



CXPS 24->48-i 8kW DC-DC Converter Sys, Dual Input

Power System Manual

Part # 053-997-B0

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Power System Manual

CXPS 24->48-i, 8kW DC-DC Converter Sys, Dual Input

053-997-B0

The following documents and drawings are included in this manual to provide the necessary information required for installation, operation and fault diagnosis of the unit:

- **System Specifications:** **053-997-B1**
- **CXCI Specifications:** **707-492-B1**
- **Outline Drawing:** **053-997-06**
- **Schematic, Power System:** **053-997-05**
- **Customer Connections:** **053-997-08**

Manuals to be included with this package are as follows:

- **Cordex Controller Software (Current Version):** **CXC SOFT**

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This section contains important instructions that should be followed during the installation and maintenance of equipment and batteries. **Please read all of the instructions before operating the equipment, and save this manual for future reference.**

A licensed electrician **MUST** perform connections to the branch circuit of service feed. Installation of the power supply and batteries must be performed by, or under the direct supervision of service personnel knowledgeable of the required electrical and battery safety precautions.

If instructions in this manual conflict with local electrical codes, those instructions shall be superseded by the local code.

The following safety symbols will be found throughout this manual, carefully read all information and abide by the instructions:



DANGEROUS VOLTAGE
This symbol indicates a dangerous voltage exists in this area of the product.



GAS HAZARD
This symbol indicates a gas hazard exists in the area of vented batteries.



NO MATCHES OR OPEN FLAMES
This symbol indicates a fire or explosive hazard exists in the area of the product.

The following levels of warning will be used with the above symbols:

DANGER: You **WILL** be **KILLED** or **SERIOUSLY INJURED** if instructions are not followed closely.

WARNING: You **CAN** be **KILLED** or **SERIOUSLY INJURED** if instructions are not followed closely.

CAUTION: You **CAN** be **INJURED** or equipment can be **DAMAGED** if instructions are not followed closely.

Mechanical Safety

Keep hands and tools clear of fans. Fans are thermostatically controlled and will turn on automatically.

Power supplies can reach extreme temperatures under load.

Use caution around sheet metal components and sharp edges.

Electrical Safety



WARNING

Hazardous voltages are present at the input of a power system. The DC output from converters, 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:

- Remove all metallic jewelry; e.g., watches, rings, metal rimmed glasses, necklaces.
- Wear safety glasses with side shields (and prescription lenses if necessary) at all times during installation.
- Use OSHA approved insulated hand tools.

Lethal voltages are present within a power system. Never assume that an electrical connection or conductor is not energized. Check the circuit with a voltmeter with respect to the grounded portion of the enclosure (both AC and DC) prior to 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 240Vac. Ensure that utility power is disabled before beginning installation or removal.

Ensure no liquids or wet clothes contact internal components.

Hazardous electrically live parts inside this unit are energized from batteries even when the AC input power is disconnected.



WARNING

High leakage current – Earth connection essential before connecting supply.

Battery Safety

Servicing and connection of batteries shall 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 hands and neck.

Use OSHA approved insulated hand tools. Do not rest tools on top of batteries.

Batteries contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Battery post terminals and related accessories contain lead and lead compounds; wash hands after handling (California Proposition 65).



WARNING

Follow battery manufacturer's safety recommendations when working around battery systems.



WARNING

Do not smoke or present an open flame when batteries (especially vented batteries) are on charge. Batteries vent hydrogen gas when on charge, which creates an explosion hazard.

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

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1 Introduction

1.1 Scope of the Manual

This instruction manual covers the features and installation of Alpha Technologies CXPS 24-48-i 8kW DC-DC Converter System with dual +24Vdc input feeds.

NOTE: *To aid the user with installation, frequent reference is made to drawings located at the rear of this manual.*

1.2 Product Overview

The CXPS 24-48-i is a complete integrated 24Vdc to 48Vdc converter system utilizing the advanced Cordex CXCI controller and 24-48V 2kW converter modules. The DCP03 300A distribution center provides front access for DC distribution and site controller connections. The system provides a maximum capacity of 8kW (148A @ 54Vdc).

The CXDF 24-48/2kW isolated DC-DC converter employs a high frequency switched mode conversion technique to provide a fully regulated and isolated -48 Volt DC output from a +24 Volt DC input.

The converter shelf has dual +24Vdc input feeds and the system can accommodate up to four CXDF 24-48/2kW DC-DC converter modules.

Converter power modules are “hot swappable” meaning they can be inserted or removed from the shelf without cutting power to or from the system or the load.

NOTE: *Converter modules are not included with the base system, but may be purchased along with the system at the time of ordering or added after the shelf has been installed.*

The shelf converter system is designed to operate with the Alpha Cordex System Controller (CXC).

Controller software version 1.97 is the minimum requirement.

This system uses the CXCI integrated version of the controller, which is factory installed on the Cordex converter system shelf.

The CXC allows the user to configure, monitor and control the entire DC power system locally or remotely via (web browser) Internet Explorer® 7 or greater. Features of the unit include temperature compensation, auto equalization, remote access, e-mail alarm notification, battery diagnostics, as well as web server and SNMP support for configuration and monitoring.

Details of controller operation are provided in the current version software manual.



Figure 1–Front view of the 053-997-20-000 rail mount CXPS 24-48-i 8kW DC-DC Converter System

1.3 System Configurations

The system is available to order in the following configurations:

Description	Part Number
CXPS 24-48-i, Cordex base 24V-48V 8kW converter system (dual input), 19/23" rail mount	053-997-20-000

1.4 Accessories

This product is available to order with the following accessories:

Description	Part Number
Cordex DC/DC 2kW converter, 24V In – 48V Out	012-526-20
Breaker, AM-type mid-trip plug-in, 1A.....	470-300-10
Breaker, AM-type mid-trip plug-in, 3A.....	470-301-10
Breaker, AM-type mid-trip plug-in, 5A.....	470-302-10
Breaker, AM-type mid-trip plug-in, 10A.....	470-303-10
Breaker, AM-type mid-trip plug-in, 15A.....	470-304-10
Breaker, AM-type mid-trip plug-in, 20A.....	470-305-10
Breaker, AM-type mid-trip plug-in, 25A.....	470-306-10
Breaker, AM-type mid-trip plug-in, 30A.....	470-307-10
Breaker, AM-type mid-trip plug-in, 35A.....	470-308-10
Breaker, AM-type mid-trip plug-in, 40A.....	470-309-10
Breaker, AM-type mid-trip plug-in, 45A.....	470-310-10
Breaker, AM-type mid-trip plug-in, 50A.....	470-311-10
Breaker, AM-type mid-trip plug-in, 60A.....	470-312-10
Breaker, AM-type mid-trip plug-in, 70A.....	470-313-10
Breaker, AM-type mid-trip plug-in, 80A.....	470-314-10
Breaker, AM-type mid-trip plug-in, 90A.....	470-315-10
Breaker, AM-type mid-trip plug-in, 100A.....	470-316-10
Load breaker kit, AM-type mid-trip plug-in, 125A (2-pole)	747-523-20
Load breaker kit, AM-type mid-trip plug-in, 150A (2-pole)	747-524-20
Load breaker kit, AM-type mid-trip plug-in, 175A (3-pole)	747-525-20
Load breaker kit, AM-type mid-trip plug-in, 200A (3-pole)	747-526-20
Load breaker kit, AM-type mid-trip plug-in, 250A (3-pole)	747-527-20
Replacement CXDF fan assembly	747-362-20
Replacement CXCI controller.....	747-502-20
Cordex DC Modem (complete with Alpha cable)	018-585-20
CXPS 24-48-i	747-521-20

The above information is valid at the time of publication. Consult factory for up-to-date ordering information.

2 Features

2.1 System Overview

The basic system configuration is called out by Alpha part number 053-997-20-000; which includes:

- 300A DCP03 distribution center
- Cordex Integrated System Controller (CXCI)
- One (1) Cordex 24-48/2kW 4-module converter shelf (dual input feeds)
- Kydex rear covers
- 19" rack mount rails (front or mid mount)
- 19" to 23" rack mount adaptors
- System integration cabling.

2.2 Distribution Center

2.2.1 Distribution Configurations

The DCP03 contains 18 total AM-type plug-in breaker positions with two-hole connection points for both load (hot) output and the ground return bus. The breaker distribution, for the CXPS 24-48-i, is configured for 18 load breaker positions.

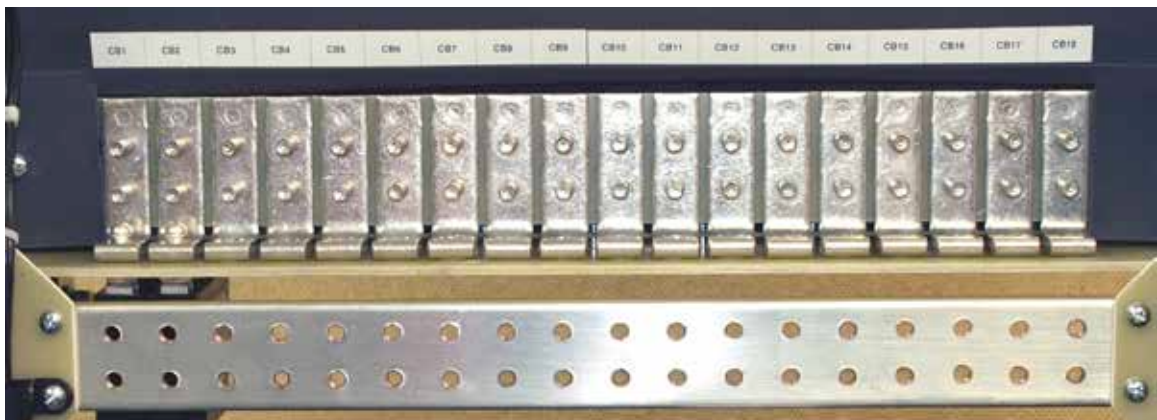


Figure 2–DCP03 configured for 18 load breakers

2.2.2 Internal Alarm Card

The DCP03 includes a standard alarm card providing a common interface point to internal system I/O connections and LED indication of breaker trip.

The alarm card provides terminal block access to internal signals such as binary alarms for breaker trip and analog input for voltage measurement. The terminal blocks provide a single point of access to these signals for connecting to an external system controller. Refer to the customer connections (“–08”) drawing at the rear of this manual for details on terminal block assignments.

I/O customer connection points



Figure 3–Internal alarm card

2.2.3 CXCI I/O Terminal Block

A CXCI I/O terminal block kit is installed in the UDC front door for front access to controller signals and interfaces to the CXCI controller on the converter shelf via a 25-pin D-sub wire harness.

The internal signals from the distribution center are wired to the CXCI I/O board direct from the internal alarm board. The remaining relay outputs, digital inputs, and analog inputs are available on the board via terminal blocks for customer connection of external signals. Refer to the customer connections (“-08”) drawing at the rear of this manual for details on terminal block assignments.

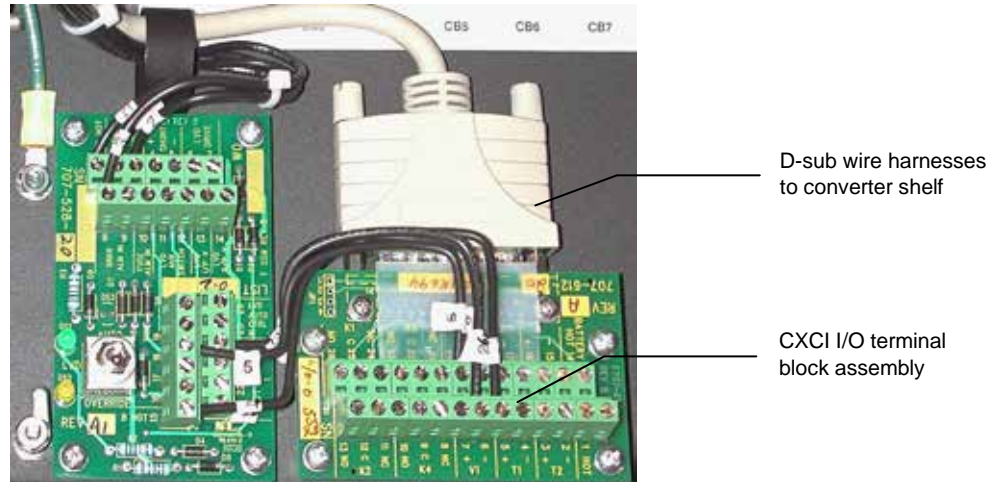


Figure 4—Internal alarm card and CXCI I/O terminal block

2.2.4 4R/8D ADIO (Option)

The 4R/8D ADIO Cordex peripheral may also be optionally installed on the front door of the DCP03 expanding the I/O capability of an existing Cordex controller by adding an additional 4 relays outputs and 8 digital inputs.

The 4R/8D ADIO installs on the right side on the front door. The ADIO is connected to the Cordex system via CAN communications using RJ-12 offset communications cables.

All I/O connections are made via screw terminal blocks. Refer to the customer connections (“-08”) drawing at the rear of this manual for details on terminal block assignments.

NOTE: *The 4R/8D ADIO board does not come with the CXPS 24-48-i system and is purchased separately. Consult factory for options.*



Figure 5—4R/8D ADIO option

2.3 Cordex Integrated System Controller (CXCI)

The controller is mounted in the converter system shelf and brings advanced monitoring technology to the Cordex series of converters. This compact system controller is designed for seamless operation and set up of Alpha power systems and is equipped with the complete range of Cordex software (**version 1.97 minimum**) features, including the following:

- Designed to communicate directly with Cordex converters
- Provides local and remote communications
- User definable alarms
- Daily logging of power system events and system statistics.

Behind the CXCI's front panel lies the main controller motherboard, which contains a microprocessor, memory, as well as numerous other electronic components.

The CXCI includes a web server providing easy set up and monitoring using an Internet connection with (web browser) Internet Explorer® 7 or greater.

NOTE: *Details of controller operation are provided in the current version software manual.*

The data logging feature allows the user to capture data from multiple inputs, for AC/DC voltages, load/battery current, cell voltages & temperatures (automatically for up to 16 user defined logs). Typical applications of the CXCI logging include power system details, thermal performance of outdoor enclosures, battery cell specifics, or mains variations captured by an AC voltage watchdog.

A built-in audio speaker sounds an intermittent tone during active alarms.

2.3.1 System Controller Front Panel

The CXCI model has a 4-digit display for monitoring system voltage (V) and current (A). A pushbutton toggle switch allows the user to alternate the display reading.

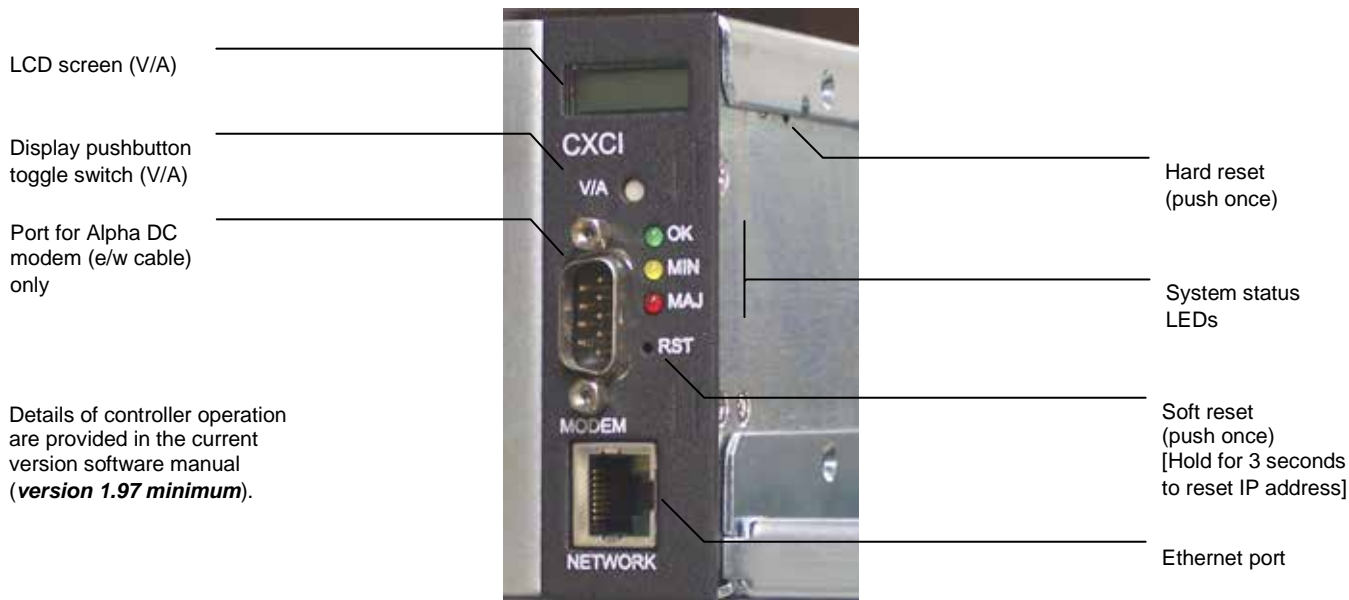


Figure 6–Cordex CXCI model system controller front panel

2.3.2 LEDs

The CXCI has three LEDs located on the front panel. These are used to display the alarm status of the power system, CXCI progress and status during startup, and file transfers.

2.3.2.1 Alarm Conditions

The CXCI illuminates the LED that corresponds to the system alarm status. The following show the corresponding alarm status for each LED color:

Green – OK, no alarms present

Yellow – Minor alarm is present (no major alarms)

Red – Major alarm is present.

Only one LED is illuminated at a time during alarm conditions.

2.3.2.2 Progress and Status Indication

The LEDs are also used in the following situations:

Base unit validation – all three LEDs are on at the same time.

File transfer – when recovering from invalid firmware application – the red LED is illuminated.

2.3.3 Reset

A reset button is located on the front panel for restarting the CXCI's microprocessor.

NOTE: *Refer also to the software manual – always select the Reset menu item before pressing the reset button.*

2.3.4 Modem Port

The Modem port (front panel DB-9 connector, Figure 6) is designed for CXCI connection to Alpha Technologies' Cordex DC Modem #018-585-20 (complete with Alpha cable).

CAUTION

Connect only Alpha-supplied modem and cable; otherwise, equipment damage can result.

2.3.5 Ethernet Port

The Ethernet port is designed for CXCI connection to a user supplied network (TCP/IP secured by user) via a front panel RJ-45 jack (Figure 6) and a standard network cable.

Local access (e.g. laptop computer) is also possible from the Ethernet port connection using a standard network crossover cable.

2.3.6 Analog Input Channels

The CXCI has analog input channels for voltage, current, and temperature.

2.3.6.1 Voltage Inputs

Two voltage input channels, V1 and V2, provide monitoring of discharge and charge voltage. The CXCI software is pre-configured to monitor V2 for load and for battery voltage. V2 is used as the system reference for converter float voltage, low voltage disconnect (LVD), system high voltage alarm, and system low voltage alarm. V1 is available for additional measurements.

2.3.6.2 Current Inputs

The CXCI software is pre-configured to monitor I1 for load current using an external 50mV current shunt.

2.3.6.3 Temperature Inputs

Two temperature input channels, T1 and T2, provide monitoring of battery temperature and temperature compensation (temp comp) or room/ambient temperature. A voltage is supplied to these terminals to power the temperature sensors.

2.3.7 Digital Input Channels

The CXCI has digital input channels to monitor alarm/control signals from converters (**software version 1.97 minimum**), rectifiers, and many other types of equipment.

2.3.8 Alarm and Control Output Relays

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

2.3.9 Network Connection and Remote Communications

The Cordex system can be set up, monitored and tested via Ethernet 10/100 Base-T serial data connection. The communication protocol supports a web interface. All alarming and control of Cordex converters is accomplished with a CXCI via a CAN bus.

Controller software version 1.97 is the minimum requirement.

A step-by-step connection wizard (Windows® 2000 operating system) – provided to establish remote communications with your CXCI – is available via the Alpha website (www.alpha.ca).

2.4 Cordex 24-48/2kW Converter

The Cordex converter modules plug into the Cordex converter shelf. The modules can be installed or removed from a system without disturbing the system provided sufficient current capacity remains. This is often referred to as “Hot Swap.”

The total output current capacity of the converter system is equal to the sum of the individual current capacities of the converter modules.



Figure 7–CXDF 24-48/2kW modular switched mode converter

2.4.1 Alarms

Converter Module Fail alarms consist of a group of (major) alarm conditions that are considered “serious” or an immediate threat to service:

- Converter failure
- Output fuse failure
- Converter off
- Thermal shutdown
- Input Voltage is out of range
- Output OVP level has been exceeded.

Converter Minor alarms consist of a group of alarm conditions that are not an immediate threat to service:

- Fan fail
- Current limit.

2.4.2 Indicators

LED indicators are provided on the front panel of the converter module to display the operational status of the module (see Table A).

Indicator Color	Associated Condition
Green (I/P)	DC INPUT OK
Green (O/P)	Converter Module Power ON
Red (FAIL)	Converter Module FAIL
Red (FAIL flashing)	Converter Minor Alarm

Table A—Module indicators and conditions

2.4.3 Regulation and Paralleling

Cordex modular converters use “output slope” or “regulation offset” to accomplish load sharing. When the converters are run in parallel (as is the case when more than one converter module is installed in the shelf) it is necessary to adjust (via the CXC: **software version 1.97 minimum**) the output voltage of the individual converter modules such that the output current is shared equally between the individual modules. At that point, the modules will track each other and share the load over the output current range of the units. The output slope value is fixed at 1.0% (1V / full current range).

2.4.4 Reverse Polarity Protection

The converter design has incorporated reverse polarity protection from the connection to a battery on the input and to a power source on the output. This prevents damage to the converter circuitry if a reverse connection is made.

3 Inspection

3.1 Packing Materials

All Alpha products are shipped in rugged, double walled boxes and suspended via solid inserts to minimize shock that may occur during transportation. Packaging assemblies and methods are tested to International Safe Transit Association standards. Power systems are custom packaged in heavy-duty plywood crates.

Products are also packaged with Cortex. This plastic wrap contains a corrosive-inhibitor that protects the product from corrosion for up to two years.

NOTE: *Converters and batteries are shipped on individual pallets and are packaged per manufacturer's guidelines.*

3.1.1 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 the product is packed with at least three inches of shock-absorbing material to prevent shipping damage.

NOTE: *Alpha Technologies is not responsible for damage caused by the improper packaging of returned products.*

3.2 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, please inform the carrier and contact Alpha Technologies for advice on the impact of any damage.

3.3 General Receipt of Shipment

NOTE: *The inventory included with your shipment is dependant upon the options you have ordered.*

3.3.1 Racks

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

3.3.2 Converters (Purchased Separately)

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

3.3.3 Miscellaneous Small Parts

Review the packing slip to determine the part number of the "configuration kits" included with your system; e.g., 053-997-20-040 for CXPS 24-48-i system installed in 7foot Z4 23" rack with 2x battery trays.

3.3.4 Batteries (Purchased Separately)

Verify that you have the correct number of batteries (if applicable). Refer to packing list.



**Verify that you have all the necessary parts per your order for proper assembly.
Call Alpha Technologies if you have any questions before you proceed:**

Canada and USA: 1-888-462-7487

International: +1-604-436-5547

Email: support@alpha.ca

4 Installation

This chapter is provided for qualified personnel to install and interconnect the power components within the Alpha power system. Regarding battery installation, refer primarily to the manufacturer's guidelines for more specific information.

NOTE: *To aid the user with installation, frequent reference is made to drawings located at the rear of this manual.*

4.1 Safety Precautions

Refer to the Important Safety Instructions near the front of this manual.

4.2 Tools Required

Various insulated tools are essential for DC power system installation. Use this list as a guide:

- Battery lifting apparatus (as 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 converter into 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.
- Insulating canvases as required (2' x 2', 1' x 1', 3' x 3', etc.)
- Various insulated hand tools (see **Error! Reference source not found.**) including:
 - Combination wrenches
 - Ratchet and socket set
 - Various screwdrivers
 - Electricians knife
- Battery safety spill kit (required for wet cells only) including:
 - Protective clothing
 - Face shields
 - Gloves
 - Baking soda
 - Eye wash equipment
- Cutters and wire strippers 0.08 to 6mm² (#28 to #10 AWG).

4.3 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 converters utilized in the power system and to allow easy access to the power system components.

NOTE: *The DCP03 requires at least 1RU (1.75") of space above the unit for tooling access to the load breaker ground connections. Ensure that at least 1RU of space is open in the relay rack above the DCP03.*

NOTE: *The power system is suitable for installation in Network Telecommunication Facilities, locations where the NEC applies, and OSP applications.*

4.3.1 Rack Mounted Systems

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

The system may be mounted into a 19" rack in either a front or mid mount position. 23" rack mounting (front or mid) is accomplished via the included 19" to 23" rack adaptors.

4.3.2 Floor Mounted Systems

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

Use isolating kits if required to isolate system from the floor.

It is recommended that the relay rack be secured to the overhead cable tray. Alpha does not supply the mechanical details necessary for overhead support.

4.4 Converter Module Insertion/Removal

Insert by placing the converter module on the shelf bottom and sliding the module into the rear connector (inside of the shelf). Apply pressure on the module handle to engage the rear connector in the shelf receptacle.

NOTE: *It is recommended that the first module be inserted into the front leftmost position using the side of the shelf (or the optional shelf-mounted controller) as a guide. Subsequent modules may be inserted using the previous module as a guide.*

Tighten the thumbscrew (1/4-turn) latch on the bottom of the faceplate to secure the module to the shelf.

NOTE: *Do not force a module into position if it does not seat properly. All modules are keyed to ensure that the correct module (voltage/polarity) type is used.*

To remove a module, loosen the thumbscrew (1/4-turn) latch on the bottom of the faceplate. Grasp handle and pull out, sliding the module away from the rear connector and out of the shelf.

4.5 Breaker Installation

1. Ensure mid-trip breakers are used for load and series-trip breakers are used for battery connections.
2. Turn breaker off.
3. Ensure that the breaker is right side up.
4. Align the breaker terminals with the correct holes.
5. Carefully push the breaker into position.

4.6 Breaker Removal

1. Turn breaker off.
2. Carefully pull the breaker out of position.

5 Wiring

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



WARNING

Ensure that power is removed by turning off converters and removing battery line fuse (if applicable) or connection before attempting work on the wiring connections. Use a voltmeter to verify the absence of voltage. Clearly mark the correct polarity of the leads before commencing work on DC connections.

Refer to the previous (Installation) chapter for safety precautions and tools required.

5.1 Grounding

This power system is suitable for installation as part of a Common Bonding Network (CBN) and is intended to be used in a DC-C configuration (common DC return). In this configuration, the isolated power system battery return bus (BRB) should be connected to the building master ground bus (MGB) or floor ground bus (FGB) in a larger building. These ground buses act as a system reference and as a low impedance path to ground for surges, transients, noise, etc. The MGB or FGB should have a direct low impedance path to the building grounding system.

The cable from the power system to the MGB or FGB should be sized to provide sufficient ampacity to clear the largest fuse or breaker on the power system, excluding the battery protection fuse (if applicable) 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.

Power System Ampacity	Ground Reference Conductor Size
< 30A	#10
30 – 100A	#6-2
100 – 400A	0000
400 – 800A	350 MCM
> 800A	750 MCM

Table B–Typical ground reference conductor selection

The power system frame must also be connected to the MGB or FGB. This is done for personnel safety and to meet many Telco grounding requirements. Each bay should have its own frame or site ground connection. Refer also to the Customer Connections drawing at the rear of this manual.

5.1.1 Frame Ground

The DCP03 is grounded utilizing screws/bonding washers to the relay rack then to the main grounding bus using 35mm² (#2 AWG) insulated cable.

5.2 Calculating 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.

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

5.3 Input/Output Connections



WARNING

Leave cables or bus bars disconnected at battery (if applicable) and verify output polarity using a voltmeter. Make battery connections only after all other wiring is completed.

DC wire shall be UL approved XHHW or RHH/RHW (for Canadian users, T90 Type) or equivalent. Control and sense wires shall be UL approved Style 1015 (for Canadian users, TEW type).

Terminate cable leads with appropriate crimp lugs. Remove Kydex covers to access input/output connections.

Secure the positive and negative to the shelf post of the correct polarity; i.e., +V_{cable} to +V_{post}. Ensure the washers are on the bolts in the same order in which they were shipped from the factory.

The common output leg of the converter system should be connected to ground. This is typically done at the load common termination point.

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

5.3.1 24Vdc Input to System

The system contains bus (bar) input for hot and return connections. The CXPS 24-48-i system is configured for bus bar or wiring connections with respect to the converter -48V shelf output integration to the breaker distribution panel. Refer to Figure 8. The dual +24Vdc input feeds are connected to the converter shelf. The negative ground input connections are also made on the converter shelf.

NOTE: *Bus bar inputs are fixed for hot and return placement. Right angle adapters are factory-installed for the +24Vdc input to allow for ease of wiring integration.*

Factory installed
-48V output bus
work or wiring

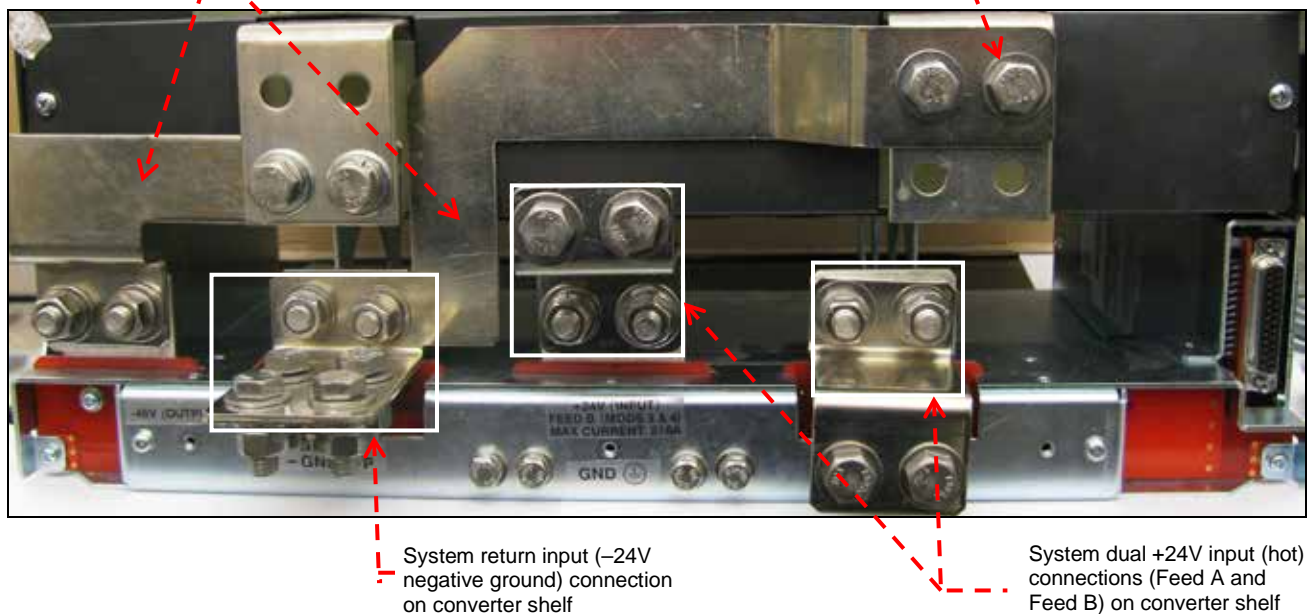


Figure 8—Rear view of CXPS 24-48-i (Dual Input) system showing factory distribution output bus bar or wiring connection, converter shelf inputs wiring, inputs (and returns) to system



WARNING

Ensure the correct polarity is used for all cable terminations.

5.3.2 Distribution Cabling

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

Distribution cabling must be terminated with 1/4"–5/8"C lugs for connecting to DCP03.

5.3.3 Breaker Output (Hot) Connections

Connect breaker (hot) output connections before connecting the breaker returns. Secure two hole lugs to the 1/4" studs (on 5/8" centers) using the supplied hardware with the DCP03. Cables should run directly out the rear of the distribution center. Refer to Figure 9.

5.3.4 Breaker Return (Ground) Connections

Connect breaker (ground) output connections to the DCP03 ground bar. Secure two hole lugs to the 1/4" holes (on 5/8" centers) using the supplied hardware with the DCP03. Cables should run directly out the rear of the distribution center above the breaker (hot) output cables. Refer to Figure 9.

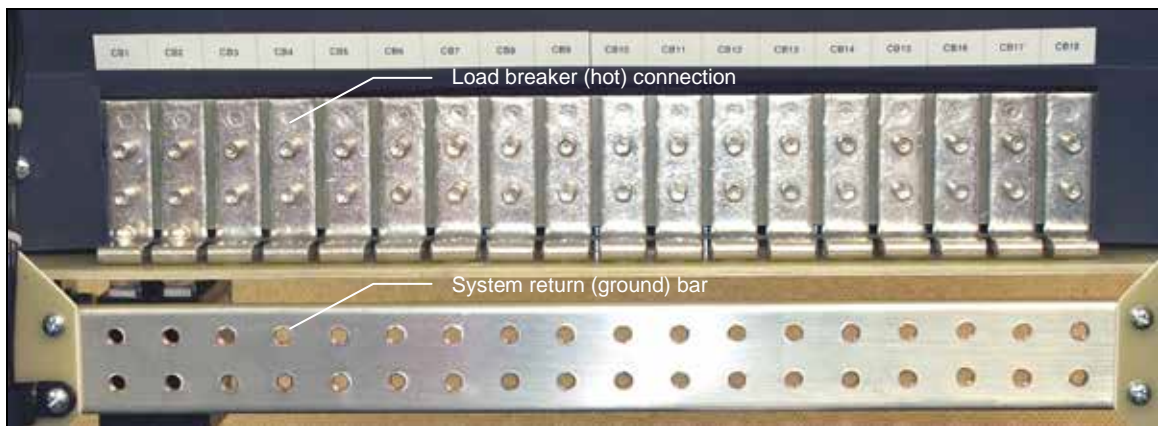


Figure 9–Load, and return connection locations

5.4 Alarm Connections

NOTE: To aid the user with installation, frequent reference is made to drawings located at the rear of this manual. Custom configurations may be detailed within the Alpha power system documentation package.

For terminal block connections, the recommended wire sizes are 0.14 to 1.50mm² (#26 to #16 AWG) for the temperature range of 0 to 50 deg. C (as per UL/CSA).



CAUTION: to reduce risk of fire, use only 0.14mm² (#26 AWG) or larger wire.

Route via wire-ways and use existing cable clamps to secure to existing (factory) wire harness along with customer run signal wires. Ensure signal wires are routed along hinge point of front door so door opening and closing won't require excess wire slack. Refer to Figure 10 for wire routing example.

Terminal block connections for the internal alarm card or CXCI I/O should be routed along the left side of the DCP03 (looking at unit from front). Connections to the optional 4R/8D should be routed along the right hand side of the DCP03. Refer to the customer connections ("–08") drawing at the rear of this manual for details on terminal block assignments.

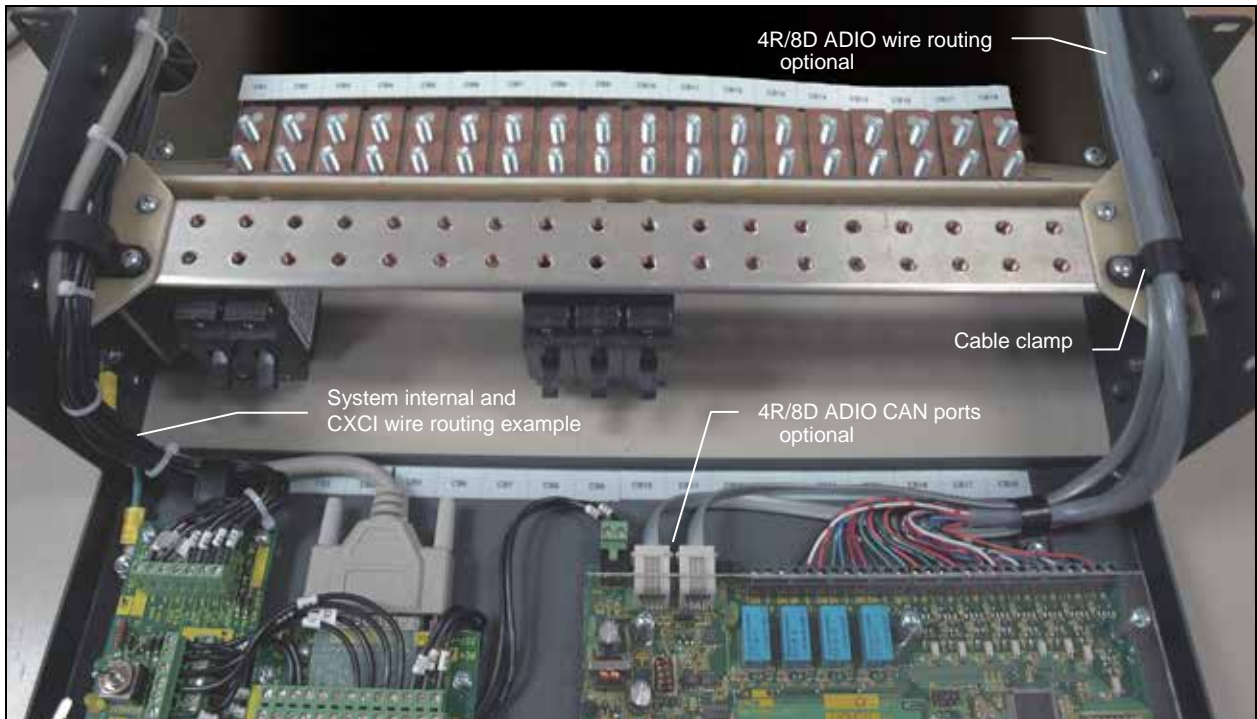


Figure 10–DCP03 wire routing example

(Photo is for reference only – subject to installation requirements)

5.5 CAN Serial Ports

Two CAN Serial ports (modular jacks with offset latches), for communications with Alpha Cordex converters and other CAN-enabled equipment (nodes) on the same system, are located on the side of the converter shelf. CAN ports may also be found on the optional 4R/8D ADIO Cordex peripheral (Figure 10).

Daisy-chain from node to node (CAN OUT of one shelf to CAN IN of another) as necessary and ensure that only the last shelf is terminated as follows:

5.5.1 CAN Termination

A CAN termination jumper is located beside the rightmost converter connector on the front of the shelf backplane. See the customer connections drawing for your shelf.

The CAN bus may be OPEN to the next node in the system or TERMINATED on the final node on the CAN bus.

5.6 Network Connection and Remote Communications via CXCI

The Cordex system can be set up, monitored and tested via Ethernet 10/100 Base-T serial data connection. The communication protocol supports a web interface.

NOTE: *Pinouts are shown in customer connections drawing.*

Some standard scenarios are described below:

5.6.1 Ethernet Port for Network Connection (Standard Network Cable)

The Ethernet port is designed for CXCI connection to a user supplied network (TCP/IP secured by user) via a front panel RJ-45 jack.

Connect using a standard network cable.

5.6.2 Ethernet Port for Local Connection (Crossover Cable)

Local access (e.g. laptop computer) is also possible from the Ethernet port connection.
Connect using a standard network crossover cable.

5.6.3 CXCI Modem Port (Alpha Cable)

The Modem port (front panel DB-9 connector, Figure 6) is designed for CXCI connection to Alpha Technologies' Cordex DC Modem #018-585-20.

Connect using the Alpha-supplied cable.

CAUTION

Connect only Alpha-supplied modem and cable; otherwise, equipment damage can result.

5.7 Signal Wiring Connections for CXCI

NOTE: To aid the user with installation, frequent reference is made to drawings located at the rear of this manual. Custom configurations may be detailed within the Alpha power system documentation package.

For terminal block connections, the recommended wire sizes are 0.14 to 0.75mm² (#26 to #18 AWG) for the temperature range of 0 to 50 deg. C (as per UL/CSA).



CAUTION: to reduce risk of fire, use only 0.14mm² (#26 AWG) or larger wire.

5.7.1 Alarm (Relay) 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. See Figure 11.

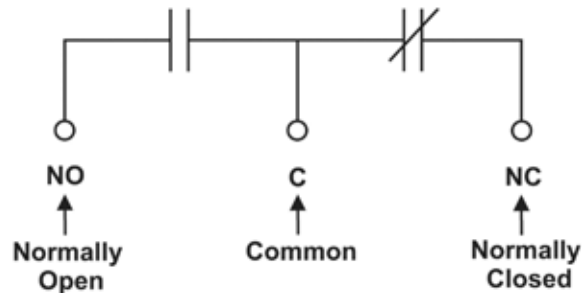


Figure 11—Showing relay connections

Relays can be programmed to energize or de-energize during an alarm condition (see CXC Software manual). When the CXCI reset button is pressed or power is lost, all relays de-energize.

5.7.2 Digital Inputs for CXCI

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

For the CXCI option, only D1 and D2 are available.

5.7.2.1 Connection Method

Typical Alpha systems use the “reset with Hot and trigger with Ground” connection. The digital input is wired in such a way that the Hot is wired directly into one of the input terminals; e.g., negative input for -48V systems. The other input terminal is wired to the Ground (common) of the system through a relay (dry contact – usually located on the equipment requiring monitoring). This method (see Figure 12) allows the digital input to receive (or not receive) a Ground signal on an alarm.

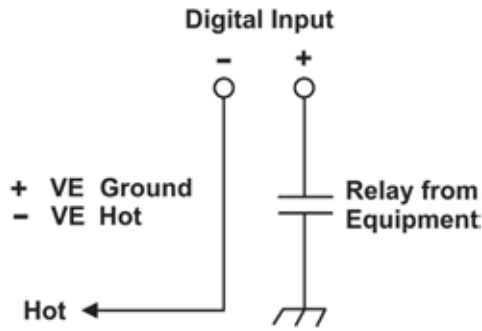


Figure 12—Showing digital input connection method

5.7.2.2 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 CXC Software manual for detailed instruction on programming.

Voltage Range (VDC)	Voltage Level (VDC) Considered As “0” (Off)	Voltage Level (VDC) Considered As “1” (On)
0—60 (system voltage setting)	0—3	18—60

Table C—Voltage level definitions for digital inputs

5.7.3 Analog Inputs

CAUTION: Ensure 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.

For the CXCI option, Battery Hot input on the I/O board is factory wired to the battery system voltage terminal for CXCI reference when a battery disconnect device is used. ***It is critical to CXCI operation as it ensures a source of power to the CXCI should the disconnect device open the circuit.***

5.7.3.1 Voltage

Voltage Input #1 (load voltage per CXC software) terminals (V1) on the shelf provide connections to an optional secondary voltage input.

Voltage Input #2 (battery voltage per CXC software) is wired internally (V2) to the converter output voltage of the shelf. This is used as the reference for system alarming (such as high voltage) and control (such as low voltage disconnect).

5.7.3.2 Temperature Sensor

Temperature Probe input channels (T1 and T2) provide connections for temperature sensors. A voltage is supplied to these terminals for sensor measurements.

5.7.3.3 Current

Current Input #1 (discharge or load current per CXC software) terminals (I1) are factory wired to the shunt in this system.

6 System Startup

Visually inspect the installation thoroughly.

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

6.1 Check System Connections

- Ensure power is off, battery breaker is off (if applicable), and all modules are removed from the shelf.
- Triple-check the polarity of all connections.

6.2 Verify Input and Power the Converter Shelf

- Verify input voltage is correct and turn on the corresponding feeder breaker.
- Install one power module. The converter I/P LED should illuminate after a preset start delay.
- Using the CXCI (via web browser), test functionality of various module alarms and controls.
- Install remaining modules.
- In the adjustments menu of the CXCI, set converter voltage.
- Using the CXCI, continue to test the functionality of various module alarms and controls. In addition, perform a load test with the system using a resistive load box as needed.

6.3 Converter Operation and Programming via the CXCI

NOTE: Refer to the current version (1.97 minimum) software manual.

The existing CXC Controller Signals category now includes signals for Converter Load Voltage and Converter Load Current; by default, Average Conv. Output Voltage and Total Conv. Output Current are used respectively.

6.3.1 Load Current in a Rectifier/Converter System

For proper operation of Charge Current Control and Power Save, the system load current must include the current drawn from the rectifiers used to power the converters. Depending on the location of the current shunt in the system, it may be necessary to modify the Load Current equation to add the Total Converter Input Current.

To view the load current of the system load, without the influence of the Converter Input Current, a custom signal can be created; for example, if Load A powers some equipment and Load B is the current drawn by the converters, then the equation for Load A would be: Total Rectifier Output Current - Total Converter Input Current.

6.3.2 Recommendation for Converter Redundancy

During firmware upgrade (programming) of the converter, the converter being programmed will be turned off and not deliver any power. This is largely due to the way in which the converter begins operation after programming.

The power-up sequence for a converter is to start with 0V and 0A for a Start Delay of one through ten seconds. After this period has expired, the converter will ramp up the Output Voltage and Current Limit values to the appropriate settings in about one second. Furthermore, since the converter will be off for at least this amount of time, the present implementation turns off the converter before the programming. The programming time is added to the Start Delay to provide the total amount of time for which the converter will be off or out-of-service.

Therefore, with one redundant converter in a system, the load will still receive power from the other converters while one of them is being programmed.

6.4 CXCI Reset

CAUTION

Before removing a CXCI from a live system, or performing controller maintenance, an external LVD inhibit (or override) is required to avoid a disruption of service.

6.4.1 Soft Reset

The reset button, located on the front panel of the optional CXCI, is for restarting the microprocessor. When pressed momentarily, the unit beeps twice then resets. The front-panel LED's will illuminate temporarily, but will extinguish after the system has finished its 15-second self-test.

6.4.2 CXCI IP Address Reset

To reset the IP address, press and hold the front panel reset button for three seconds. The CXCI unit will beep three times, IP will be reset (to 10.10.10.201) and DHCP will be disabled. The settings will be saved and the unit will then reset.

This will allow local access; e.g., with a laptop and a standard network crossover cable. See current version software manual for details.

6.4.3 CXCI Hard Reset

There is a second reset button located to the right of the front panel on the side of the CXCI. This may be used to restart the microprocessor in the event that the front panel (soft) reset button fails to operate as described above.

CAUTION: Use of hard reset may cause loss of data.

To access the hard reset button, remove the converter module adjacent to the CXCI.

6.4.4 Time Settings

The CXCI, upon startup*, will set the time based on the following:

- Attempt to synchronize with the NTP server (see www.NTP.org).
- Retrieve the last time stamp from the Event Log.
- Retrieve the last time stamp from the Statistics Log.
- Set the time to 2005-01-01 midnight.

* Whenever the unit is reset or power is completely removed from the CXCI.

Canada and USA toll free 24-hour emergency technical support: +1 888 462 7487.

7 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 repairs.

The following table lists a few maintenance procedures for this system. These procedures should be performed at least once a year.

WARNING: HIGH VOLTAGE AND SHOCK HAZARD.



Use extreme care when working inside the shelf 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.

Procedure	Date Completed
Clean ventilation openings	
Inspect all system connections (re-torque as necessary)	
Verify alarm/control settings	
Verify alarm relay operation	

Table D—Sample maintenance log

NOTE: Consult factory for replacement parts.

To order more breakers refer to the options listed in the Specifications Section at the front of this manual. Always replace circuit breakers with the same type and rating.

7.1 Fan Replacement

CAUTION: Use fan assembly with correct connector as supplied by Alpha.

1. Shut off the unit and unlatch (rotate 1/4-turn) the front fastener that secures the converter module to the shelf.
2. Slide the module 10 cm (4") out of the shelf and wait two minutes for module capacitors to discharge.
3. Access the fan by removing the screws (top and side) that secure the front panel to the module chassis.
4. Disconnect the fan power lead wires from the module.
5. Note the direction of air flow (into the module front) and remove the fan from the front panel.
6. Install the replacement fan with the correct airflow direction following the preceding steps in reverse order.

NOTE: Use care with fan wire routing so that the lead wires do not become pinched when the front panel is reattached.

7.2 CXCI Replacement (as used with CXDF shelf)

Refer to all safety instructions provided in the documentation package provided with your system.

WARNING: HIGH VOLTAGE AND SHOCK HAZARD.

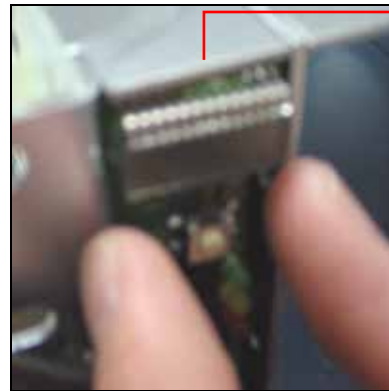


Use extreme care when working inside the shelf while the system is energized. Do not make contact with live components or parts.

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

1. Write down the CXCI communication information: dynamic or static IP, IP address, and gateway.
2. Connect user laptop to CXCI per software manual; standard network crossover cable to Ethernet port.
3. A step-by-step connection (wizard) application – provided to establish remote communications with your CXCI – is available via the Alpha website (www.alpha.com). The CXC Connection Wizard will save your LAN configuration and restore it back when exiting the application.
4. Save CXCI configuration file (see software manual).
5. Bypass system LVD using LVD Inhibit switch as required and remove signal wires (via DB connectors) from CXCI.
CAUTION: If the LVD is not bypassed, the DC loads will be shut down when the wiring to the controller is removed.
6. Ensure converter is in the right-most position.
7. Remove converter in the left-most position in order to access the side of the CXCI where the mounting screws are located.
8. Continue with the steps illustrated below:

Remove two (2) side mounting screws from the baffle to release the CXCI front panel



Gently remove the LCD to access the front mounting screw

Remove front mounting screw to release the CXCI assembly



Remove the CXCI by disengaging the module from the rear connector (inside the shelf)

Use the baffle to grip the assembly and slide along the shelf bottom

Figure 13–Showing CXCI module removal (replacement)

9. Replace the CXCI following the illustrations above in reverse order.
CAUTION – Use minimal pressure to re-install the LCD.
10. Ensure LCD is straight and aligned parallel to the front panel window when reattaching the CXCI front panel. Continue to step 11 to complete procedure.
11. Review steps 1 through 3 with respect to new installation and upload the saved CXCI configuration file to the new controller.
12. Use a meter to verify the bus voltage and current shunt. Recalibrate as required due to differences in the new CXCI.
13. Replace converters and signal wires. Return LVD Inhibit switch to normal.

8 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
CMA	Circular mil area
CSA	Canadian Standards Association
CX	Cordex™ series; e.g., CXC for <u>C</u> ordex <u>S</u> ystem <u>C</u> ontroller
DC	Direct current
DCP	Distribution Center Plug-In
DHCP	Dynamic Host Configuration Protocol
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	<u>E</u> lectro <u>s</u> tatic <u>D</u> ischarge
FCC	Federal Communications Commission (for the USA)
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
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
UL	Underwriters Laboratories

9 Warranty and Service Information

Technical Support

Free Technical Support 24/7/365 is part of the Alpha customer satisfaction commitment. The phone numbers below can also be used to access a wide range of service solutions both at your premise and at the Alpha facility nearest you.

In Canada and the USA, call toll free 1-888-462-7487 24 hours a day, seven days a week.

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

Warranty

Alpha Technologies Ltd. warrants all equipment manufactured by it to be free from defects in parts and labor, for a period of two years from the date of shipment from the factory. The warranty provides for repairing, replacing or issuing credit (at Alpha's discretion) for any equipment manufactured by it and returned by the customer to the factory or other authorized location during the warranty period.

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

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

Battery Warranty

Note that battery warranty terms and conditions vary by battery and by intended use. The most common battery warranty provided by Alpha is a two year full replacement warranty with a pro-rated warranty for the following three years. Pro rated warranty provides a credit applicable toward the purchase of new batteries from Alpha. The credit is calculated as the purchase price multiplied by the percentage of the battery life that was not available (in months). Battery warranty coverage is lost where the battery charge is not maintained for 6 months. Contact your Alpha sales representative or the Technical Support team at the above number to understand your entitlements under Battery Warranty.

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.

Service Centers

For a list of service centers, please visit:

<http://www.alpha.ca/web2/about-alpha/service-centers.html>

Specifications for Alpha CXPS 24-48-i 8kW DC-DC Converter System (Dual Input)

Output

Voltage:		-48 to -54Vdc
Current:	System:	148A maximum @ 54Vdc
	Converter Module:	37A maximum @ 54Vdc
Power:	System:	8000W maximum @ 54Vdc output
	Converter Module:	2000W maximum @ 54Vdc output
Heat Dissipation (per converter): <930 BTU per hour per converter module		
Static Regulation:		±0.1% line; -1.0% ±0.1% load
Dynamic Regulation:		<1% deviation for 50% - 100% load step; settling to 0.1% in <2ms
Electrical Noise:		<38dBrnC (voice band) <10mVrms 10kHz to 10MHz (wideband) <150mVp-p 10kHz to 100MHz <1.0mV (psophometric)
Acoustic Noise:		<60dBa @ 1m (3ft.) @ 30°C (86°F)

Input

Voltage:		+21 to +30Vdc
Efficiency:		>88% @ 50 to 100% load
Electrical Noise:		<32dBrnC (voice band) <10mVrms 10kHz to 10MHz (wideband) <150mVp-p 10kHz to 100MHz
Current:	System:	Feed A: <188A @ +24V input (216A maximum) Feed B: <188A @ +24V input (216A maximum)
	Converter:	<94A @ +24V input (108A maximum)

Environmental

Temperature:		-40 to +55°C (-40 to +131°F) standard operating -40 to +70°C (-40 to +158°F) storage
Humidity:		0 to 95% non-condensing
Elevation:		-500 to +2800 m (-1640 to 9186 ft)

Miscellaneous

Number of Converters:	Up to four (4) Cordex CXDF 24-48/2kW modules; Alpha #012-526-20
Distribution Capacity, Load:	18x 1-pole positions, plug-in type (bullet terminals), AM-style, 1 to 100A NOTE: Multiple pole breakers, 125 to 250A, also available
Dimensions:	438mm W x 222mm H x 310mm D (17.24" W x 8.75" H x 12.2" D) [-000 configuration – excludes mounting brackets, rear cover, and module handles. For additional options see outline drawings at the rear of this manual.]

Connections

Cable Access: Front and top

NOTE: *Back-to-back lug installation is possible. See -08 drawing at rear of manual.*

Load Connections: AM breakers (1-pole): 1/4" holes on 5/8" centers
AM breakers (multiple pole): 3/8" holes on 1" centers (with adapter)

Alarm/Signal Connections: 0.081mm² to 0.55mm² (#28 to #20 AWG)

Input, +24V, Feed A: 3/8" holes, 1" spacing (1 set)

Input, +24V, Feed B: 3/8" holes, 1" spacing (1 set)

Shelf Common Return: 3/8" holes, 1" spacing (1 set)

Recommended Disconnect Device and Wire Sizing

Input Wire Size (minimum): National Electrical Code: 250A circuit breaker or fuse, #4/0 AWG wire minimum (per feed) with 90°C rated insulation or greater @ 30°C ambient room temperature
Canadian Electrical Code: 250A circuit breaker or fuse, 250MCM wire minimum (per feed) with 90°C rated insulation or greater @ 30°C ambient room temperature

Safety

NOTE: *Safety certifications performed at converter level only.*

EN 60950:	Converter output shall be rated SELV suitable for connection to TNV-1 circuits
UL:	60950
CSA:	C22.2 No. 60950
CE:	EN 60950, CB Scheme 73/23/EEC Low Voltage Directive with amendment 93/68/EEC
Telcordia (Bellcore):	GR-1089-CORE (requirements applicable to converter)

Other Referenced Standards

This product is designed to meet or exceed the following:

FCC 47 CFR part 15:	Class A radiated and conducted EMI
EN 55022 (CISPR 22):	Class A radiated and conducted EMI
ENV 50204:	Radiated electromagnetic immunity (digital radio and telephones)
EN 61000-4-2:	ESD Immunity
EN 61000-4-3:	Radiated Electromagnetic Immunity
EN 61000-4-4:	Electrical Fast Transients Burst Immunity
EN 61000-4-6:	Conducted Electromagnetic Immunity
CAN/CSA (NRTL/C):	C22.2 No. 60950-1-03
ANSI/UL (NTRL):	60950-1
Bellcore GR-63-CORE:	Vibration and Shock
Bellcore GR-1089-CORE:	Electromagnetic Compatibility and Electrical Safety

*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.*

Specifications for Alpha CXCI/CXCI+ Cordex Controller Integrated Model

Basic Unit, CXCI/CXCI+

CXCI Input Voltage:	17 to 65Vdc within rated limits [9 to 65Vdc for shelf systems with 12V rectifiers (List 3)]
CXCI+ Input Voltage:	10 to 65Vdc within rated limits
Current:	<100mA @ 48Vdc <200mA @ 24Vdc
MTBF:	472,000 hours @ 25°C (77°F)
EMC:	The unit meets requirements of: ICES-003 Class B EN 55022 Class B (CISPR 22) EN 61000-4-2 ESD EN 61000-4-3 Radiated Immunity EN 61000-4-4 EFT /Burst EN 61000-4-6 Conducted Immunity FCC Part 15 Class B, FCC Part 68

In accordance with FCC requirements, we provide the following statement as specified in the FCC guidelines for conformance to Part 15, Class B:

NOTE: *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications to this equipment not expressly described in this manual could void the FCC compliance.

Environmental

Temperature:	-40 to 65°C standard @ 3000m derate to 55°C @ 4000m (-40 to 149°F derate to 131°F @ 13124ft)
Humidity:	0 to 95% non-condensing
Elevation:	-500 to +4000m (-1640 to 13124 ft)

Hardware Specifications, CXCI/CXCI+

CPU:	Coldfire
Display:	4 digit LCD
Front Panel Controls:	Display pushbutton toggle switch for voltage (V) or current (A) CXCI/CXCI+ reset switch (soft reset button; hold for 3 seconds to reset IP)
LED's:	System OK (Green) Power System Minor Alarm (Yellow) Power System Major Alarm / Controller Fail (Red)
Audio:	Built-in speaker for alarm and popup message tones
Dimensions:	88mm H x 26mm W x 280mm D (3.5" H x 1" W x 11" D)
Weight:	0.34 kg (0.75 lb.)
Mounting:	Integrated on Cordex 2RU series 19" and 23" shelves
Relay Outputs:	Four (4) Form C, 60Vdc 1A maximum
Digital Inputs:	Two (2), 0 to 60Vdc
Analog Inputs:	One (1) DC voltage, 0 to 60Vdc One (1) DC current, $\pm 50\text{mV}$ Two (2) temperature, self-powered Alpha sensor (max 12Vdc)
CXCI Communication Ports:	Ethernet RJ-45, Alpha Modem DB-9, CAN [see shelf specifications]
CXCI+ Communication Ports:	Ethernet RJ-45, CAN [see shelf specifications]

Software Specifications, CXCI/CXCI+

CXCI	Software version 2.05
CXCI+	Software version 3.1x (x indicates the latest release)

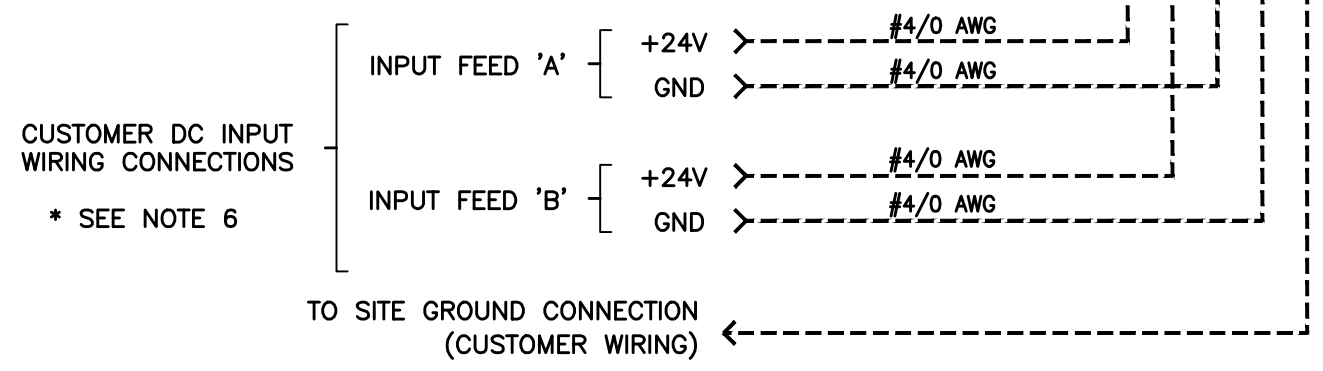
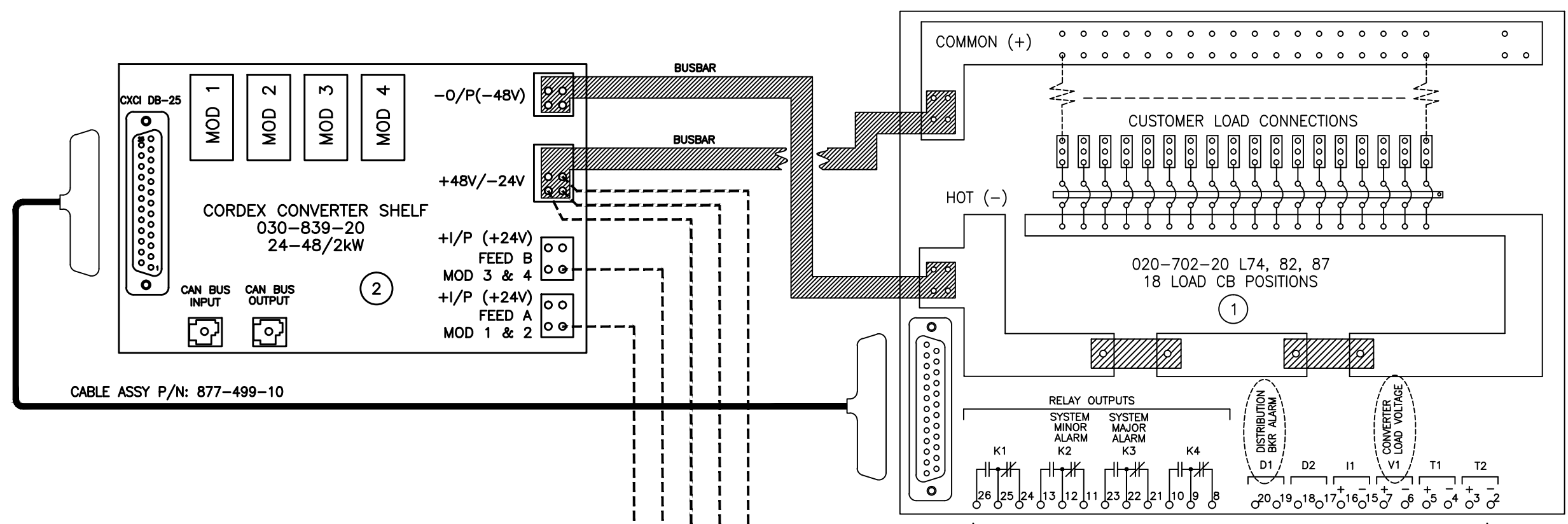
Recommended Signal Wire Sizes (as per UL/CSA)

Wire Size Range:	0.14 to 1.50mm ² (#26 to #16 AWG)
Temperature Range:	0 to 50°C (32 to 122°F)

CAUTION – TO REDUCE RISK OF FIRE, USE ONLY 0.14mm² (#26 AWG) OR LARGER WIRE.

*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.*

REVISIONS			
LTR	DESCRIPTION	DATE	APPD
P/B	Cable #1 was #1/0 AWG	09/04	ES
A	Revised for Release	09/04	ES
B	Customer wiring and sheet 2 added.	11/05	ME



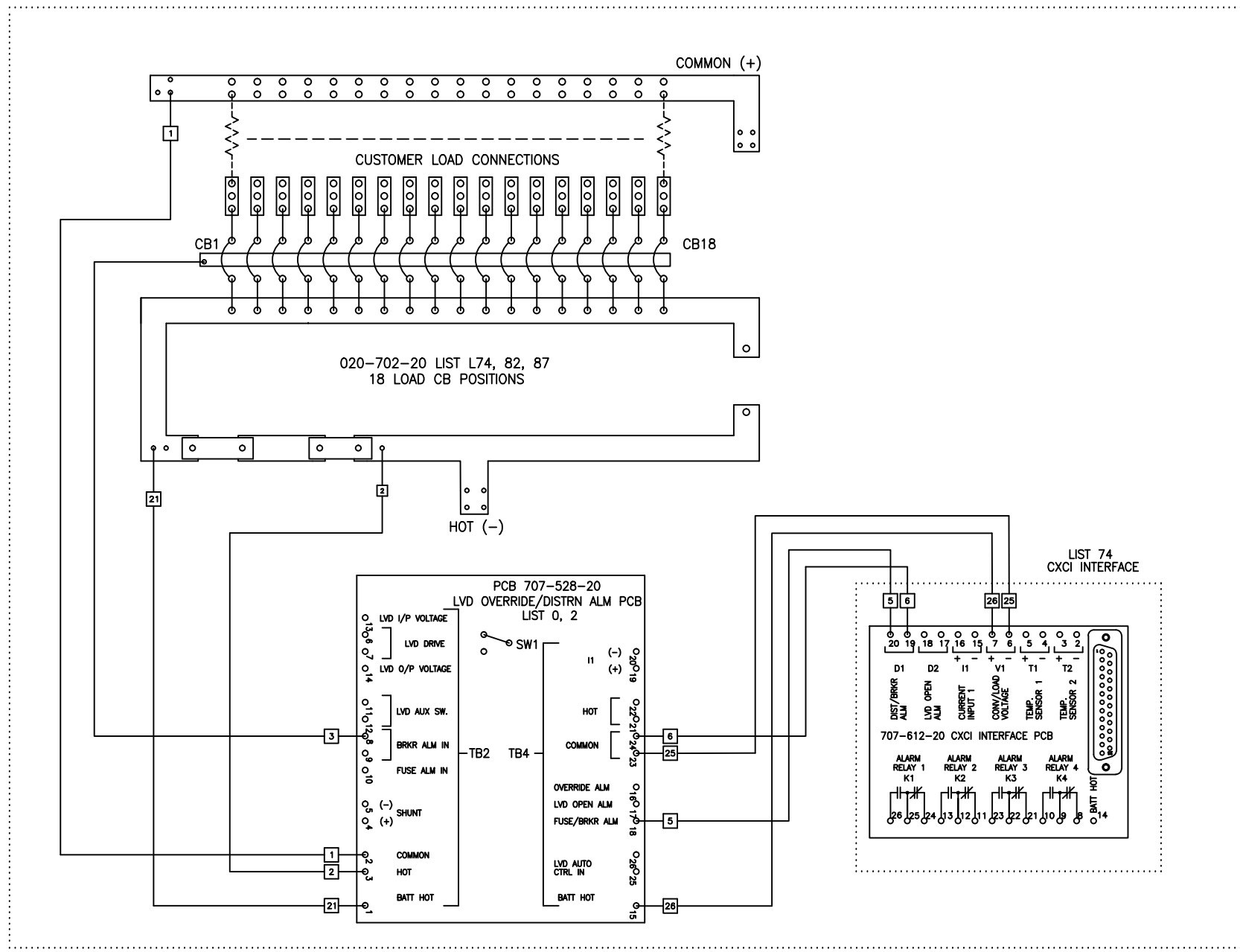
REFER TO SHEET 2 FOR INTERNAL WIRING

- NOTES:
- 1) FOR CONTINUOUS OPERATION, IT IS RECOMMENDED THAT SHUNTS ARE NOT RUN AT MORE THAN 80% THE RATED CURRENT UNDER NORMAL CONDITIONS.
 - 2) DASHED LINES DENOTE CUSTOMER WIRING.
 - 3) ALL WIRES ARE #18-22 AWG EXCEPT AS NOTED.
 - 4) NUMBERS IN BUBBLES REFER TO ITEM NUMBERS ON BILL OF MATERIALS.
 - 5) "□" REFERS TO WIRE TAG NUMBERS ON WIRES.
 - 6) RECOMMENDED INPUT WIRE SIZE IS MINIMUM #4/0 AWG (PER FEED) WITH A 90°C RATED INSULATION OR HIGHER BASED ON AN AMBIENT TEMPERATURE OF 30°C.

LTR	DESCRIPTION	QTY
FINISHED HOLE LEGEND		
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DESIGN	DD 09/04/02	MATERIAL
DRAWN	DD 09/04/02	
CHECKED	RW 09/04/02	
APPROVED	RW 09/04/02	FINISH
TOLERANCES (UNLESS OTHERWISE NOTED)		
		SCALE N/A
TITLE		
CONVERTER SYSTEM		
CXPS 24-48-i, 8kW, DUAL I/P		
ISSUE DATE	SHEET 1 OF 2	
SIZE TYPE DWG NO.	REV	
B A2	053-997-05	B

REVISIONS			
LTR	DESCRIPTION	DATE	APPD

020-702-20 UDC INTERNAL WIRING



- NOTES:
- 1) FOR CONTINUOUS OPERATION, IT IS RECOMMENDED THAT SHUNTS ARE NOT RUN AT MORE THAN 80% THE RATED CURRENT UNDER NORMAL CONDITIONS.
 - 2) DASHED LINES DENOTE CUSTOMER WIRING.
 - 3) ALL WIRES ARE #18-22AWG 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
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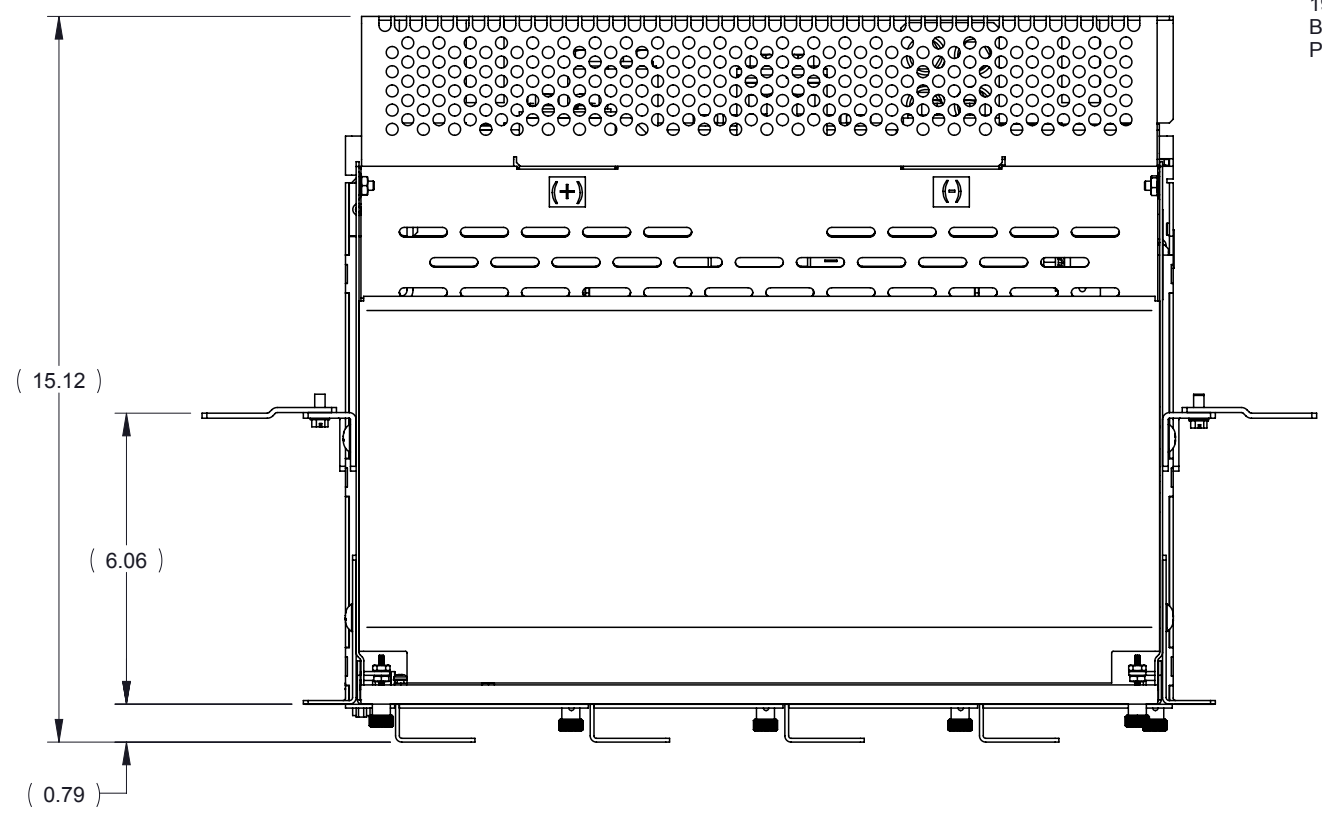
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DESIGN	MATERIAL
DRAWN	
CHECKED	
APPROVED	FINISH
TOLERANCES (UNLESS OTHERWISE NOTED)	
SCALE N/A	

TITLE
 CONVERTER SYSTEM
 CXPS 24-48-i, 8kW, DUAL I/P

ISSUE DATE	SHEET 2 OF 2
SIZE TYPE DWG NO.	REV B
B A2	053-997-05

REVISIONS				
LTR	DESCRIPTION	DWN	DATE	CHK
A	PRELIMINARY RELEASE	SDW	04/2011	ME-
B	NOTES ADDED	SL	06/2011	ME
C	REVISED IAW BP01439	SL	28NOV2011	ME
D	BP03272, POLARITY SYMBOL UPDATED	JH	26JUN2012	ME



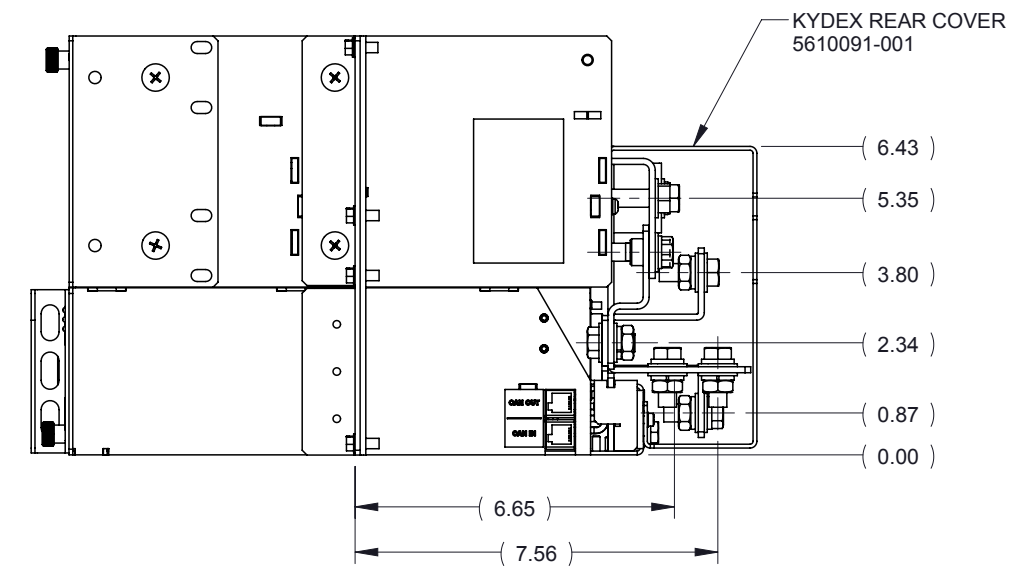
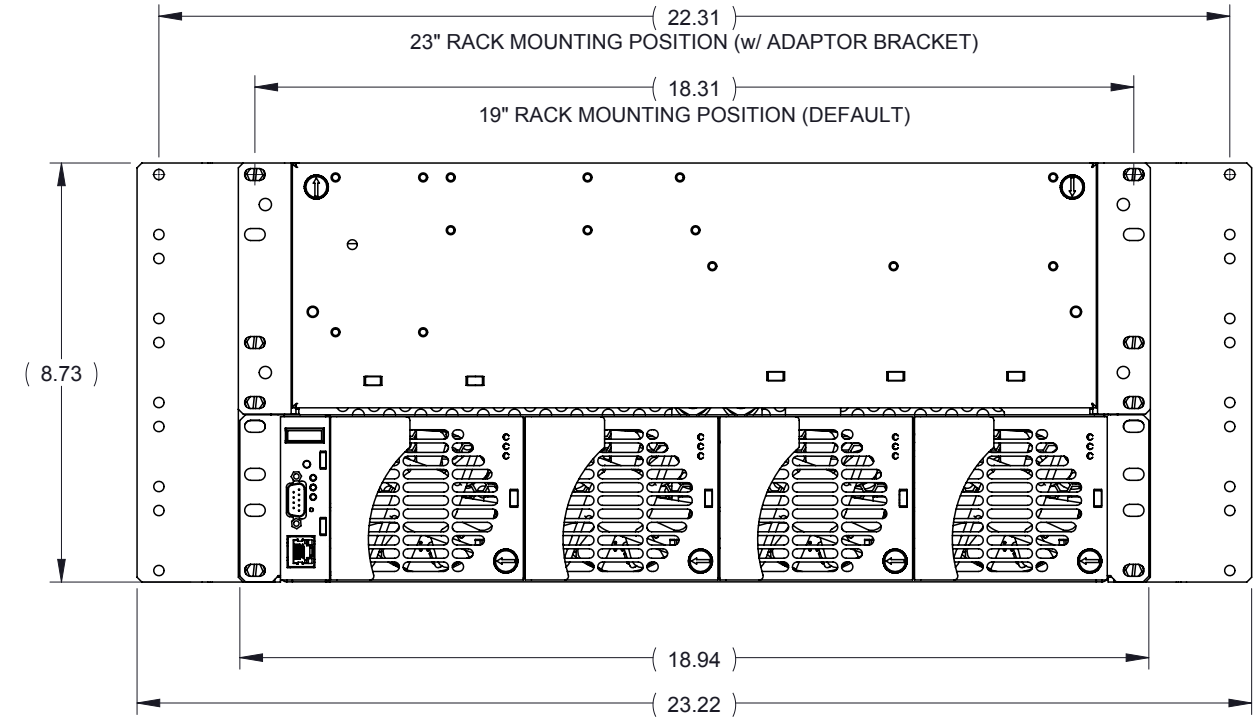
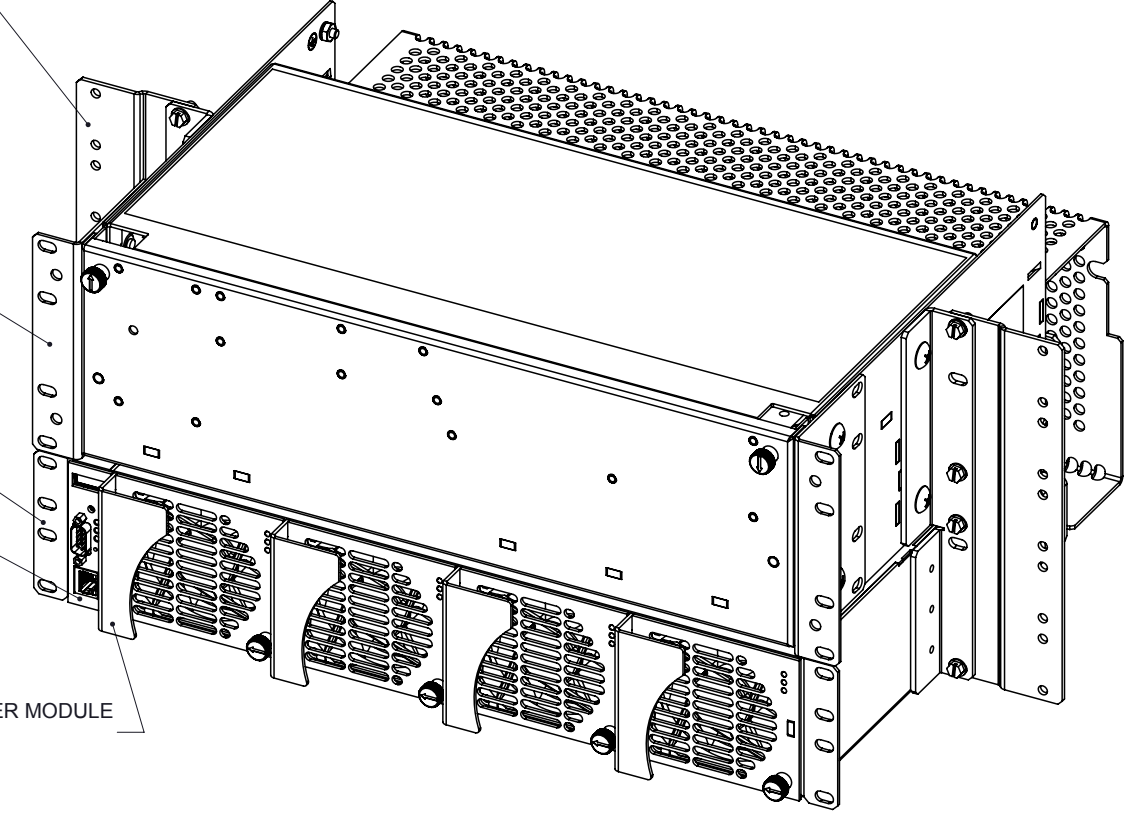
19" TO 23" MID MOUNT RACK ADAPTOR BRACKETS AND MOUNTING HARDWARE PROVIDED FOR MOUNTING SYSTEM

UDC ASSEMBLY
020-702-20

CONVERTER SHELF
030-839-20

CXCI
SYSTEM CONTROLLER
747-502-20

CXDF 24-48/2kW CONVERTER MODULE
(4 MAX.) 012-526-20



KYDEX REAR COVER
5610091-001

UNLESS OTHERWISE SPECIFIED
DIM ARE IN INCHES

X.X ±0.040
X.XX ±0.020
X.XXX ±0.010
ANGULAR: ±1°

INTERPRET DIM AND TOL PER
ASME Y14.5 -1994

THIRD ANGLE PROJECTION

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APPROVALS	DATE
DRAWN SL	24NOV2011
CHECKED ME	24NOV2011

ALPHA TECHNOLOGIES™

TITLE: **OUTLINE, CXPS 24 TO 48-i
CONVERTER SYSTEM**

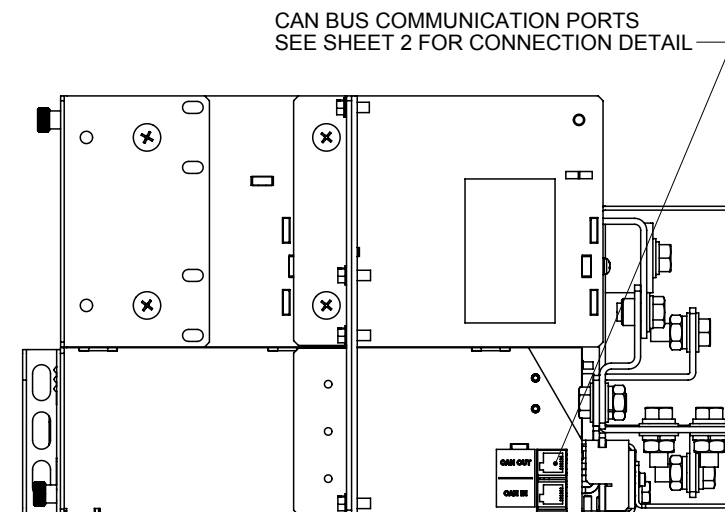
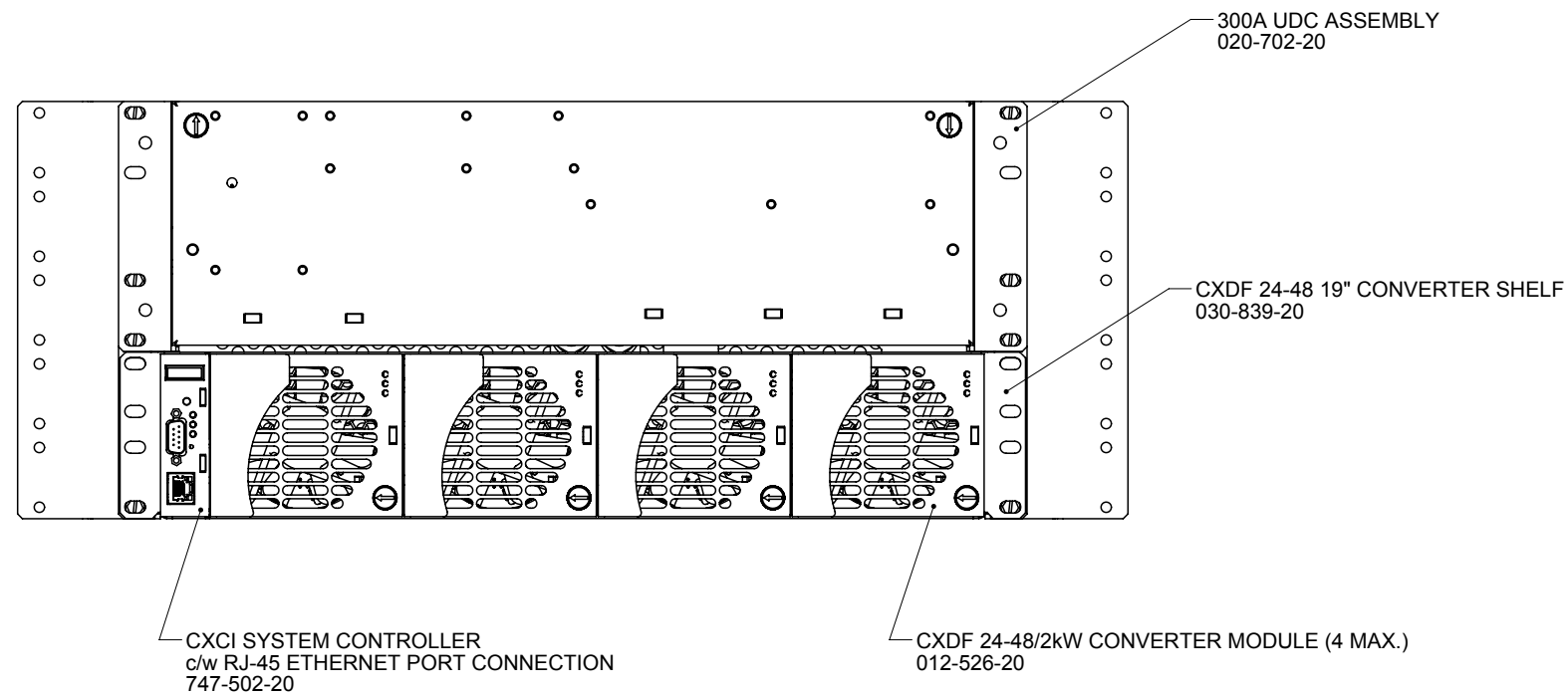
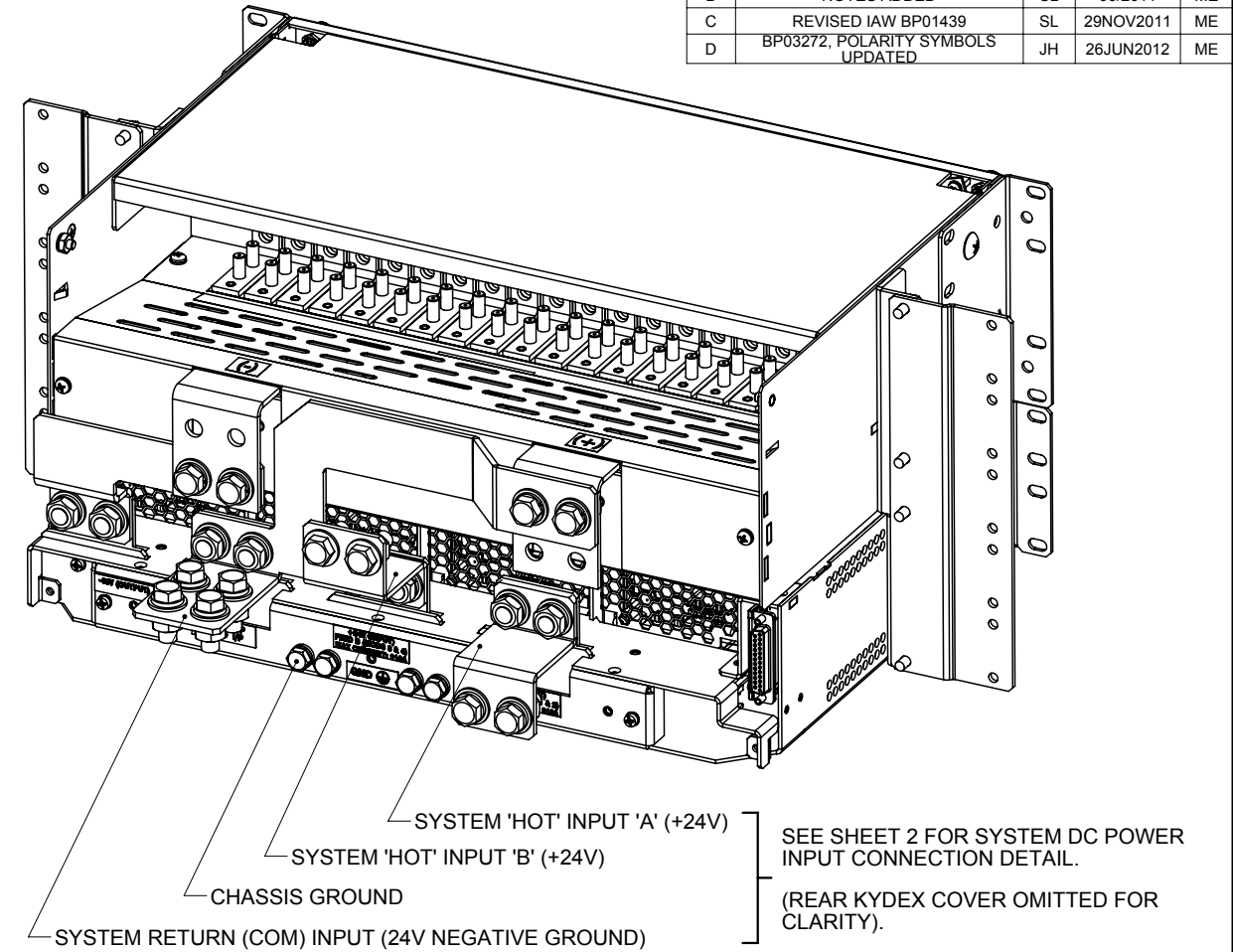
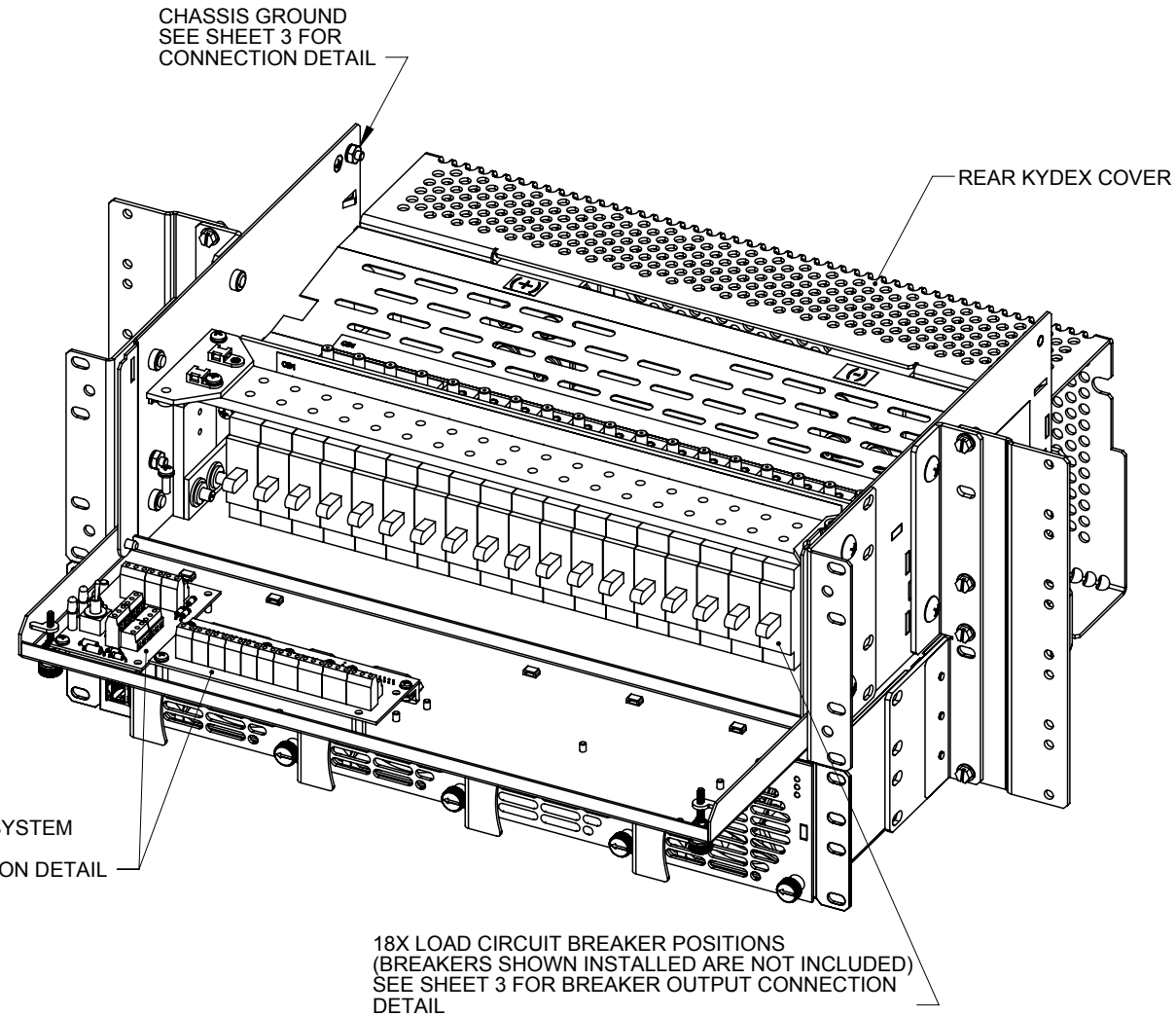
SIZE B	DWG NO. 053-997-06	REV D
SCALE: 1:1	SHEET 1	OF 1

ITEM
QTY




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REVISIONS				
LTR	DESCRIPTION	DRW	DATE	CHK
A	PRELIMINARY RELEASE	BK	04/2009	SDW
B	NOTES ADDED	SL	06/2011	ME
C	REVISED IAW BP01439	SL	29NOV2011	ME
D	BP03272, POLARITY SYMBOLS UPDATED	JH	26JUN2012	ME




UNLESS OTHERWISE SPECIFIED
DIM ARE IN INCHES [mm].
X.X [X] ±0.040 [±1]
X.XX [X.X] ±0.020 [±0.5]
X.XXX [X.XX] ±0.010 [±0.25]
ANGULAR: ±1°
INTERPRET DIM AND TOL PER
ASME Y14.5M-1994

THIRD ANGLE PROJECTION



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APPROVALS		DATE
DRAWN	BK	2009/04
CHECKED	SDW	2009/04
DESIGN	JK	2009/04
APPROVED	ME	2009/04
ISSUE DATE		



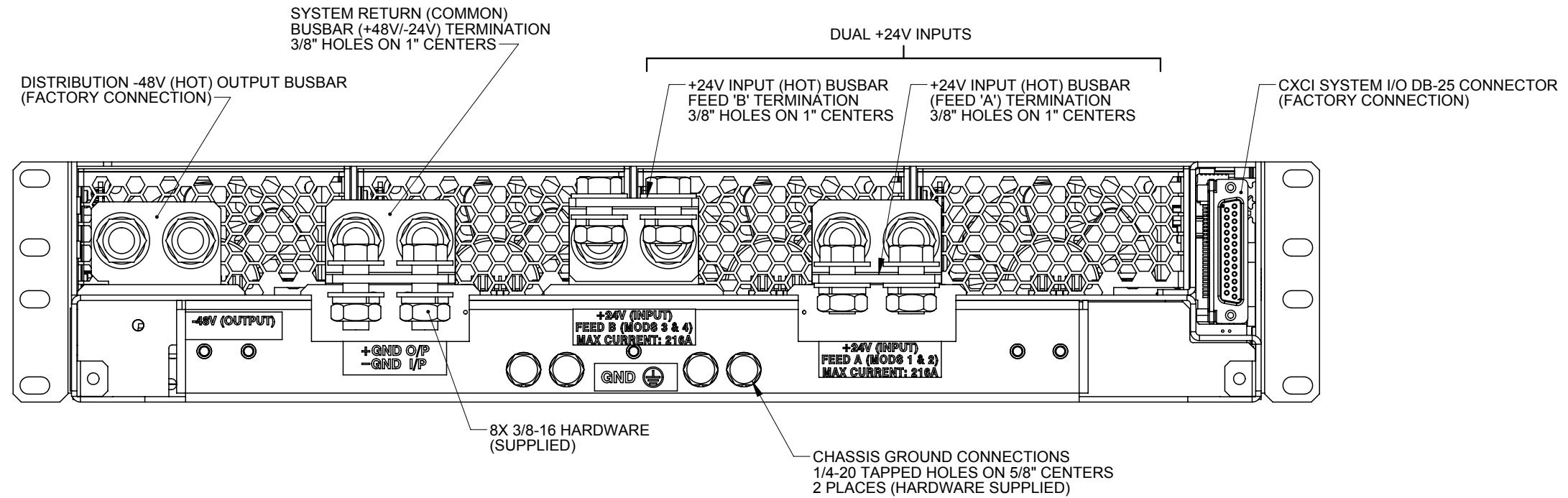
TITLE: CONNECTION, CXPS 24-48-i
CONVERTER SYSTEM

SIZE	TYPE	DWG NO.	REV
B	D2	053-997-08	D

SCALE NTS. SHEET 1 OF 4

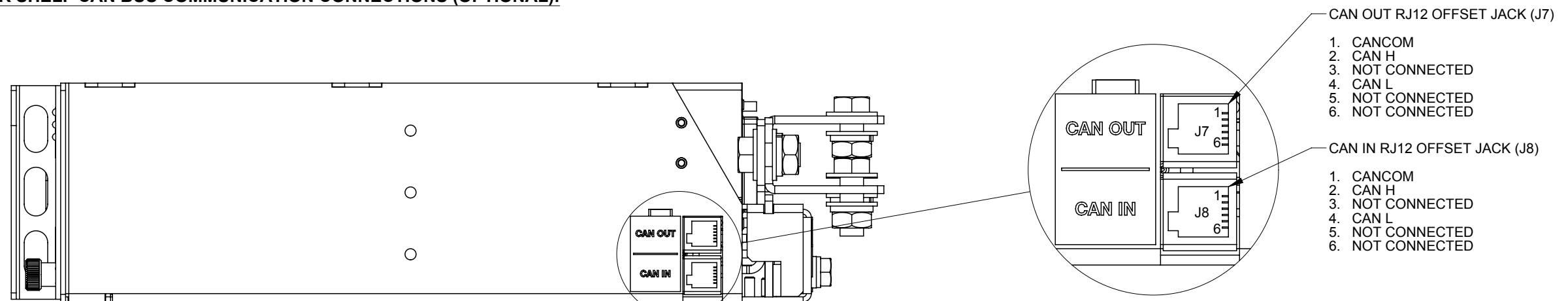
CONVERTER SHELF DC POWER INPUT WIRE CONNECTIONS:

NOTE: REFER TO 053-997-05 WIRING SCHEMATIC FOR MORE INFORMATION



REAR VIEW

CONVERTER SHELF CAN BUS COMMUNICATION CONNECTIONS (OPTIONAL):

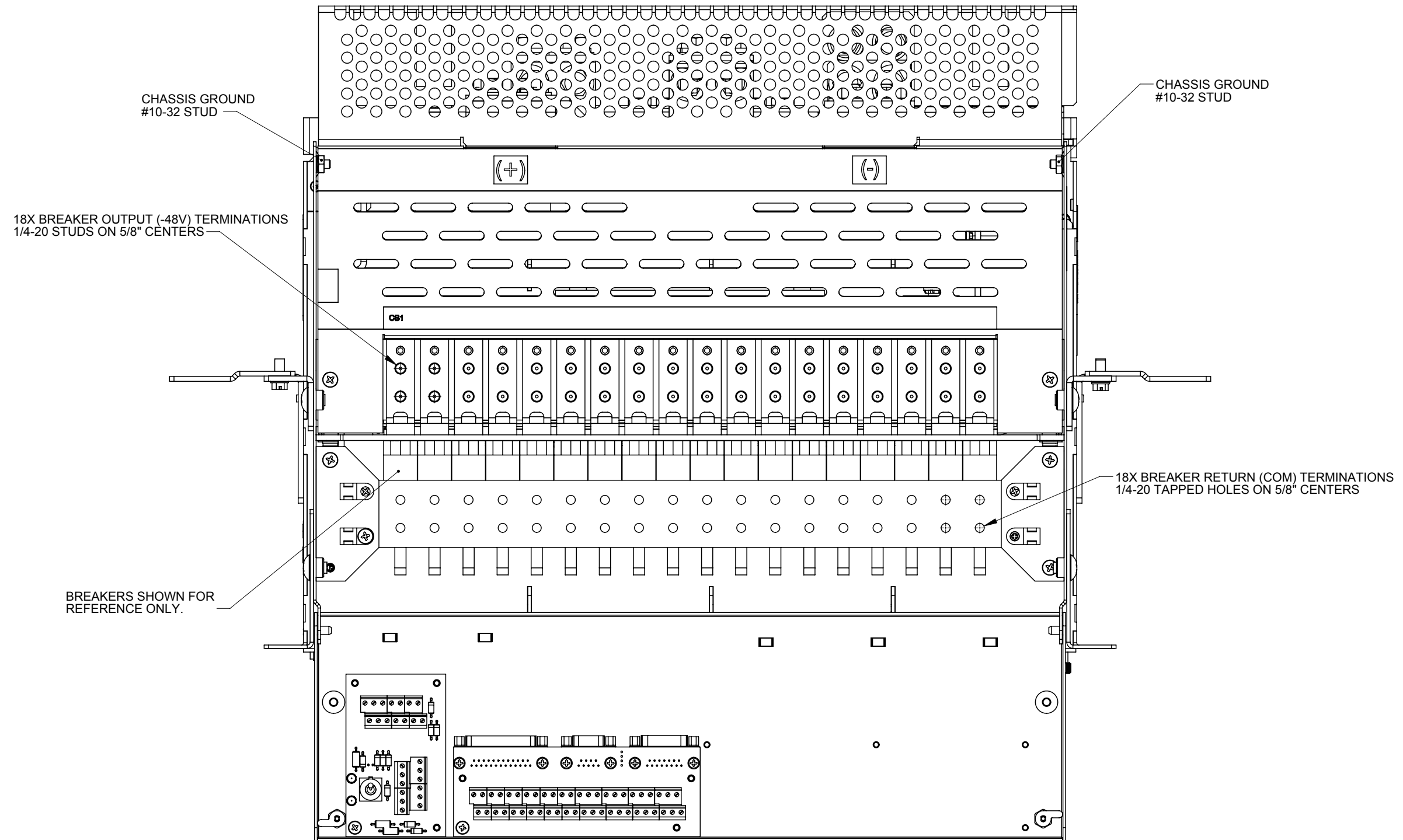


RIGHT SIDE VIEW

DETAIL 'B'

SIZE	TYPE	DWG NO.	REV
B	D2	053-997-08	D
SCALE: NTS		SHEET 2 OF 4	

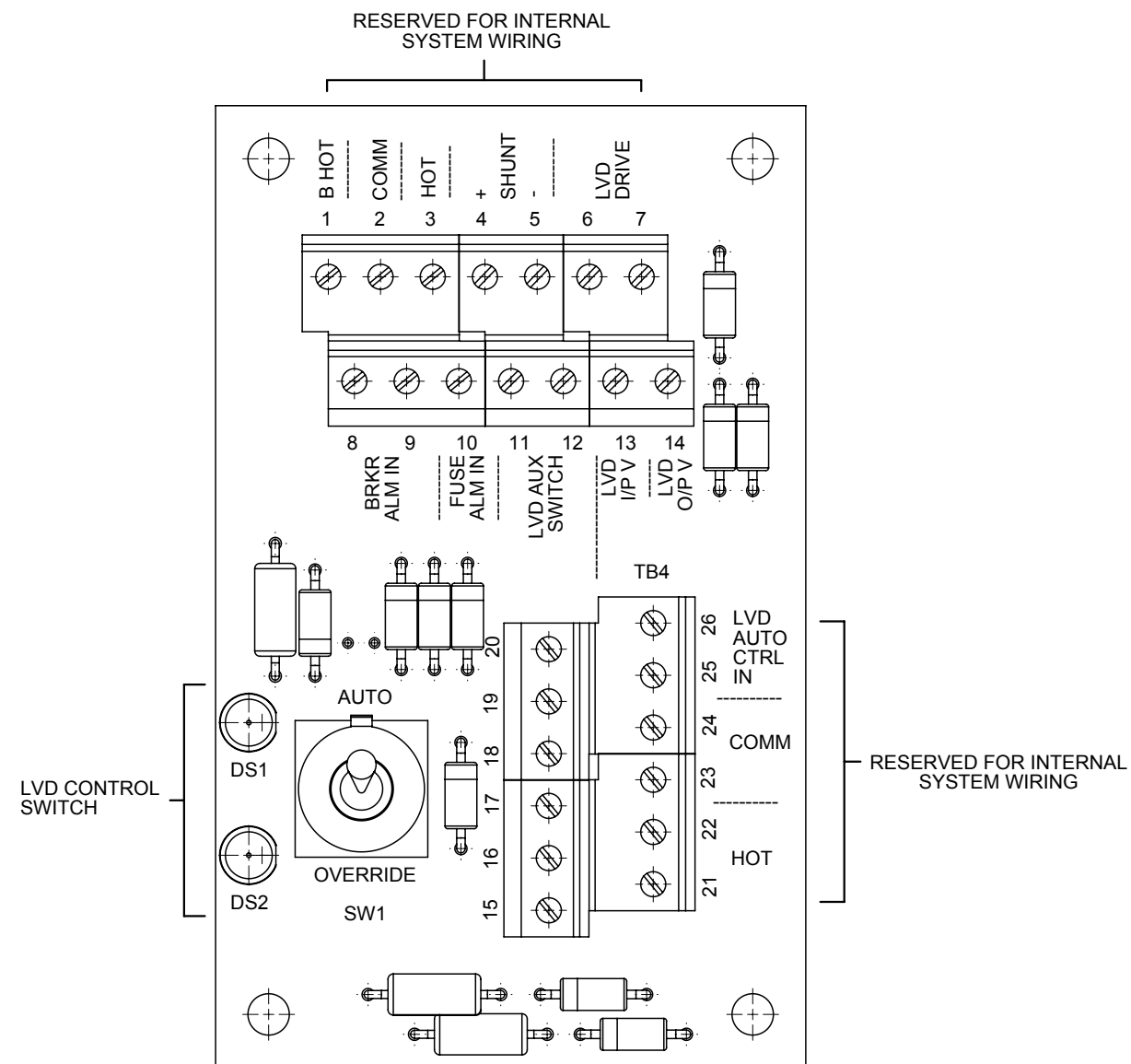
LOAD CIRCUIT BREAKER OUTPUT WIRE CONNECTIONS:



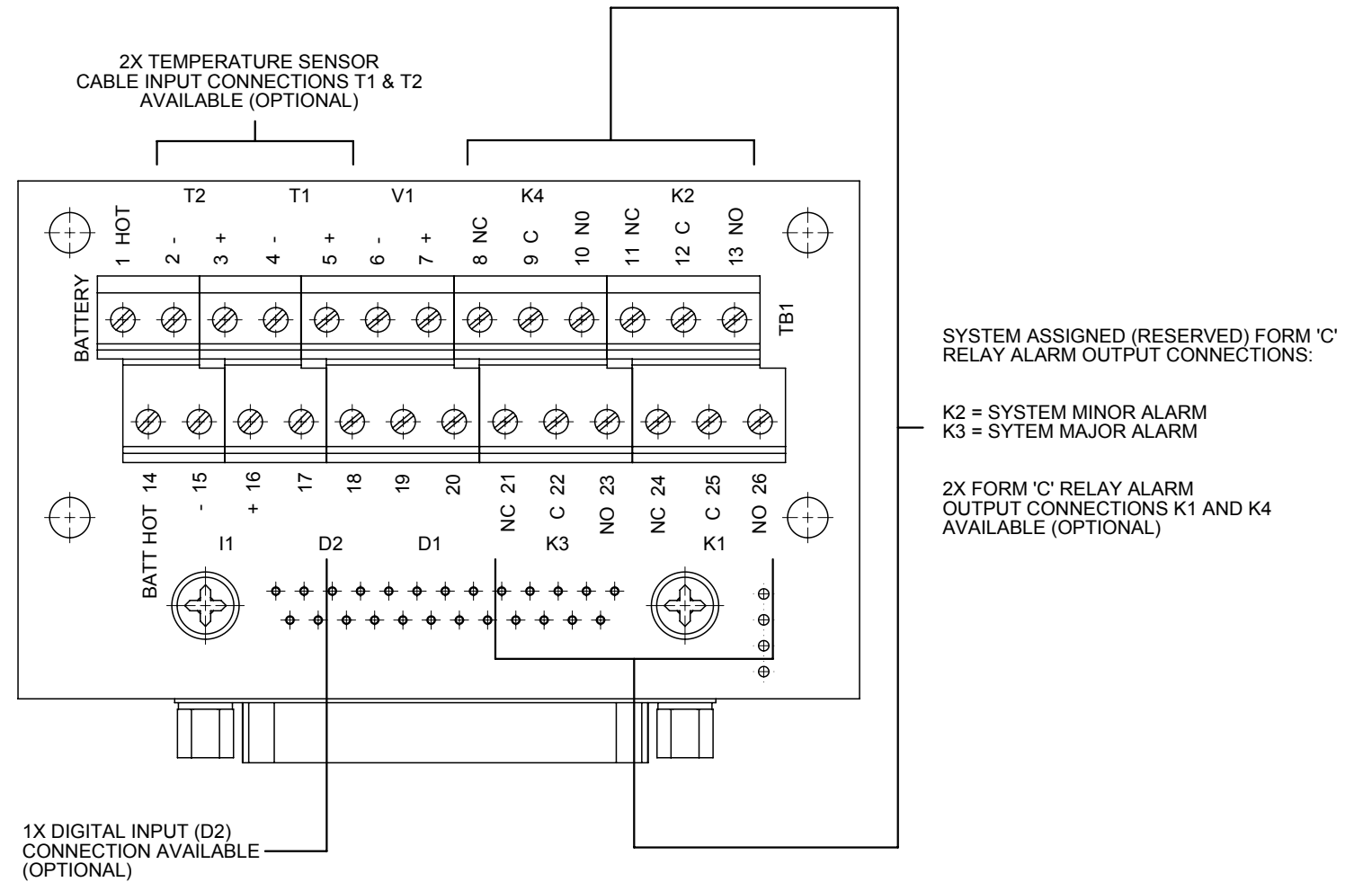
TOP VIEW
(DOOR OPEN)

SIZE	TYPE	DWG NO.	REV
B	D2	053-997-08	D
SCALE: NTS		SHEET 3 OF 4	

EXTERNAL ALARM AND SYSTEM INPUT/OUTPUT CONNECTIONS (OPTIONAL):



DISTRIBUTION LVD OVERRIDE/ALARM BOARD



CXCI SYSTEM CONTROLLER I/O INTERFACE BOARD
 (NOTE: ALL OTHER INPUTS NOT IDENTIFIED ARE EITHER USED FOR INTERNAL SYSTEM WIRING OR NOT AVAILABLE)

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Power