CXDM-E2 Series 600A Distribution Module

Installation & Operation Manual

Part #9400011-J0
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CXDM-E2 Series Distribution Module 600A

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.

NOTE:

IE 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.

For technical support, contact IE Technologies:

Phone: **+64-9-835-0700**

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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 Innovative Energies.

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!

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

1.2 General Warning 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 along with customer installed radios 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.
- Place a warning label on the utility panel to warn emergency personnel that a reserve battery source is present which will power the loads in a power outage condition or if the AC disconnect breaker is turned off.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

1.4 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 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. Overview

2.1 Introduction

This manual covers the features and installation of the CXDM-E2 series 600A distribution modules.

E2 panel is a high density breaker panel used in central offices, cable headends and data centers for tertiary distribution applications. The 2RU panel, designed with a split bus, offers the capability for up to 22 plug-in breaker/ fuse positions in a 19” configuration. Individual 600A buses allow for maximum utilization of distribution capacity.

The E2 offers options for remote monitoring of alarms and analog parameters via a CAN bus to a centralized controller (CXC-HP) or with IP/SNMP connectivity.

2.2 Features and Benefits

- High density remote distribution for Telecom CO’s, MSC’s, data center and cable headend facilities
- Industry leading system density
- High breaker density: 11x plug-in bullet breakers or TPS/TLS fuses per bus
- High current density :each bus is rated for a maximum amperage of 600A
- Split bus design provides redundant input feeds to network equipment
- 2RU height recovers space in network bays for revenue generating equipment
- Front panel control options: standard, enhanced I/O interface, advanced controller
- Adaptor kits available to accommodate vertical feeds
- Adaptor kits available for 2 pole and 3 pole breakers

Figure 1 — CXDM-E2 600A Distribution

3. Specifications

For the E2 part numbers and list options go to the Innovative Energies website.

Table A — Specifications

	Standard	CAN Bus Monitoring	IP/SNMP Monitoring
Electrical			
Nominal Voltage	48V	-48V	-48V
Bus Capacity	600A per Bus	600A per Bus	600A per Bus
Mechanical			
Dimensions	3.5" H x 19" W x 12" D (89mm x 483mm, 305mm) (Excludes mounting brackets)	3.5" H x 19" W x 12" D (89mm x 483mm, 305mm) (Excludes mounting brackets)	3.5" H x 19" W x 12" D (89mm x 483mm, 305mm) (Excludes mounting brackets)
Mounting	19"/23" (w/ 1RU adaptor); flush or center(default)	19"/23" (w/ 1RU adaptor); flush or center(default)	19"/23" (w/ 1RU adaptor); flush or center
Weight	TBD	TBD	TBD
Connections			
Input (Hot and Return)	2 x 3/8" mounting holes on 1" centers*	2 x 3/8" mounting holes on 1" centers*	2 x 3/8" mounting holes on 1" centers*
Positions	11 breakers per bus (22 positions per panel)	11 breakers per bus (22 positions per panel)	11 breakers per bus (22 positions per panel)
Output (Hot and Return)	22 x 1/4"-20 studs on 5/8" centers	22 x 1/4"-20 studs on 5/8" centers	22 x 1/4"-20 studs on 5/8" centers
Lug Adaptors (optional)	Double Pole: ⅜" Studs on 1" Centers**	Double Pole: ⅜" Studs on 1" Centers**	Double Pole: ⅜" Studs on 1" Centers**
	Triple Pole: ⅜" Studs on 1" Centers***	Triple Pole: ⅜" Studs on 1" Centers***	Triple Pole: ⅜" Studs on 1" Centers***
Chassis Ground	1/4" studs on 5/8" centers	1/4" studs on 5/8" centers	1/4" studs on 5/8" centers
Controls			
Alarms	Breaker/Fuse trip: Form C contacts	Breaker/Fuse trip: Form C contacts	Breaker/Fuse trip: Form C contacts
Monitor	Breaker/Fuse trip and bus voltages via indicator board	Breaker/Fuse trip and bus voltages via CAN bus to CXC-HP controller	Breaker/Fuse trip and bus voltages on CXC-HP controller (IP/SNMP)
LED Indicators	System Ok (Green) Breaker/Fuse Trip (Red)	System Ok (Green) Breaker/Fuse Trip (Red)	System Ok (Green) Breaker/Fuse Trip (Red)
Environmental			
Temperature	0 to 40°C (0 to 104°F)	0 to 40°C (0 to 104°F)	0 to 40°C (0 to 104°F)
Humidity	0-95% non-condensing	0-95% non-condensing	0-95% non-condensing
Compliance			
CSA	CSA C22.2 No. 60950-1 UL 60950-1	CSA C22.2 No. 60950-1 UL 60950-1	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.			

* Can accept up to 2x 750 MCM cables (back to back) on hot and return connections. Vertical input kit is highly recommended when each bus is fused at 400A and above. (For vertical input connections order kit)
** For double pole breakers order adapter kit
*** For triple pole breakers order adapter kit

For ordering information refer to datasheet 0470195-001.

4. Features

4.1 Ground Connection

Each side panel of the E2 has a lug landing for connection to earth ground. These may either be horizontally aligned PEM studs (Figure 2) or vertically aligned PEM nuts for use with 3/8” bolts (included with system).

The E2 grounds can either be connected to the frame in which the E2 is mounted if the frame is grounded, or they can be connected directly to the ground bar in a remote location. Both connections must be made. A minimum #6 AWG wire is recommended.

Follow all local codes and company safety protocols for the ground connections. The above information should be used as a guide only.

Left Ground Connection

Right Ground Connection

Figure 2 — Ground Connections

4.2 Feed Connection

The E2 has two isolated hot and return input feeds. Each bus each can accommodate up to two (2) 750MCM cables (max. lug tongue width is 1.63 inches) in a back to back orientation. The landings are designed for the input feeder cables to be installed horizontally, optional adapters(recommended) are available for the input feeder cables to be installed vertically with a slot that allows the cables to be angled backwards up to 30 degrees. The base system cover opens easily to make connections, and can be re-closed using snap clips. Additional lug and adapter covers are included with the vertical adapter kits.

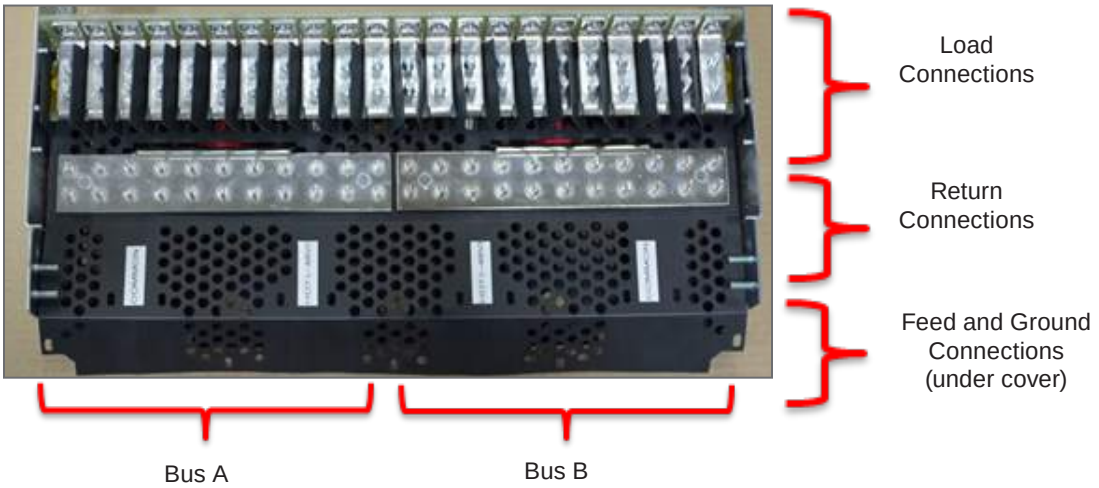


Figure 3 — Feed Connections

4.3 Load Connections

The system has a total of 22 load connections divided into a split bus for both hot and return. Both connections are front accessible when the unit is installed with a minimum of 2RU space above. The connections are protected by a cover to prevent objects from falling into connecting area. A separate cover also protects the breaker area and can be left in place while connections are made.

The load hot connections are located closest to the front for easy access and are separated by dividers to prevent accidental contact with potentially live connections.

CAUTION!

(The load connections being added should not have a breaker or be live when the cable is installed.

The load return connections are located behind and below the load hot connections allowing the two cables to be routed together to minimize any current loops.

Studs are provided for both hot and return connections to simplify alignment. The insulation covers below the connection area prevent any dropped hardware from entering into the buswork area of the system.

The load positions are identified by a label located along the top of the breakers/fuses. There is also a second label located on the top of the front door for describing the load of each breaker/fuse and is accessible when the door is open.

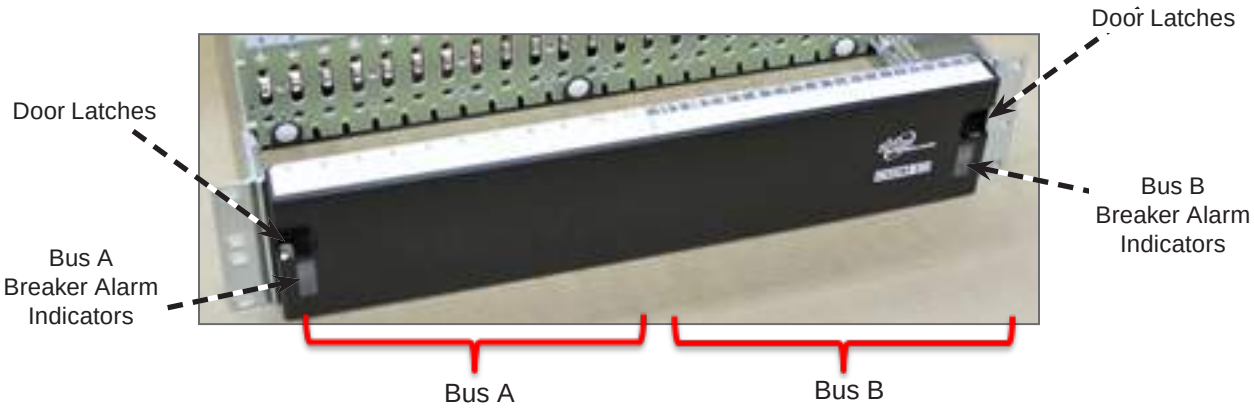


Figure 4 — Front Panel

4.4 Monitoring Methods

The E2 is available with three different front panels that provide increasing levels of inputs and outputs (I/O) and control: standard, enhanced I/O and advanced controller. All panels have the basic features such as, alarm indicators, door latches, and top label as shown in Figure 4 below.

The standard front panel includes two indicator circuit boards, one for each bus located at the corresponding end of the panel. Each indicator board receives power and signals through a single cable which connects to the breaker alarm strip in the core of the E2. The indicator boards also act as an interface to the L-ADIO module and CXC HP controller in the more advanced panel versions.

Feature	Standard	CAN Bus Monitoring	IP/SNMP Monitoring
LED indicator – Bus Power Present/Breaker Alarm (2	•	•	•
Dry Contact– Breaker Alarm (2)	•	•	•
Bus Voltage Sense (2)	•	•	•
Dedicated I/O: Bus Voltage Monitoring (2) Breaker Alarm Monitoring (2)		•	•
Expansion I/O (Customer Use): Temperature Sensor Inputs (4) Form C Relay Outputs (12) Digital Inputs (6) Voltage Sense Inputs (2) Current Shunt Inputs (4)		•	•
CXC HP Controller Local connection to LADIO Advanced GUI		•	•
Ethernet Connection			•

4.4.1 Breaker Labelling

The breakers are numbered starting from one near the side panel and going up to 11 near the center line. The labels for the Bus “A” breakers are indicated by black letters and the labels for Bus “B” are indicated by white letters on a black background. The breaker position index label is a thin strip over the breakers and is visible from the front, while the breaker assignment label is located on the top of the front panel and has additional space for describing the use of the breaker. This label is visible from the front when the door is open, as well as from the top when the door is closed.

4.5 Standard Front Panel

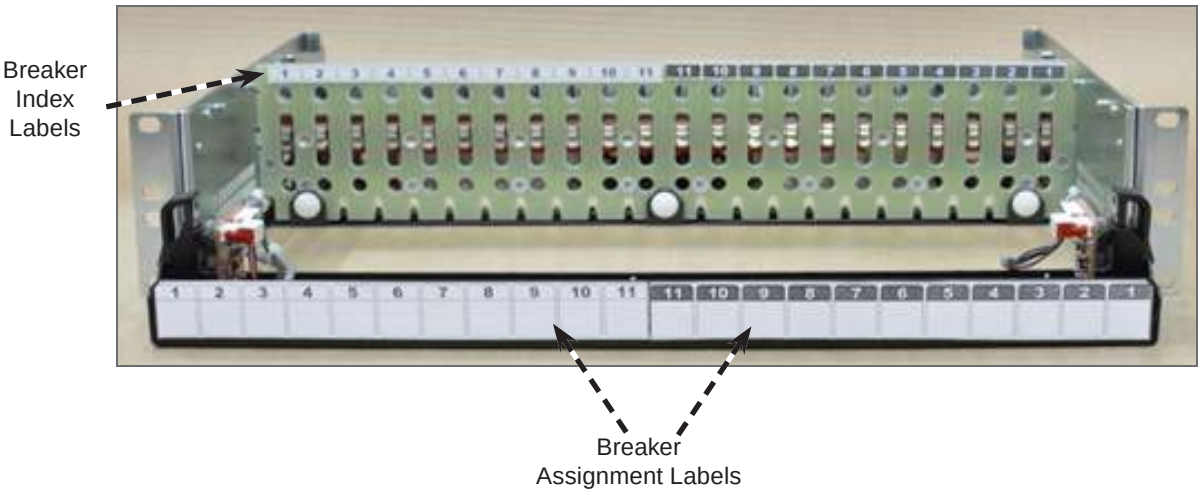


Figure 5 — Breaker Labelling

4.5.1 Status Indicators

All E2 systems are equipped with two LED status indicators on the front panel which indicate the status of a single bus. Bus A on the left LED, and Bus B on the right. The LED's indicate the following:

- Power (Green): Power to the bus
- Alarm (Red): Breaker tripped

4.5.2 Basic Status Outputs

Each indicator board has two terminal block connectors that provide connections to a Form C dry contact for the breaker alarm, and to connection terminals for monitoring bus voltage, which can be wired to 3rd party monitoring equipment. The terminal blocks can be accessed when the door is open.

The status of each bus can also be monitored by wiring to outputs on the indicator boards. A 2-position screw-type terminal connector makes the bus voltage available. This is a non-isolated fused signal intended for connection to a high impedance input. A 3-position screw type terminal connector makes the breaker status available through connection to a dry contact relay.

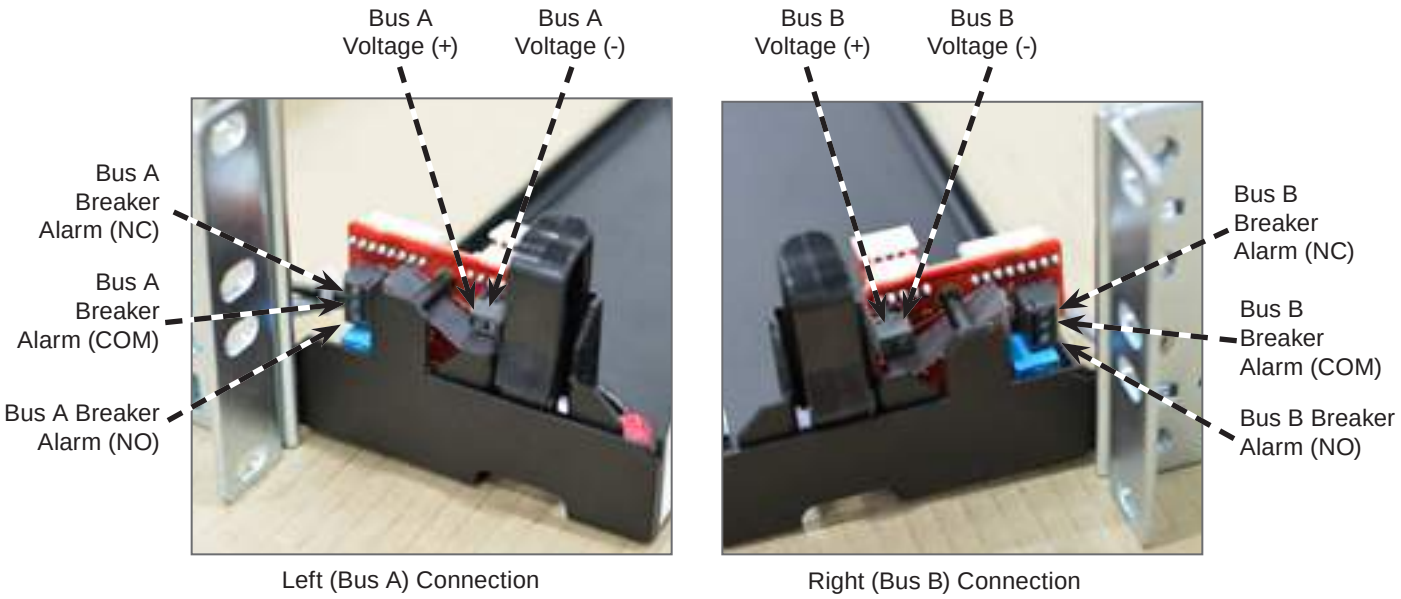


Figure 6 — Left- and Right-side Connections

4.6 Front Panel with Enhanced I/O

The front panel with enhanced I/O includes the components and functionality of the standard front panel with the addition of a Large Analog /Digital Input and Output (L-ADIO) module and a cable harness that connects it to the indicator boards. The L-ADIO module is powered by both the A and B bus via the indicator boards and will continue to operate even if one of the bus is not powered. The breaker alarm status and voltage level of each bus is monitored by the L-ADIO and can be read by a remote CXC HP controller through the CAN bus connection.

The L-ADIO also provides expansion I/O capability, including two analog voltages (V3-V4), four thermocouples (T1-T4), 12 dry contact relays (K1-K12), six digital inputs (D3-D8). Please refer to the hardware manual (0180036-J0) for specifications of these inputs, as well as the front panel wiring notes below for guidance on L-ADIO wire routing.

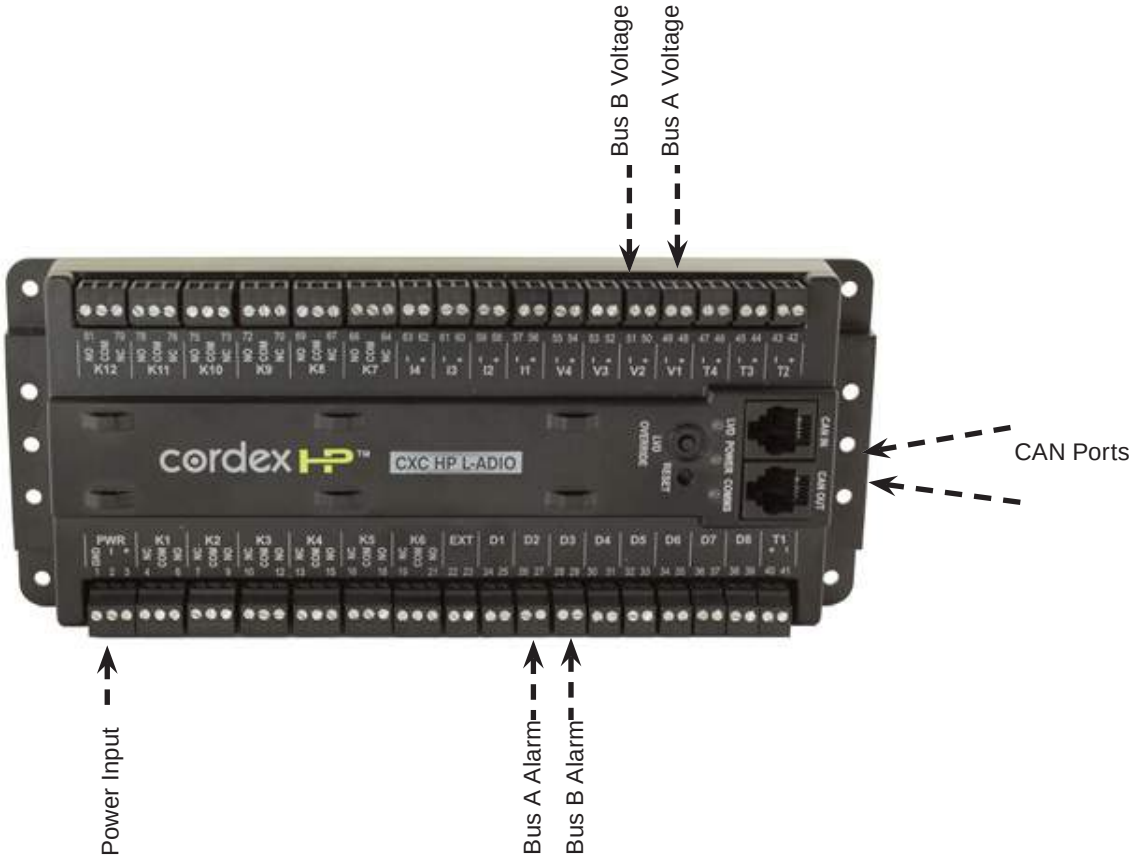


Figure 7 — L-ADIO I/O Peripheral

4.6.1 Analog Input Channels

The controller is supplied with analog input channels for voltage, current, and temperature.

4.6.2 Voltage Inputs

Two voltage input channels, V1 and V2, are used to monitor the discharge and charge voltage. V1 for Bus A Voltage and V2 for Bus B Voltage. Voltage inputs V3 and V4 are not used in the E2 and are available for customer use.

4.6.3 Temperature Inputs

The E2 panel can accept up to four temperature probes to monitor the surrounding ambient temperatures. These analog values can be used to report high orlow temperature alarms.

4.6.4 Digital Input Channels

The E2 panel can accept up to eight digital inputs. Digital Inputs D1 and D2 are wired for Bus 'A' Breaker Alarm and Bus 'B' Breaker Alarm respectively. Digital inputs D3 to D8 are available for customer use.

4.6.5 Alarm and Control Output Relays

The controller contains 12 Form C digital alarm output relays, that are used to extend alarms and control to external apparatus. Each internally generated alarm or control signal may be mapped to any one of these relays, or several signals may be mapped to just one relay or none at all. None of the output relays are pre-configured on the (K1-K12) are available for customer use.

4.6.6 Network Connection and Remote Communication

A CAN bus is used to transmit all alarm and control functions between the LADIO and a remotely located CXC HP controller.

4.7 Front Panel with a CXC HP Controller

The front panel with CXC HP controller also includes the L-ADIO module with all of the features described in section 4.6 above. With this version the L-ADIO CAN Bus is pre-wired to the local CXC HP controller.

Detailed operation of the controller is provided in the CXC HP controller software manual.

The CXC HP family of products provide centralized setup, control and monitoring of power systems. This can range from simple monitoring and threshold alarms for temperature, voltage and current, to advanced battery charging and diagnostic features. The controller has a 4.3-inch, full color touch screen display.

The CXC HP provides dual Ethernet ports allowing for simultaneous network, LCD and local laptop access to the controller including both web and SNMP interfaces.

The CXC HP supports dual CAN ports to allow up to 254 power and/or ADIO modules to be controlled and monitored. The CXC HP 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

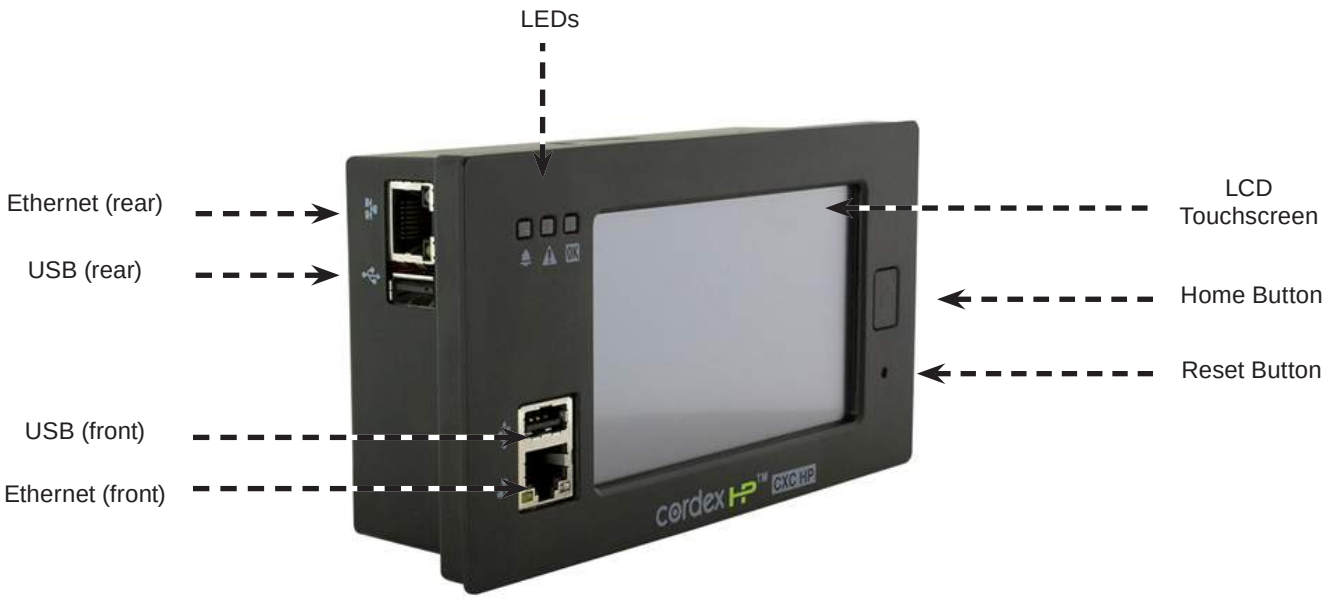


Figure 8 — CXC HP controller, front left view

Figure 10 — CXC HP controller, right / top view

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 speaker tones during active alarms and can be disabled if required.

Ethernet: dual ports 10/100BASE-T Ethernet connection on both the front and rear of the controller for remote or local communication.

USB: dual ports on both the front and rear of the controller for upgrades or file management via a standard USB flash drive.

CAN: dual independent CAN bus ports for communication with the Cordex and AMPS family of products, allowing 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 9 — CXC HP controller touchscreen display

4.7.1 Network Connection and Remote Communications

The Cordex system can be set up, monitored, and tested via an Ethernet 10/100 Base-T serial data connection. The communication protocol supports a web interface. A CAN bus is used to transmit all alarm and control functions between the controller and rectifiers.

Refer to CXC-HP Software Manual (0350058-J0)for operation of controller.

4.7.2 Front Panel Wiring Notes

The terminal blocks on the Indicator Boards are suitable for #26-16AWG wire. As both signals are low current, it is recommend to use thinner wire were possible to make routing easier and to minimize space consumed by in the system. This is especially important with the L-ADIO if many of the expansion I/O capabilities are to be used.

Added wiring should be routed along the same path as the bus connection cable and then extend through the back of the unit. Take care to restrain the wiring sufficiently while providing enough slack so as not to interfere with operation of the door. Use the cable tie locations on the L-ADIO to restrain the cables within the front panel, and use the lance features on the chassis side panels to guide the cabling to the back of the unit.

5. Site Evaluation and Pre-Installation

5.1 Packing Materials

IE 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 IE 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 Innovative Energies packaging material is from sustainable resources and or is recyclable.

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.

Innovative Energies is not responsible for damage caused by improper packaging of returned products.

5.2 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 Innovative Energies for advice on the impact of any damage.

5.3 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.

6. Installation

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

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

- Various crimping tools and dies to match lugs used in installation
- 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
- 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
- Cutters and wire strippers (#14 to #22 AWG) [2.5 to 0.34 mm^2]

6.3 Assembly and Mounting

The E2 must be mounted in a clean and dry environment. Sufficient free space must be provided at the front and rear of the power system in order to meet the cooling requirements and to allow easy access to the power system components. This includes at least 2RU (3.5") of space above the unit to access connections points and provide adequate cooling/ventilation.

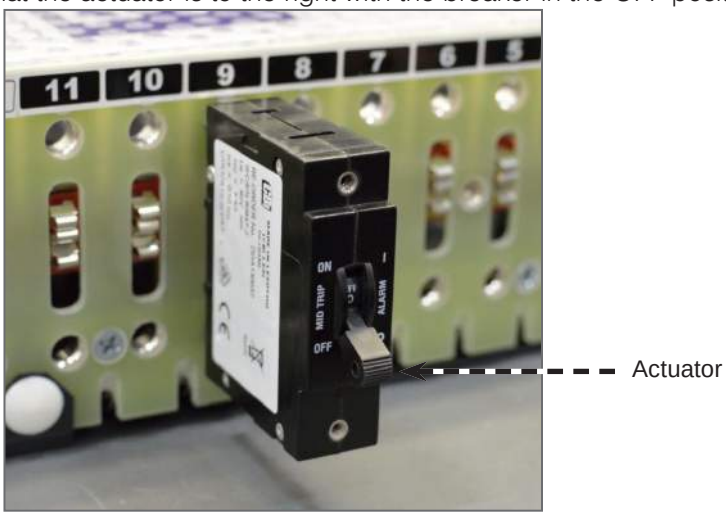
Attach the power system to the customer-provided relay rack using mounting screws and star washers. This will ensure an electrical bond between the system chassis and relay rack.

The system may be mounted into a 19" rack in a center mount position. Use the 19" to 23" rack adaptors to mount into a 23" rack.

The unit is shipped with the mounting brackets in the front mounted position. Move them to the center position as desired and attach 19"-23" the rack adapters when installed in a 23" rack.

6.4 Breaker Installation

1. Ensure mid-trip breakers are used for load.
2. Turn the breaker OFF.
3. Orient the breaker so that the actuator is to the right with the breaker in the OFF position.



4. Align the breaker terminals with the correct holes.
5. Carefully push the breaker into position.
6. Ensure that the breaker is fully inserted so that the flat face of the hexagonal nut is against the mounting surface.

7. Wiring

This chapter provides cabling details and notes on cable sizing for DC applications. All field-wired conductors shall be rated to a minimum 90° C.

WARNING!

Ensure that the power is removed by turning off rectifiers and removing battery line fuses or connections before attempting work on the wiring connections. Use a voltmeter to verify the absence of voltages. Clearly mark the correct polarity of the battery leads before working on DC connections.

Refer to the Chapter 6, Installation for safety precautions and tools required.

7.1 Chassis Ground

The E2 frame must be connected to the Main Ground Bus (MGB) or Frame Ground Bus (FGB) for safety reasons and to meet standard Telco grounding requirements. This acts as a system reference and a low impedance ground path for surges, transients and noise. The FGB or MGB should have a direct low impedance path to the building grounding system.

The cable from the distribution center to the MGB should be sized to provide sufficient ampacity to clear the largest fuse or breaker on the distribution center, 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 should also be factored in. The insulated cable should be equipped with two-hole crimp type lugs and should not have any tight bends or kinks.

Use the two studs shown in Figure 11 to connect the chassis ground of the E2 to the building MGB. Recommended wire size is a minimum of #6 AWG insulated cable.

The above should be used as a guide, follow local codes and company safety protocols for the ground connections.

Left Ground Connection

Right Ground Connection

Figure 11 — Ground connections (horizontal alignment shown)

7.2 Calculating output wire size requirements

To calculate wire sizes, first determine the appropriate maximum voltage drop requirement. Use the formula below to calculate the CMA wire size requirement. Determine the size and number of conductors needed to satisfy the CMA requirement.

CMA = (A x LF x K) / AVD, where:

CMA = Cross section of wire in circular MIL area

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 conform to the code.

7.3 DC Output Connections

WARNING!

Leave the cables or bus bars disconnected at the load and verify the output polarity using a voltmeter. Make the connections only after this verification.

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

Terminate the cable leads with appropriate crimp lugs.

Secure the positive and negative DC output cables to the unit's output post of the correct polarity; i.e., +Vcable to +Vpost. Ensure that the washers are placed on the bolts in the same order in that they were shipped from the factory.

7.3.1 DC Input Connection

WARNING!

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

The E2 is rated for a maximum 600A per bus and the input connections are sized to accept up to 2 x 750 MCM per bus. All cables should be routed carefully and secured to the ladder rack or frame so that there is limited stress on the E2 connections themselves.

7.3.2 Standard Horizontal Feed Connections

Up to 750 MCM sized lugs can be directly connected to the each input bus bars of the E2. These connections are accessible through the back cover and are arranged as shown in Figure 12.

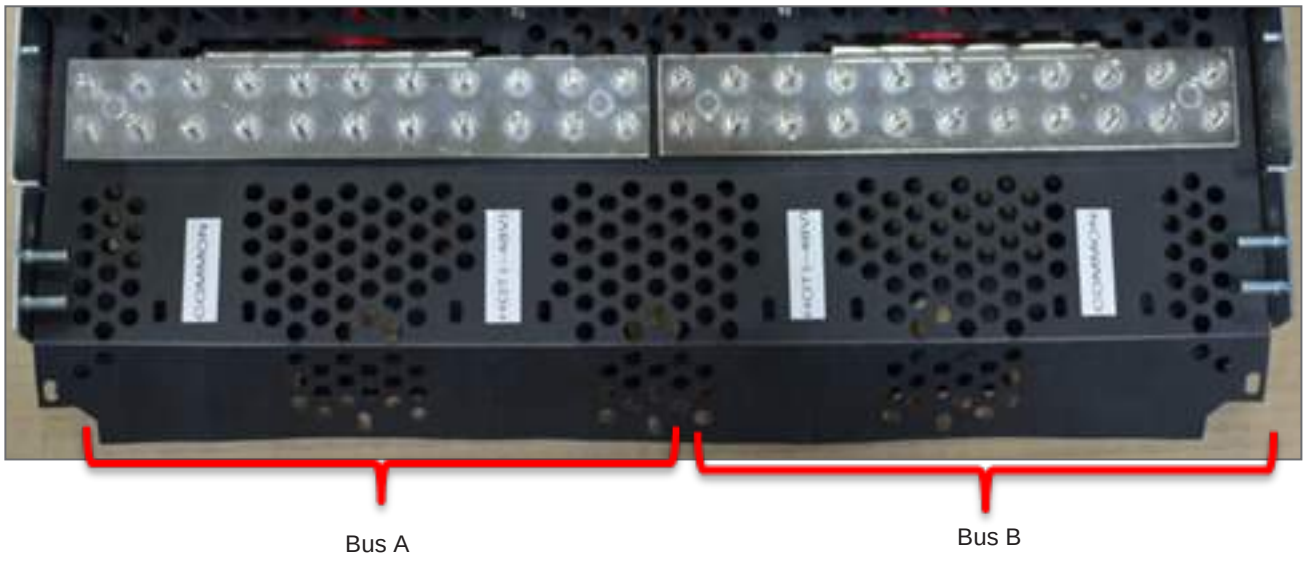


Figure 12 — Horizontal Feed Connections

1. Open the unit cover fully. With bottom cover hanging vertically there is maximum access to the connections. Although it is possible to make the connections with the bottom cover in place, it is recommended that the feed connections to the E2 are made before adjacent equipment is installed.
2. With the cover open, mount the lugs back to back on the input bus bars.
3. Place the nuts on the side that provides the greatest access for a ratchet.
4. Tighten the self-locking nuts (rather than the bolt) - no separate washers necessary.
5. Once the lugs are connected, move the bottom cover into position and secure the middle of the cover first

Figure 13 — Lug Connection, middle push-clip

with a single push-clip.

6. The fasten at each end(two total).
7. Connect the top cover to the bottom cover using the three (3) push-clips along the back.
8. Affix the top to the side panels using the two push-clips at the ends.

Figure 14 — Back Cover Installation

7.3.3 Feed Connections using Vertical Adapter Kits

For feeds coming from above use the vertical adapter kits(P/N?). These kits make it easier to dress the feed cables at varying angles while still maintaining clearance for attaching load cables.

1. Add the adapter plates to the input bus bars of the E2. When deciding which side of the input bus bar to mount the adapter plates refer to the tear-out section of the top cover. When mounted correctly the tear out

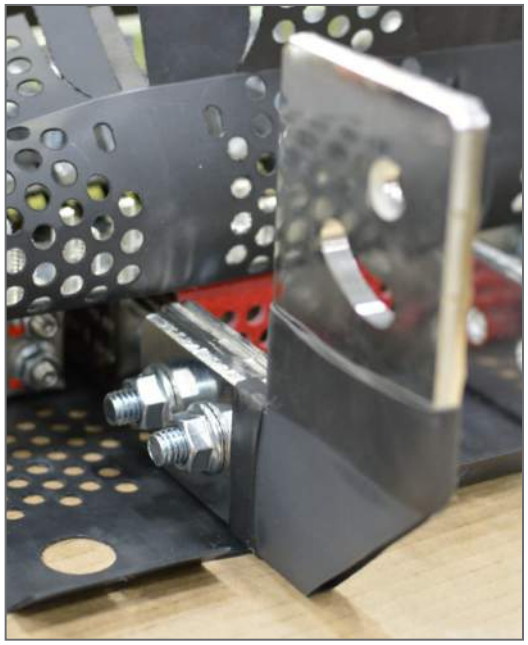


Figure 15 — Vertical Adapter Installation

   section is aligned with the adapter plate.
2. Once the adapter plate is mounted, attach the bottom cover to the frame using the instructions from 7.3.2.
3. Tear-out the narrow section of the top cover to fit around the adapter plate, and attach the top cover to the

NOTE:

Before applying power to the unit, ensure that the bottom of the adapter plate is insulated from any equipment that may be mounted below, and ensure that all covers are in place.

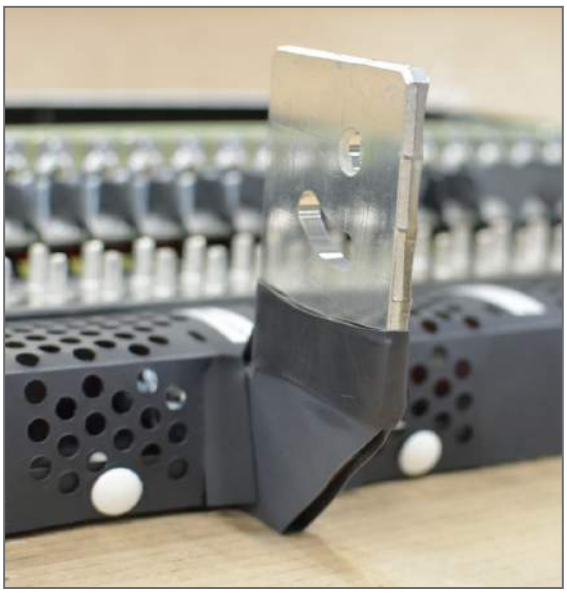


Figure 16 — Vertical Adaptor Closed

bottom cover and to the side panels using the instructions from 7.3.2.

4. Once the cover is in place, connect the lugs to the adapter plate at an angle that is most convenient for cable routing.
5. Check that there is no excessive force from cable weight or stiffness to the input bus bars. Cables should be externally supported to avoid undue stress being transferred from the cable to the E2.

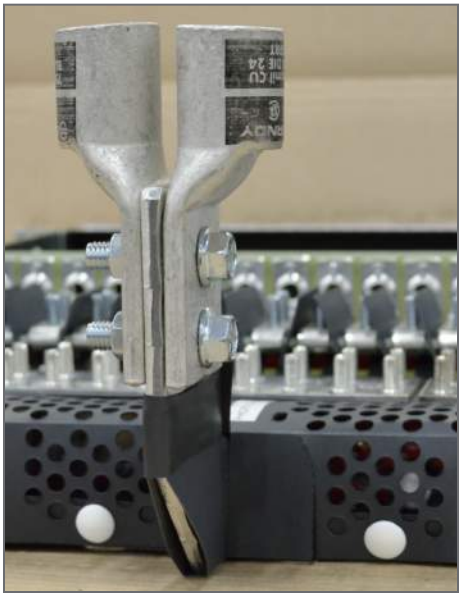


Figure 17 — Lugs Mounted to Vertical Adapter

7.4 Distribution Cabling

7.4.1 Calculating Output Wire Size Requirements

Wire size is calculated by first determining the appropriate maximum voltage drop requirement. Using the formula below calculate the CMA wire size requirement. Determine the size and number of conductors required to satisfy the CMA requirement.

CMA = (A x LF x K) / AVD, where:

CMA = Cross section of wire in circular mil area

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.

7.4.2 Load Planning/Breaker(fuse) Spacing

The E2 current rating of 1200A (600A per bus) continuous enables very dense power distribution in a 2RU 19" rack volume. Effective management of heat is critical to such systems, and the E2 buswork and ventilation is designed to both minimize heat generation, but also extract and dissipate the heat generated by the breakers or fuses.

Because breakers/fuses generate most of the heat in a system, care must be taken in the layout of high current breakers/fuses. Specifically the guidelines are as follows:

1. Any single pole Over Current Protection Device (OCPD) rated at 100A and above can be mounted in pairs, but cannot have an OCPD installed on either side of the pair
2. Any single pole Over Current Protection Device (OCPD) rated at 90A can be mounted in triples, but cannot have an OCPD installed on either side of the triple
3. Any single pole Over Current Protection Device (OCPD) rated at 80A and below can be mounted in any position without spacing

While these guidelines require some planning, they do not limit achieving the 600A/side capacity for any breaker size combination (except if many small breakers are used). Below are example layouts which may show how to best accomplish 600A capacity with the largest size of breakers.

7.4.3 Load Connections

For wire sizing refer to guidelines supplied with the load equipment.

Terminate distribution cabling with 1/4"–5/8" center lugs for connecting to E2. Always make the return connection to the E2, and then verify the nut tightening torque before installing the hot connection as once the hot connection is in place it is difficult to access the return connection.

Always use the supplied hardware (nuts) for attaching the lugs. The supplied nuts have a serrated flange which eliminates the need for a second lock washer both allowing more threads to show after a completed connection and avoiding thin hardware which can fall through small gaps in the equipment covers.

Load Breaker Return Connections

NOTE:

Connect load breaker returns before hot connections.

1. Secure cables with two hole lugs to the 1/4" studs on 5/8" centers using the supplied hardware.
2. Run cables directly out the rear of the distribution center.

Load Breaker Hot Connections

Connect load breaker hot connections.

1. Secure cables with two hole lugs to the 1/4" studs on 5/8" centers using the supplied hardware.
2. Run cables directly out the rear of the distribution center above the breaker return cables.

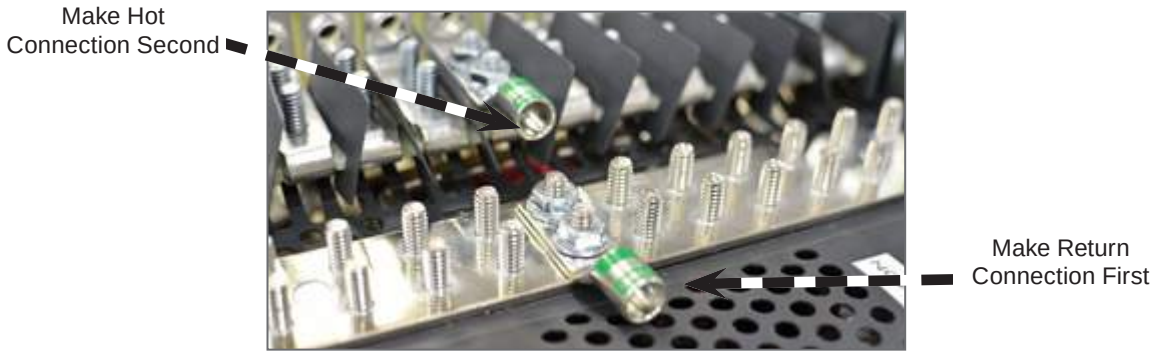


Figure 18 — Battery, load, and return connection locations (with battery and load breakers shown)

7.5 Alarm and Signal Connection

7.5.1 Breaker Alarm and Bus Voltage Connections

1. Locate the terminal block on the rear of the CXDM-E2. Refer to Figure 9 and the schematic drawing at the end of this manual for details on terminal block assignments.
2. Connect these alarms and signals to the local alarm-sending unit. Use wire sizes #20 to #26 AWG (0.518 to 0.14mm^2).

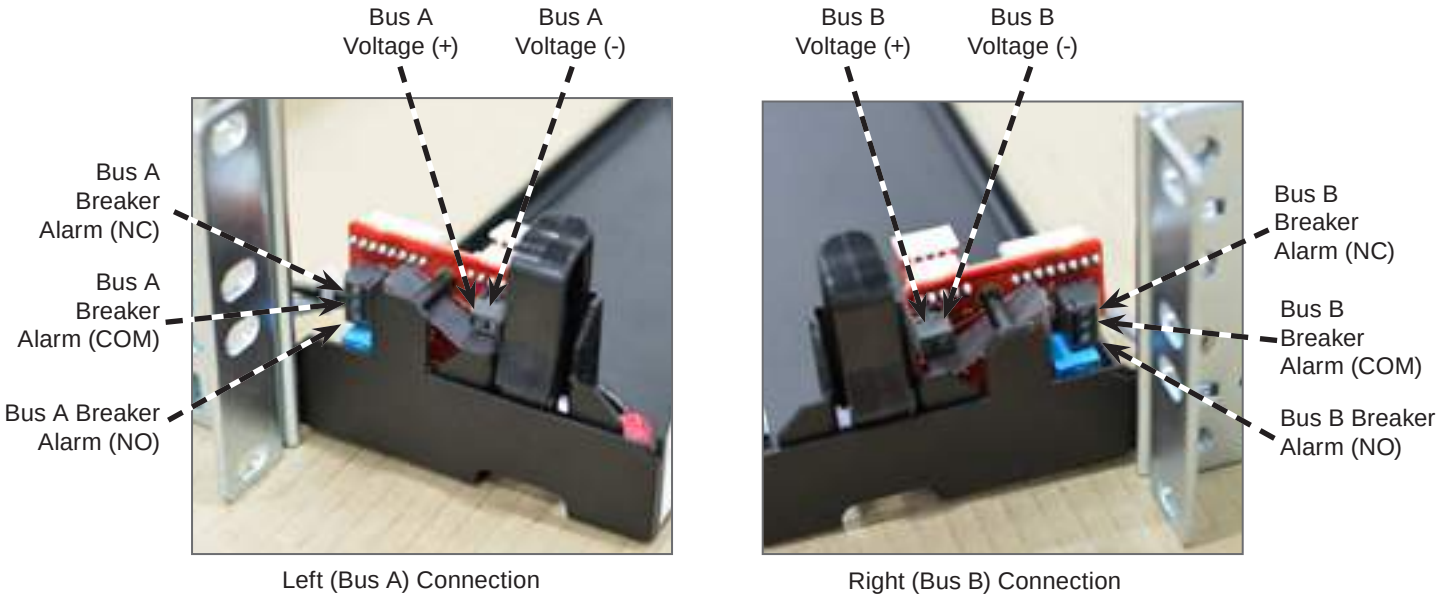


Figure 19 — Battery, load, and return connection locations (with battery and load breakers shown)

7.6 CAN Serial Ports

The CAN serial port(s) are located on the front of the L-ADIO and on the side of the controller and are clearly labelled. CAN serial ports are modular jacks with offset latches that are used to communicate with the rectifiers and other CAN-enabled equipment (nodes) on the same system. For more detailed information on CAN, refer to the Reference section in the software manual (0350058-J0).

7.6.1 CAN Termination

A CAN termination jumper is located beside each of the CAN serial port jacks on the rectifier shelves. See the customer connection drawing and schematic that describes your system.

7.7 Network and Remote Communication

When equip[ped with a CXC HP controller, the system can be set up, monitored and tested via an Ethernet 10/100 Base-T serial data connection and accessed via the controller or a web interface. Pin-outs are shown in the customer connections drawing.

Some standard scenarios are described below:

- Network Connection: The Ethernet port is designed to connect the controller to a user supplied network (TCP/IP supplied by the user) via a front panel RJ-45 jack. Use a standard network cable for this connection.
- Local Connection: The Ethernet port can also be used for local access such as using a laptop computer. Use a standard Ethernet cable for this connection.

7.8 Signal Wiring Connections for Controller

Reference is made to drawings located at the rear of this manual. Custom configurations may be detailed within the Innovative Energies documentation package.

For terminal block connections, the recommended wire sizes are #16 - #26 AWG (1.5 - 0.129 mmP2P) for the temperature range of 0 - 50°C (as per UL/CSA).

Bundle the signal cables together and route them through the entry holes of the shelf.

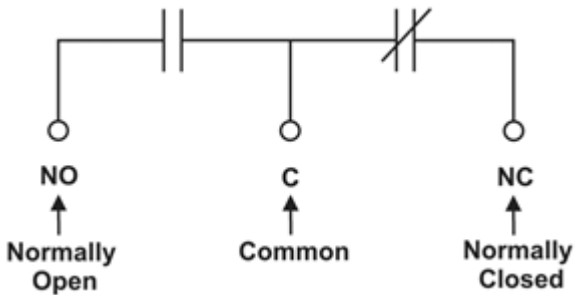
7.8.1 Alarm Outputs

Terminals provide contacts for extending various alarm or control signals. Each relay output can be wired for NO or NC operation during an alarm or control condition.

Relays can be programmed to energize or de-energize during an alarm condition. See the controller software manual. All relays will de-energize when the controller reset button is pressed or when the power is lost.

CAUTION!

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



7.8.2 Digital inputs for controller

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

Connection Method

Typical Innovative Energies use a “reset with Hot and trigger with Ground” connection. The digital input is wired so that Hot is wired directly into one of the input terminals; e.g., negative input for -48 V systems. The other input terminal is wired to the common ground of the system through a relay, which is a dry contact usually located on the equipment that requires monitoring. This method allows the digital input to receive or not receive a Ground signal during an alarm. See Figure 11.

Programming the Digital Input

The digital input channels can be programmed for “active high” or “active low”. Active high indicates an alarm when a ground signal is present. Active low indicates an alarm when the ground signal is removed. See the controller software manual.

7.8.3 Analog Inputs

CAUTION!

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 that accommodate various types of analog signals.

Voltage/Temperature/Current Inputs

See the front panel descriptions, under section "4. Features".

8. Maintenance

Although very little maintenance is required with Innovative Energies, 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.

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 semi-conductor devices, 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 B — 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.	

9. Warranty and Service Information

9.1 Technical Support

Free Technical Support 24/7/365 is part of the IE customer satisfaction commitment.
The phone numbers below can also be used to access a wide range of service solutions.

Phonel: +64 9 835 0700. info@innovative.co.nz.

9.2 Warranty

From the date of shipment from the factory. The warranty provides for repairing, replacing or issuing credit (at IE 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 Innovative Energies will pay the cost of shipping the repaired or replacement unit back to the customer.

9.3 Return of Material

Please contact Technical Support at the number above to obtain a Service Repair Order (or Return Material Authorization) number BEFORE sending material back. This will ensure that your service needs are handled promptly and efficiently.

9.4 Service Centers

For a list of service centers, refer to the Innovative Energies website:

http://www.innovative.co.nz

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. 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)

IE rectifier and power system products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 60950-01 and UL 60950-01. IE 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)

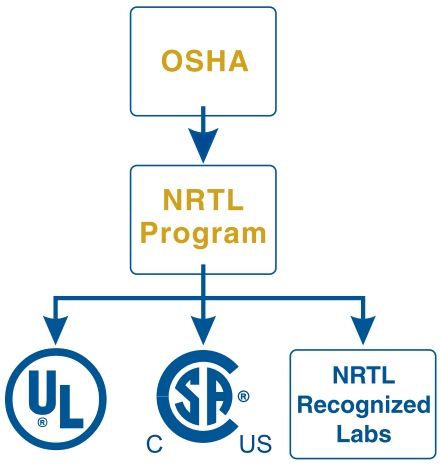
Only Underwriters Laboratories may grant a licence for the use of this mark, which indicates compliance with both Canadian and US requirements. (3)

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)

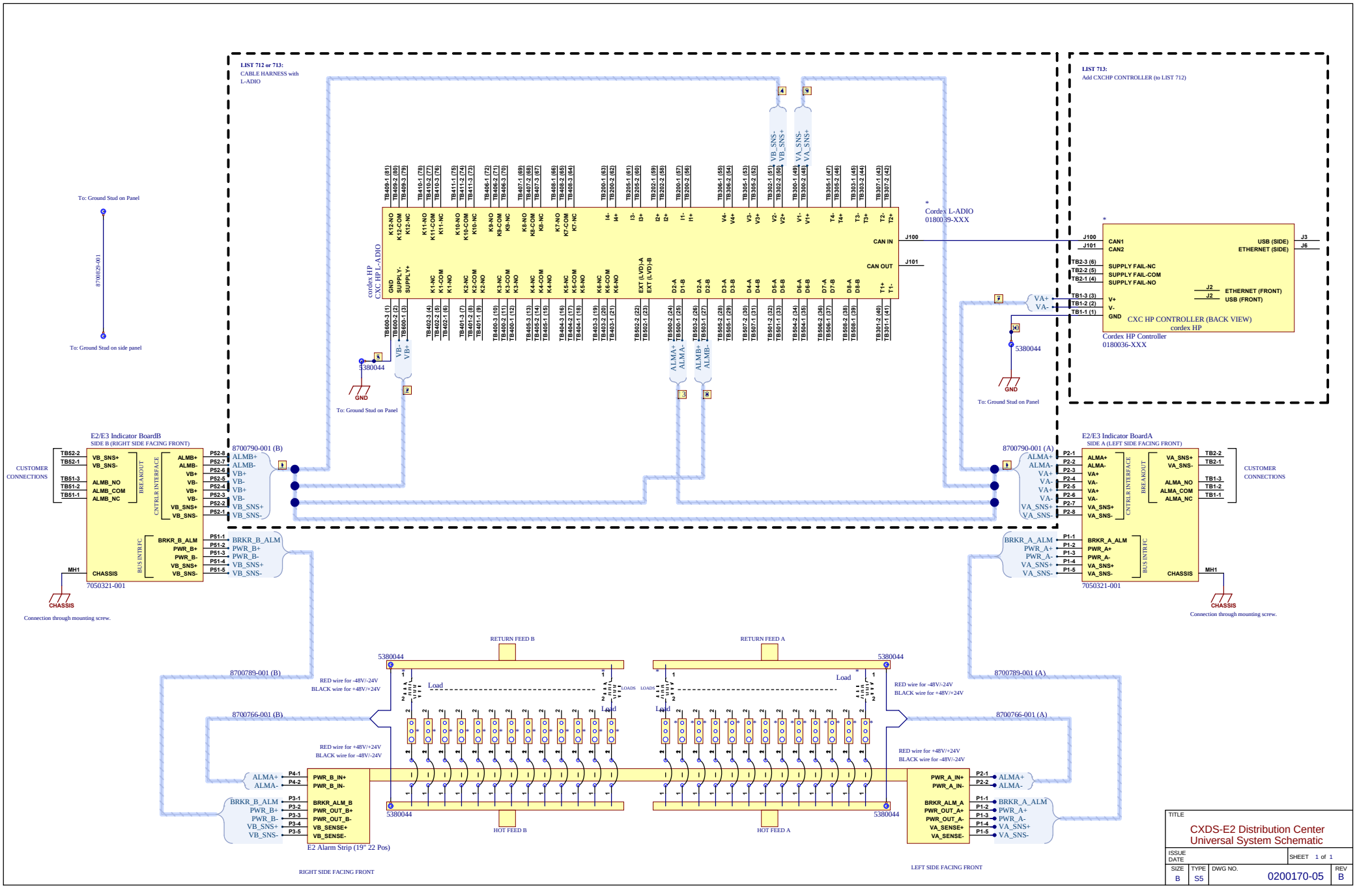
The NRTL determines that a product meets the requirements of an appropriate consensus-based product safety standard either by successfully testing the product itself, or by verifying that a contract laboratory has done so, and the NRTL certifies that the product meets the requirements of the product 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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CABLE HARNESS with L-ADIO
LIST 713:
Add CXCHP CONTROLLER (to LIST 712)
8700829-001
To: Ground Stud on Panel
To: Ground Stud on side panel
cordex HP
CXC HP L-ADIO
Cordex L-ADIO
0180039-XXX
CAN IN
CAN OUT
J100
J101
CXC HP CONTROLLER (BACK VIEW)
cordex HP
Cordex HP Controller
0180036-XXX
CAN1
CAN2
USB (SIDE)
ETHERNET (SIDE)
SUPPLY FAIL-NC
SUPPLY FAIL-COM
SUPPLY FAIL-NO
ETHERNET (FRONT)
USB (FRONT)
V+
V-
GND
VA+
VA-
5380044
GND
To: Ground Stud on Panel
E2/E3 Indicator BoardB
SIDE B (RIGHT SIDE FACING FRONT)
8700790-001 (B)
7050321-001
CUSTOMER CONNECTIONS
BREAKOUT
CNTRLR INTERFACE
BUS INTRFC
CHASSIS
Connection through mounting screw.
E2/E3 Indicator BoardA
SIDE A (LEFT SIDE FACING FRONT)
8700790-001 (A)
RETURN FEED B
RETURN FEED A
8700789-001 (B)
8700789-001 (A)
8700766-001 (B)
8700766-001 (A)
RED wire for -48V/-24V
BLACK wire for +48V/+24V
Load
LOADS
HOT FEED B
HOT FEED A
E2 Alarm Strip (19" 22 Pos)
RIGHT SIDE FACING FRONT
LEFT SIDE FACING FRONT
TITLE
CXDS-E2 Distribution Center
Universal System Schematic
ISSUE DATE
SHEET 1 of 1
SIZE B
TYPE S5
DWG NO. 0200170-05
REV B

DO NOT SCALE DRAWING

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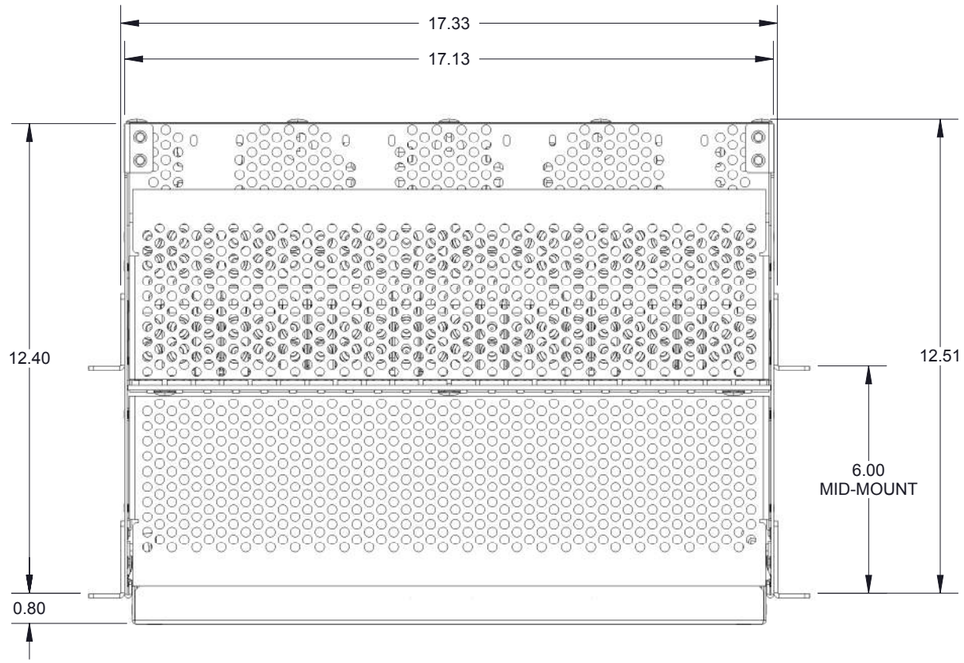

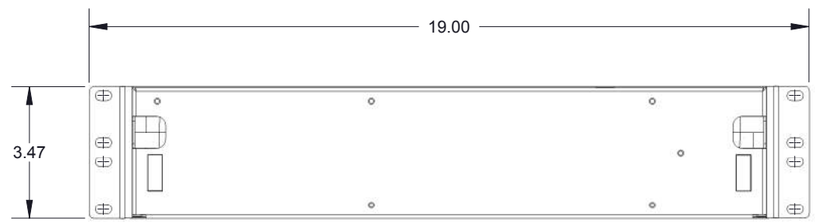

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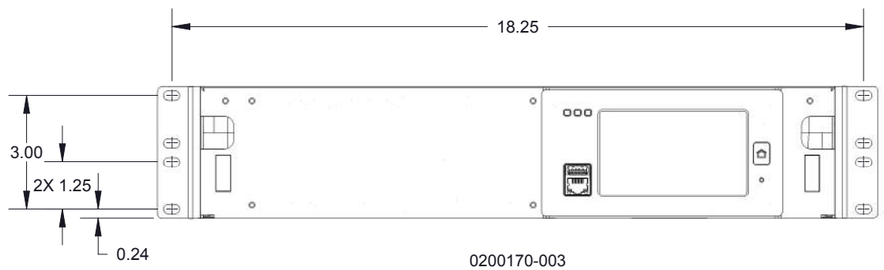

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UNLESS OTHERWISE SPECIFIED
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X.XX ±0.020
X.XXX ±0.010
ANGULAR: ±1°
INTERPRET DIM AND TOL PER ASME Y14.5-1994
THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	RP	2015/06/24
CHECKED	DM	2015/06/24

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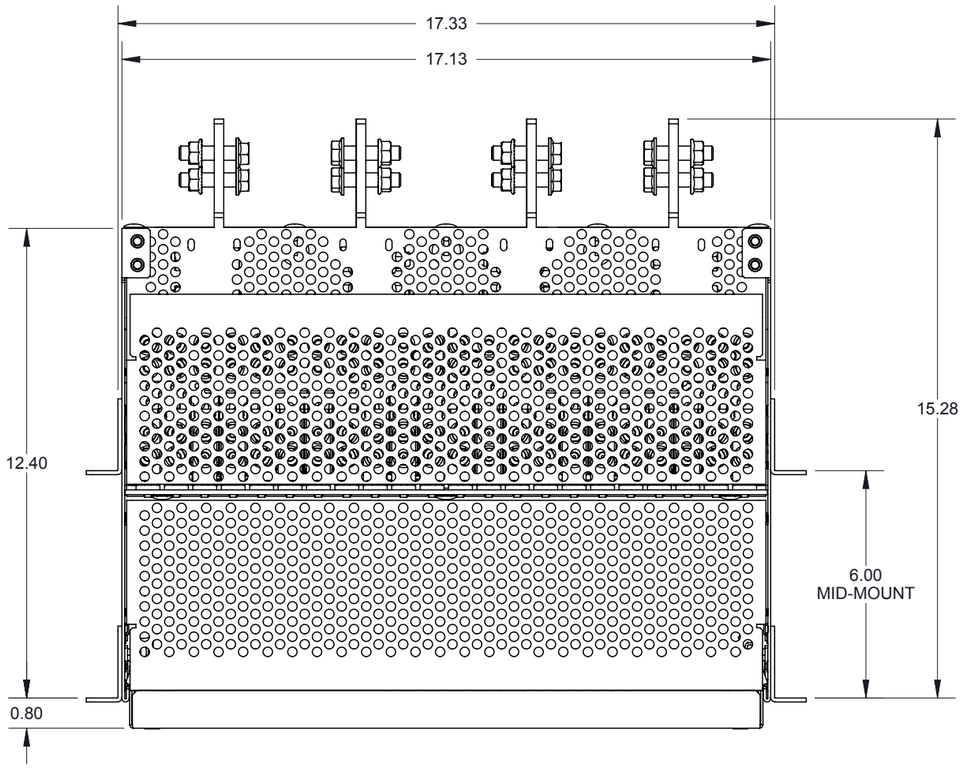

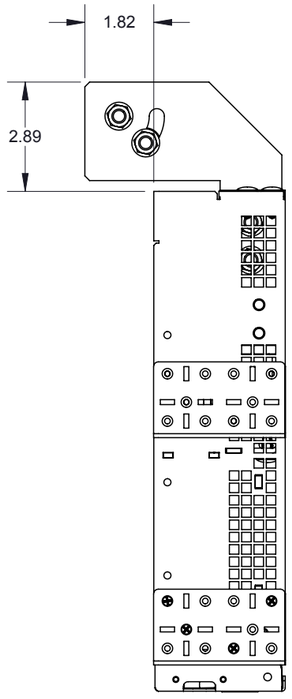

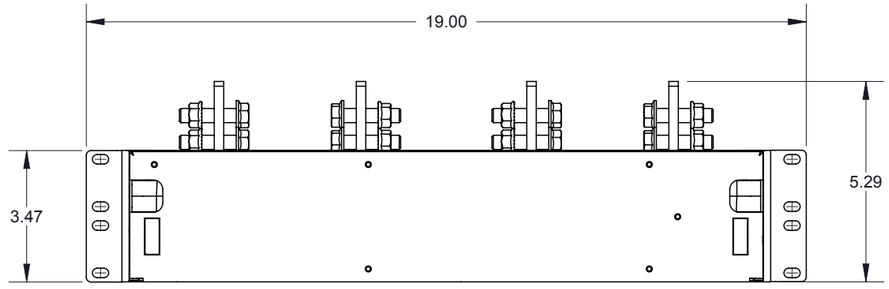

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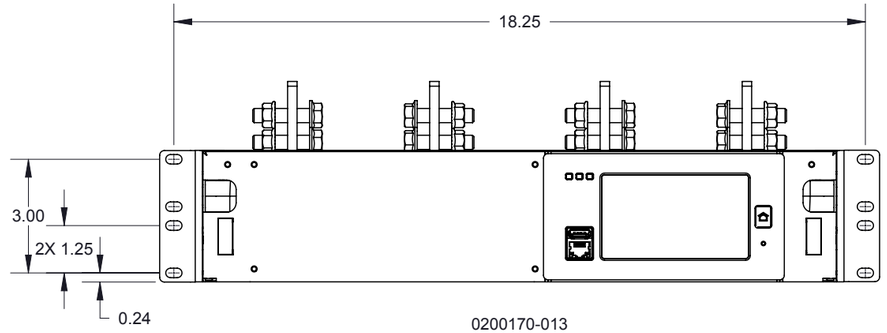

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