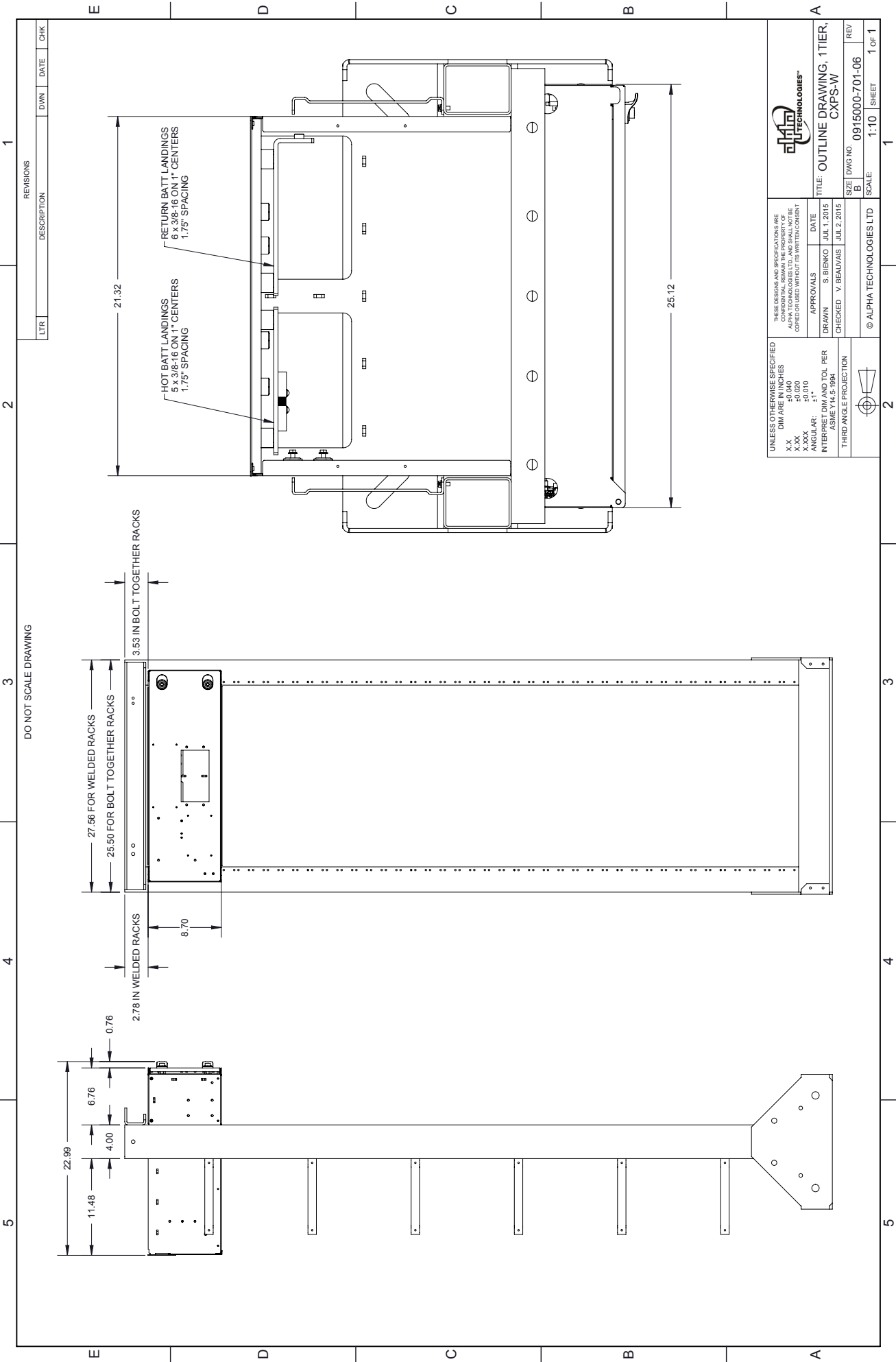
The NRTL determines that a product meets the requirements of an appropriate consensus-based product safety standard either by successfully testing the product itself, or by verifying that a contract laboratory has done so, and the NRTL certifies that the product meets the requirements of the product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

12.6.1.3 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



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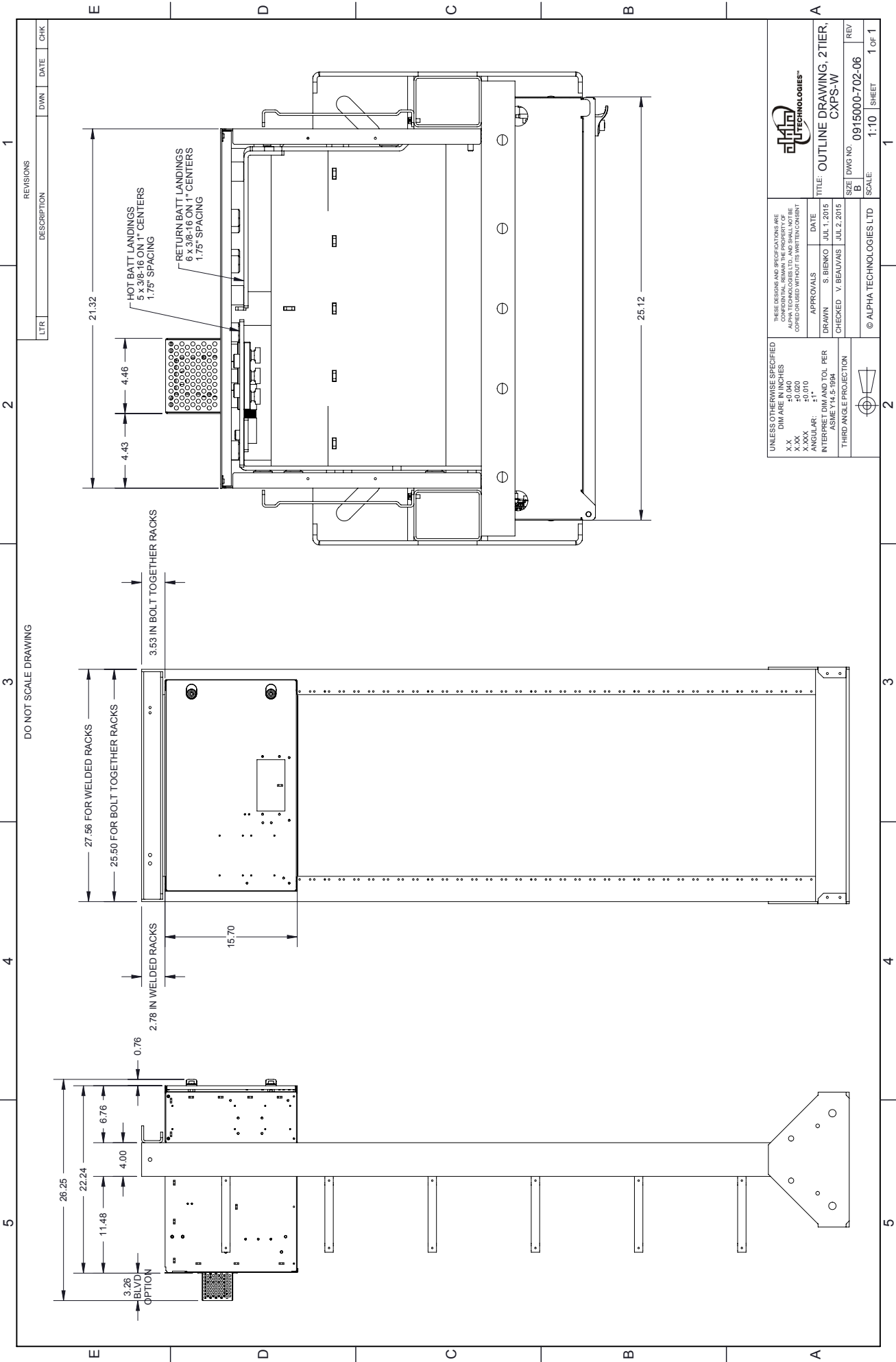
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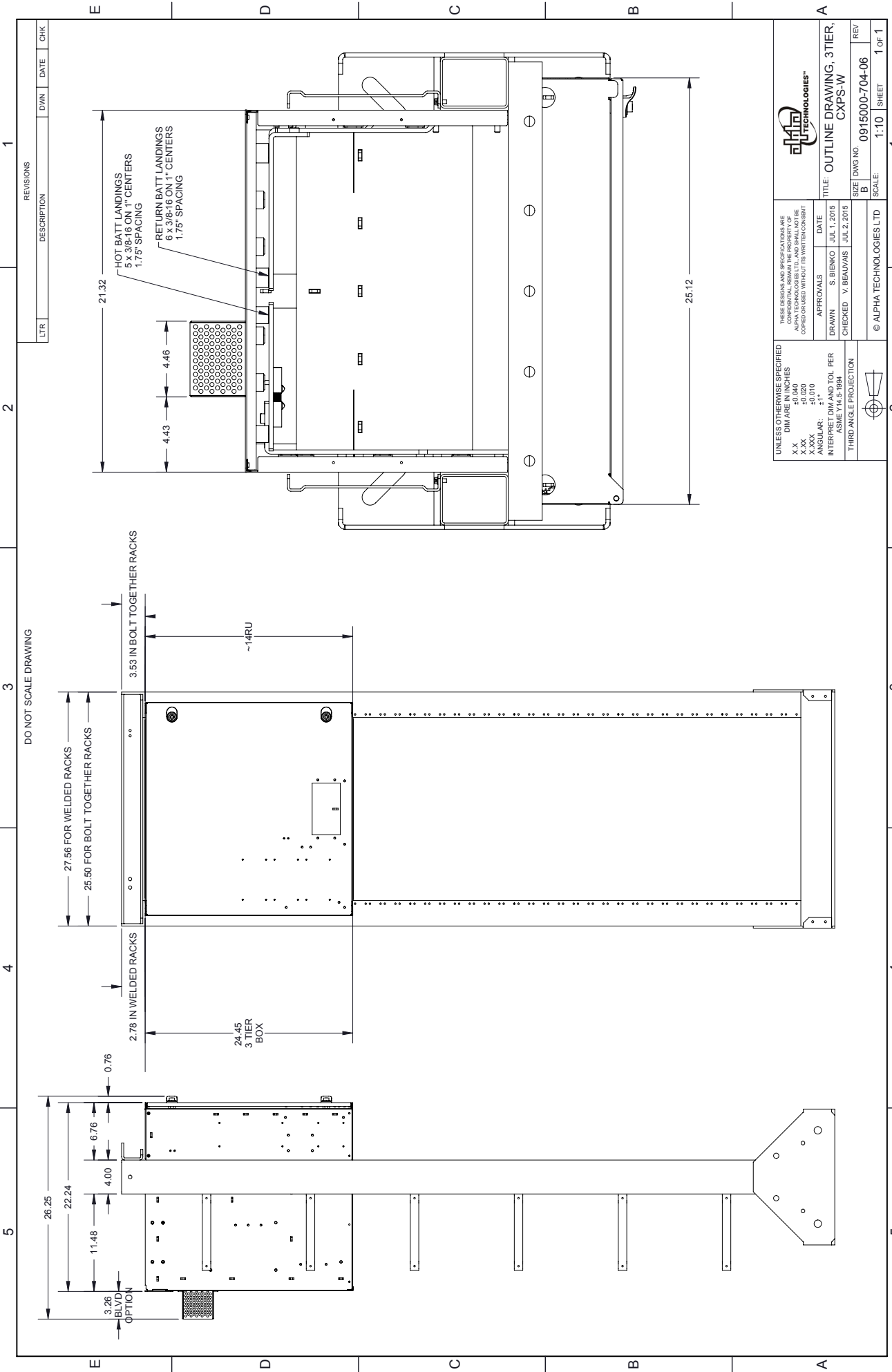

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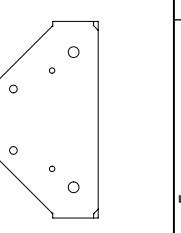
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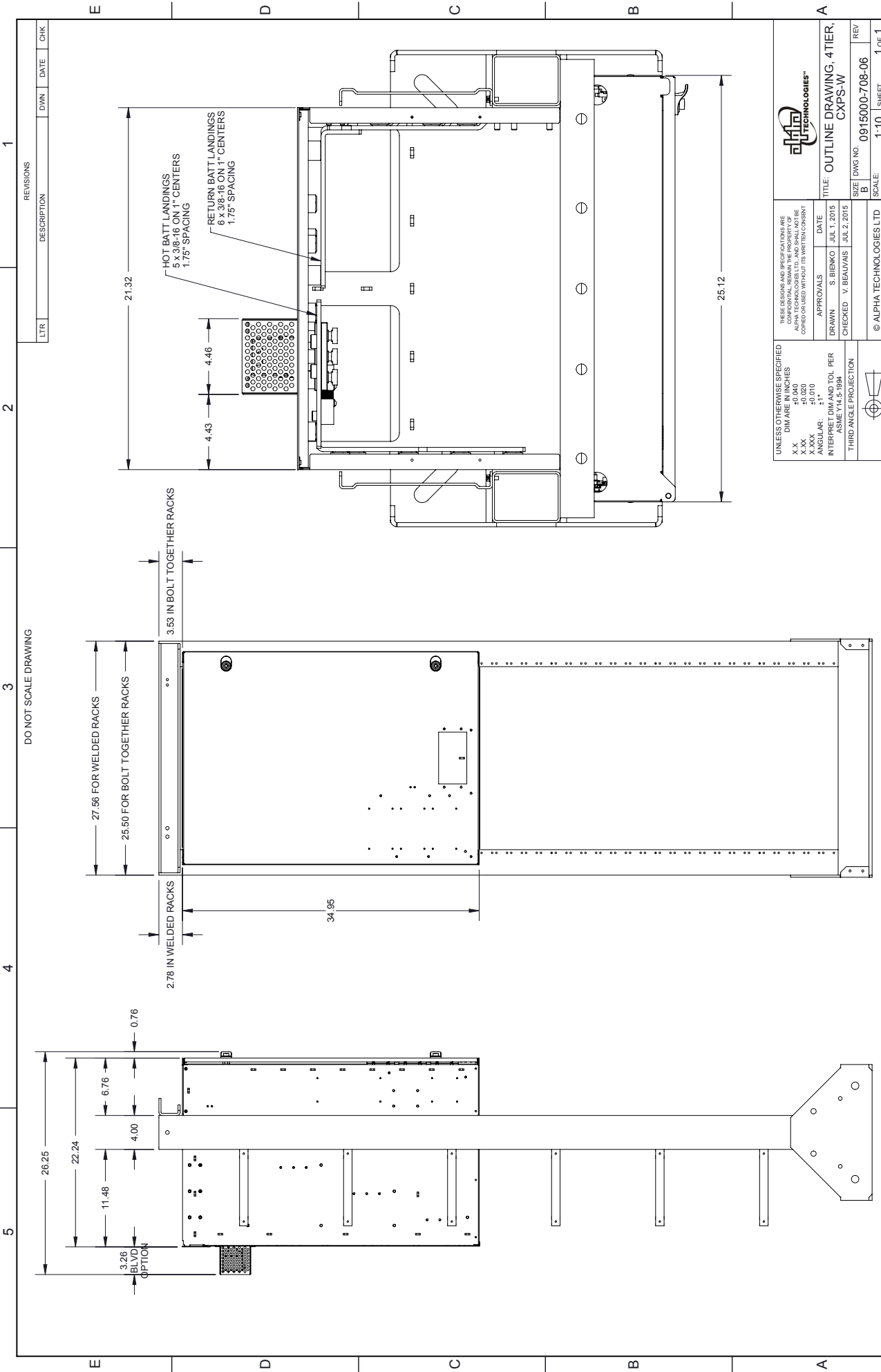
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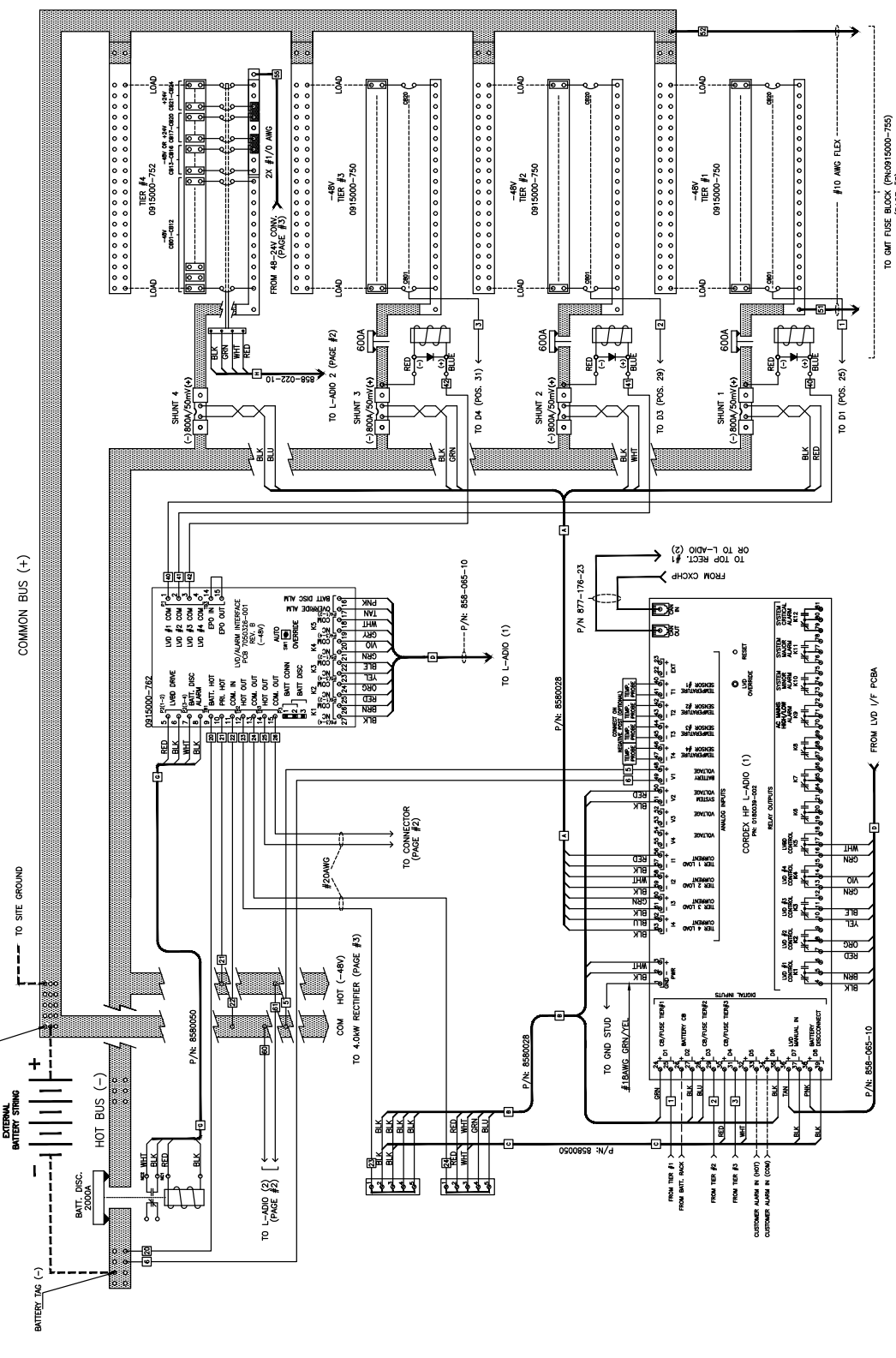
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DRAWN S. BIENKO	JUL. 1, 2015
CHECKED V. BEAUVAIS	JUL. 2, 2015

TITLE: OUTLINE DRAWING, 4 TIER, CXFS-W
 SIZE: DWG NO. 0915000-708-06
 SCALE: 1:10 SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED
 DIM ARE IN INCHES
 DECIMAL DIMENSIONS:
 X.XX ±0.000
 X.XXX ±0.010
 ANGULAR: ±1°
 INTERPRET DIM AND TOL PER ASME Y14.5-2004
 THIRD ANGLE PROJECTION

REVISIONS		DATE	APFD
LTR	DESCRIPTION		
A	Update the label CXC-HP	01/17	RM
B	Alarm Relay		

TIER #	DEFAULT CONFIGURATION
081-0810	X
081-0812	X
081-0816	X
081-0820	X
081-0824	X



NOTES:

- 1) FOR CONTINUOUS OPERATION, IT IS RECOMMENDED THAT THE RATED CURRENT IN THE WIRE BE AT LEAST 125% OF THE RATED CURRENT UNDER NORMAL CONDITIONS.
- 2) DASHED LINES DENOTE CUSTOMER WIRING.
- 3) ALL WIRES ARE #22AWG EXCEPT AS NOTED.
- 4) NUMBERS IN BUBBLES REFER TO ITEM NUMBERS ON BILL OF MATERIALS.
- 5) "[]" REFERS TO WIRE TAG NUMBERS ON WIRES.

LTR	DESCRIPTION	QTY
	FINISHED HOLE LEGEND	

REVISION	DATE	BY	CHKD	APPROVED	FINISH	TOLERANCES (UNLESS OTHERWISE NOTED)
RW	15/09/23				MATERIAL	
RW	15/09/24					

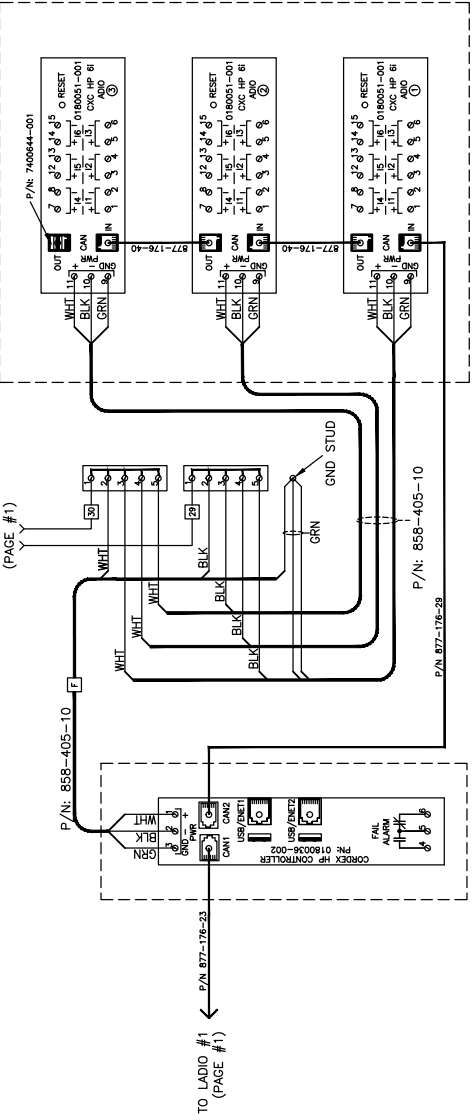
TITLE	SCALE
CXPS-W, 4 TIER DISTRIBUTION -48V, 2000A, LVBD, CXC-HP	N/A

SIZE	SHEET	OF
B	A2	3

P/N: 0915000-711 E/W 0915000-750, 0915000-752

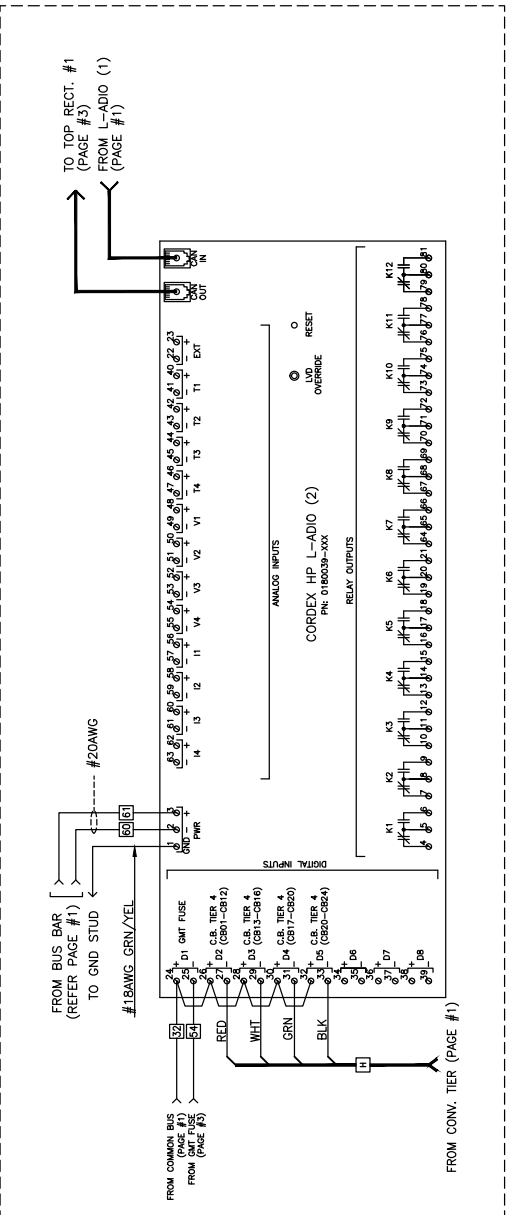
LTR	DESCRIPTION	DATE	APPD
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0915000-561; 0915000-761



0915000-517; 0915000-717

P/N: 0915000-760 OR 0915000-560



NOTES:

- 1) FOR CONTINUOUS OPERATION, IT IS RECOMMENDED THAT THE UNIT BE KEPT UNDER POWER FOR THE ENTIRE DURATION UNDER NORMAL CONDITIONS.
- 2) DASHED LINES DENOTE CUSTOMER WIRING.
- 3) ALL WIRES ARE #22AWG EXCEPT AS NOTED.
- 4) NUMBERS IN BUBBLES REFER TO ITEM NUMBERS ON BILL OF MATERIALS.
- 5) "1" REFERS TO WIRE TAG NUMBERS ON WIRES.

LTR	DESCRIPTION	QTY
FINISHED HOLE LEGEND		
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DESIGN	RW 15/09/02	INITIAL
CHECKED	RW 15/09/02	
APPROVED		FINISH
TOLERANCES (UNLESS OTHERWISE STATED)		
SCALE	N/A	
TITLE		
CXPS-W, 4 TIER DISTRIBUTION		
-48V, 2000A, LVBD, CXG-HP		
SIZE	DWG NO.	SHEET 2 of 3
B	A2	0915TYPICAL-05
REV	B	



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