

# LPS36

## Line Power System


Technical Guide: 0120011-AB-J0

Effective: 09/2018






# Cordex HP LPS36/Compact -48Vdc to +/-190Vdc Line Power System

 **NOTE:**


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

 **NOTE:**

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

 **NOTE:**

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# 1. Safety

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**SAVE THESE INSTRUCTIONS:** This manual contains important safety instructions that must be followed during the installation, servicing, and maintenance of the product. Keep it in a safe place. Review the drawings and illustrations contained in this manual before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies or the nearest Alpha representative.

## 1.1 Safety Symbols

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this manual. Where these symbols appear, use extra care and attention.



### **NOTE:**

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



### **CAUTION!**

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



### **WARNING!**

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



### **HOT!**

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

## 1.2 General Warning and Cautions



### **WARNING!**

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

## 1.3 Mechanical Safety



### **CAUTION!**

**Do not disassemble the product – call our qualified service centers for servicing. Incorrect reassembling may result in a risk of electrical shock or fire.**

**Do not operate the product if it has received a sharp blow, it has been dropped, or otherwise damaged in any way – return it to a qualified service center for repair.**

## 1.4 Electrical Safety

### WARNING!

**The DC input to the modules (and the converter system) – though not dangerous in voltage – has a high short circuit current capacity that may cause severe burns and electrical arcing.**

**The DC output is a potentially dangerous voltage. Do not touch the output connections when under power. Ensure that power has been removed from the outputs before working on them.**

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. Hazardous voltages are present at the input of power systems. 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.

## 2. Product Overview

The LPS36 is a modular DC to DC up-converter system designed for distributed power communications applications using +/- 190Vdc (RFT-V circuit) over existing copper network.

Using switched mode technology, the LPS36 quad output converter module provides outstanding efficiency in a compact design. Applications include powering sealed DSLAM's, Distribution Point Units (DPU) as well as Optical Network Terminals (ONT) in Fiber to the Home Networks (FTTH). Each LPS36 converter module contains four isolated DC-DC converters, up to 100 Watt maximum. Converter modules are ordered separately at time of ordering or later after the converter system has been installed. Blank plates can be ordered separately for empty slots.

- High efficiency >92% for increased operating expenses (OPEX) savings and reduced carbon footprint
- High temperature tolerance for installation in Central Office (CO) or harsh outside plant (OSP) cabinet environments
- Industry leading power density enabling up to 48 channels in a compact 2RU footprint
- High reliability convection-cooled design with optional fan tray
- Cordex CXCI HP system controller provides advanced remote web based monitoring and control features

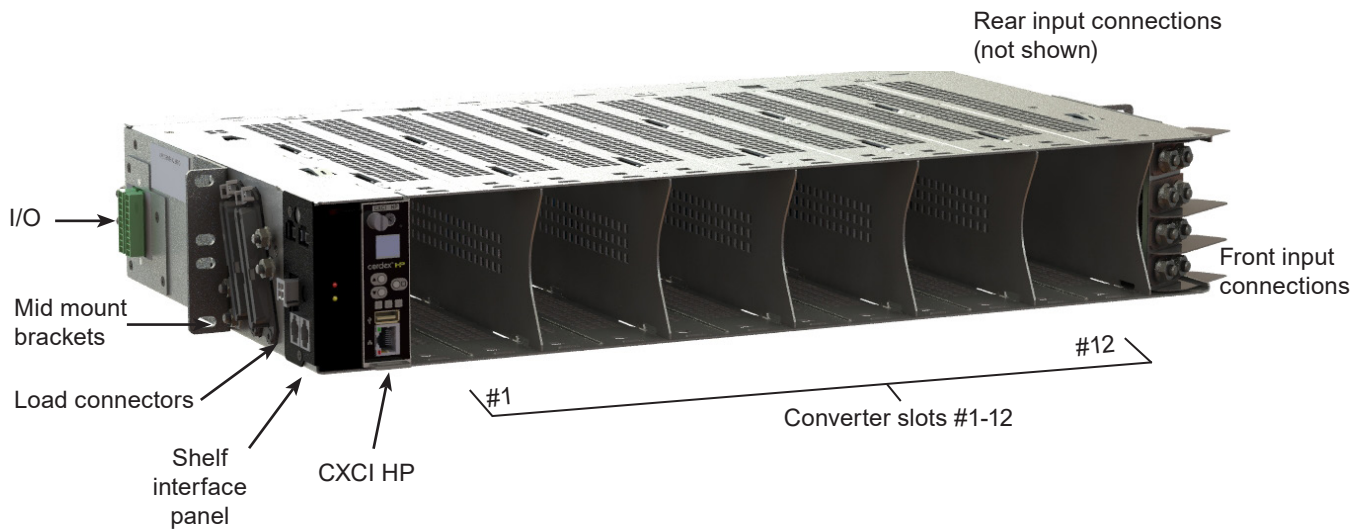


Figure 1 — LPS36 Shelf (23" shown)



Figure 2 — LPS36 Compact, (cable length not to scale)

The 19" and 23" LPS36 systems consist of one or more converter modules and an optional CXCI HP controller installed in a common shelf. A 19" shelf can have up to 9 modules, and a 23" shelf up to 12. All connections are front access. Input connections can be made at the rear of the unit as well. External connections are available at the shelf interface panel for alarm interfaces.

The LPS36 Compact packs maximum power into minimum space, but doesn't compromise on features. The shelf provides up to 16 line powering channels in the compact 2RU x 6" x 12" form. Standard system features include major and minor alarms for monitoring, connectorized cable output and one side mounting. This product is particularly suitable for remote OSP power cabinets where free rack space is tight or non-existent. With a six inch width and a single side bracket, it can be easily mounted to the side of a rack support post without using up valuable rack space.

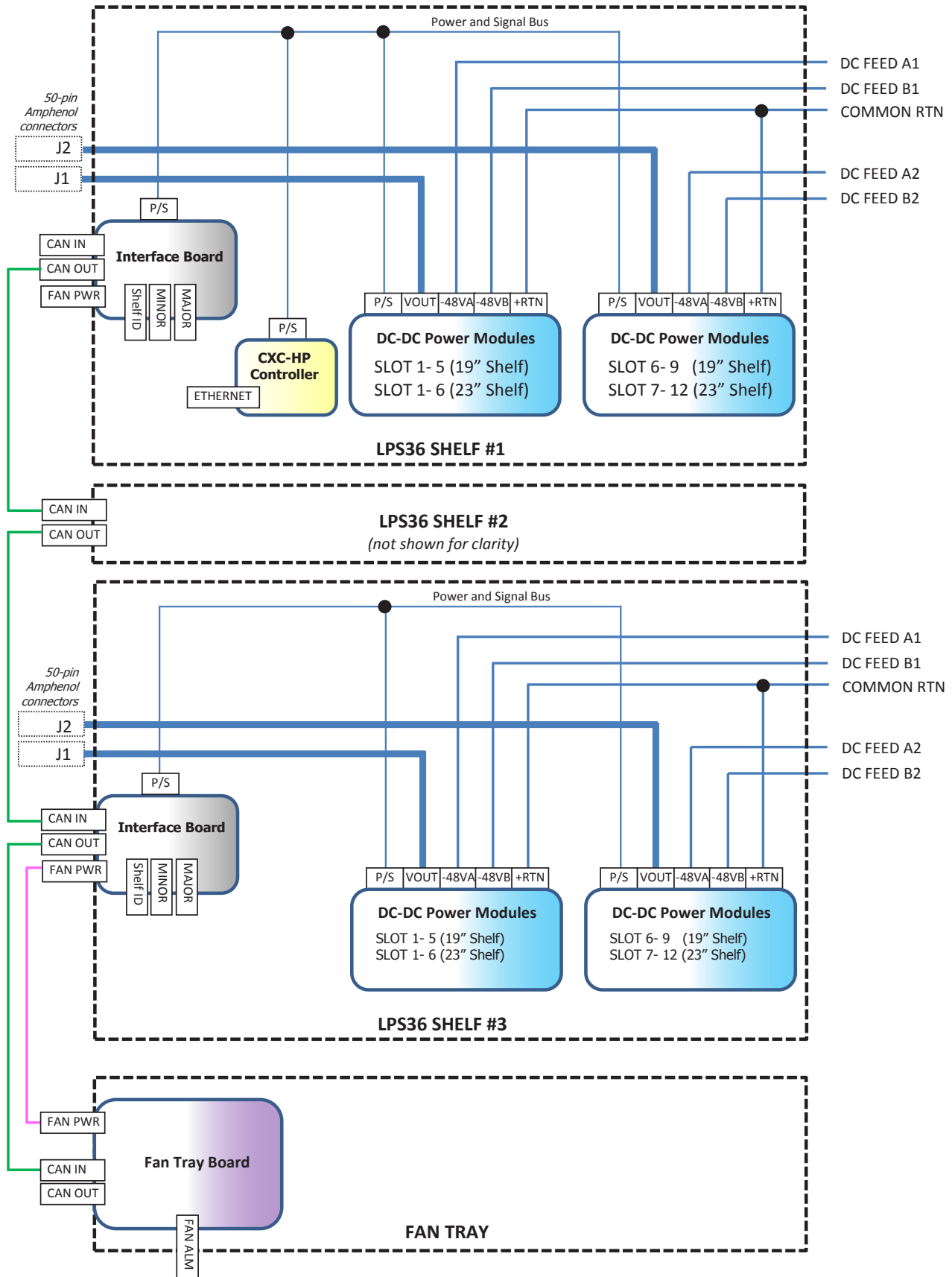
Alpha's LPS36 modular DC to DC converter systems incorporate a full range of standard features, including current limiting and individual ground fault interrupt for each circuit. Particular emphasis is placed on recognizing a fault condition and shutting down the circuit as quickly as possible to ensure the highest level of personnel safety. Compliance with GR-1089-CORE - Class A2 provides the ability to work on the equipment while powered, which significantly reduces the administrative and labeling requirements and overheads for the high voltage wiring.

## 2.1 Product Part Numbers

Product	Part number
19" Shelf - 9 modules	0300055-011
19" Fan Tray	0300055-002
19" Baffle	0300055-003
19" Fan Filter	0380256-001
23" Shelf - 12 modules	0300090-011
23" Fan Tray	0300090-002
23" Baffle	0300090-003
23" Fan Filter	0380256-201
Input Cover Kit (19/23")	0380249-001
Alarm Cable Kit (19/23")	8700649-001
6" Shelf - 4 modules	0300189-004
6" Fan Tray	0300189-002
6" Input Lug Kit (18")	8700870-001
CXCI HP Controller	0180053-002
Converter Modules	0120011-001
Blanking Plate Kit (quantity 2)	0380070-001

## 2.2 Block Diagram—Three Shelves and a Fan Tray (19" and 23")

Block Diagram – 3 LPS36 Shelves and a Fan tray (19" and 23")



### 3. Specifications

Electrical	
<b>Input Voltage:</b>	-40 to -60Vdc
<b>Recommended Breaker:</b>	
<b>6" Shelf:</b>	50A per feed
<b>19" Shelf:</b>	70A per feed
<b>23" Shelf:</b>	80A per feed
<b>Recommended Cable Size:</b>	As per NEC 2014, Minimum #6 AWG (16mm <sup>2</sup> ) copper rated for 90°C or #4 (25mm <sup>2</sup> ) rated for 75°C
<b>Output Voltage:</b>	±190Vdc (RFT-V)
<b>Power:</b>	96W nominal per output, >92W for worst case conditions (4 outputs per module)
<b>Efficiency:</b>	>92%
<b>Regulation:</b>	<2% no load to full load <1% line
<b>Output Noise:</b>	
<b>Wide Band:</b>	<500mV <sub>RMS</sub> (10kHz to 10MHz) <2.5V p-p (10kHz to 100MHz)
<b>Acoustic:</b>	<60dBa @ 1m (3ft), 55°C
<b>Connections (19/23"):</b>	
<b>Input:</b>	HOT: 2x sets, 1/4" holes on 5/8" centers RTN: 2x sets, 1/4" holes on 5/8" centers
<b>Output:</b>	Two 50-pin amp-champ style connector
<b>Alarm</b>	Two 10-PIN terminal blocks
<b>Connections (6"):</b>	
<b>Input:</b>	Anderson Style (To be cut if not needed or mate with Alpha part number 8700870-001)
<b>Output:</b>	One 50-pin amp-champ style connector
<b>Alarm</b>	TE Style Connections (to be cut if not needed)
<b>Quad Output Power Module (#0120011-001)</b>	
<b>Dimensions (HxWxD):</b>	386mm x 35mm x 283mm (3.4in x 1.4in x 11.1in)
<b>Weight:</b>	0.61kg (1.4lbs)
<b>19" Shelf - 9 Modules (#0300055-011)</b>	
<b>Dimensions (HxWxD):</b>	88mm x 435mm x 311mm (3.5in x 17.1in x 12.25in)
<b>Weight:</b>	5.45kg (12lbs)
<b>23" Shelf - 12 Modules (#0300090-011)</b>	
<b>Dimensions (HxWxD):</b>	88mm x 536mm x 311mm (3.5in x 21.1in x 12.25in)
<b>Weight:</b>	7.28kg (16lbs)
<b>6" Shelf - 4 Modules (P/N 0300189-004)</b>	

<b>Dimensions (HxWxD):</b>	88mm x 149mm x 305mm (3.6in x 5.9in x 12in)
<b>Weight:</b>	1.5kg (3.3lbs)
<b>Cable Length</b>	Output: 178mm (7.0in) Alarm: 1372mm (54.0in)
<b>Environmental</b>	
<b>Temperature Operating:</b>	
<b>Forced Air Cooling:</b>	- 40 to 65°C (-40 to 149°F) with minimum OSP cabinet air flow @200LFM or fan tray (used with two and three shelves)
<b>Convection Cooling:</b>	- 40 to 45°C (-40 to 122°F) single shelf operation only separated by 1RU baffle
<b>Temperature Storage:</b>	- 40 to 85°C (-40 to 185°F)
<b>Humidity</b>	0 to 95% RH non-condensing
<b>Altitude:</b>	-500 to 2000m (-1640 to 6562ft)
<b>Heat Dissipation:</b>	<118 BTU per hour/module
<b>Performance/ Features</b>	
<b>Communication Ports:</b>	
<b>CAN:</b>	Smart peripherals
<b>Ethernet:</b>	10/100 Base-T for TCIP/SNMP features (19"/23" systems only)
<b>Alarm relays:</b>	
<b>Shelf:</b>	1x Form C Major 1x Form C Minor
<b>Fan Tray:</b>	1x Form C fan tray alarm
<b>Alarm indicating LEDs:</b>	
<b>Module:</b>	One tri color LED per converter—see Table A
<b>(19" or 23" only) Shelf:</b>	System OK (off) Minor alarm (yellow) Major alarm (red)
<b>Fan Tray:</b>	Major alarm (red)
<b>MTBF:</b>	> 400,000 @ 30°C (86°F) ambient; test model Telcordia SR-332, Issue 2 (2006)
<b>Compliance</b>	
<b>Safety:</b>	CSA/UL/IEC/EN No 60950-1 CSA/UL/IEC/EN 60950-21 (RFT-V circuit) CE marked
<b>EMC:</b>	ETSI 300 386
<b>Emissions:</b>	CFR47 (FCC) Part 15 - Class A Device ICES-003 - Class A Device
<b>Immunity:</b>	EN 61000-4-2, EN 61000-4-3 EN 61000-4-4, EN 61000-4-5 EN 61000-4-6 EN 61000-4-8
<b>NEBS/Telcordia (19"/23" systems only):</b>	GR-1089-CORE - Class A2 GR-63-CORE GR-3108-CORE

# 4. Features

## 4.1 Converter Modules

A module contains four isolated DC to DC converters with a common control and supervisory circuit. Each module output operates independently. An internal micro controller monitors both the inputs and outputs of the converters, turns the converters on and off, and generates a converter fail alarm if required.

### 4.1.1 Status Indicators

The converter module has four LED indicators – one per converter. The LEDs are color-coded to indicate converter status as follows:

LED State	Converter Status
<b>Green</b>	Normal
<b>Blinking Green</b>	Remote shutdown enabled on individual channel/converter
<b>Blinking Green (All 4 LEDs)</b>	Shelf is not compatible with the module
	Module not seated properly
<b>Yellow (All 4 LEDs)</b>	Recoverable: • Ambient temperature high
<b>Blinking Yellow (All 4 LEDs)</b>	Input qualify not OK
<b>Blinking Yellow</b>	Recoverable: • OCP/Overload
	Non-recoverable: • Converter Input Fuse fail
<b>Red</b>	Locked-State: • OVP
	Non-recoverable: • Converter Output Fuse fail
<b>Blinking Red</b>	Recoverable: • GFI
<b>OFF (All 4 LEDs)</b>	Recoverable: • No power
	Non-recoverable: • Main Input Fuse cut-off
<b>Chasing Red/Green Pattern (All 4 LEDs)</b>	Locate feature enabled



Four Status LEDs – one per converter

### 4.1.2 Converter Alarms

Two converter fail outputs are present at the card edge connector. Alarms are activated after a one second delay for the following conditions:

- Internal regulation fails
- Output voltage  $< \pm 140V$
- Over Voltage Protection (OVP) operation
- Ground Fault Interrupt (GFI) trip
- Input fuse or output fuse fail
- Output short circuit ( $\pm 30V \pm 20\%$ )
- Input voltage out of range
- Heatsink/ ambient temperature out of range (Over Temperature Protection - OTP)



### 4.1.3 Blanks

Blanks are available for blank slots. Order blanking plate kit (contains 2 blanks) #0380070-001.

 **NOTE:**

**Blanks must be installed when using fan trays to allow proper air flow to the modules, see section 6.4.2.**

## 4.2 LPS36 19"/23" System Features

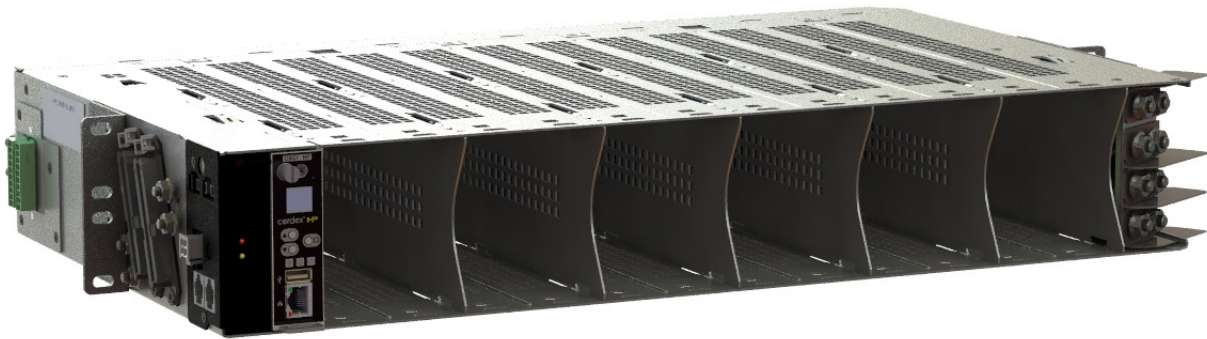


Figure 3 — LPS36 Shelf (23" shown)

### 4.2.1 CXCI HP Controller

CXCI HP in-shelf controllers have a small organic LED (OLED) display. This displays 30 characters total (six characters wide, five lines high) and the controller has three navigation buttons and one reset button. The display has three main operating modes: dashboard, menu and screen saver.

After 20 minutes with no activity, the controller goes into screen saver mode and the display shuts off. From screen saver mode, press any of the three navigation buttons to re-activate the screen and enter dashboard mode.

For details on using the controller go to the Alpha website to download the software manual (0350058-J0).

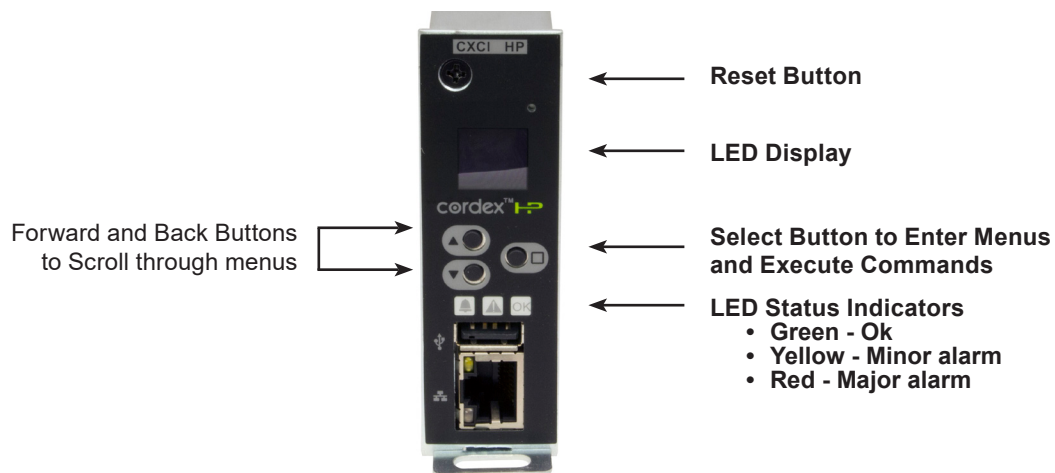


Figure 4 — CXCI HP Controller Front Panel

## 4.2.2 Controller I/O Connections

The converter shelf may be equipped with an optional CXCI HP controller. This controller has an integrated onboard I/O module containing analog and digital inputs, as well as Form C relay outputs.

Access for these connections is provided on the side of shelf (ref: Figure 4) via modular terminal blocks. Signal connections available are:

- Two(2) voltage inputs: 0-60Vdc
- One(1) Current shunt input: 25-100mV
- Two(2) Temperature probe inputs: Consult factory
- Two(2) Digital inputs: Off = 0-1Vdc; On = 5-60Vdc; 1-5mA signal
- Two(2) Form C Relays: 60V, 1A max

### ✓ NOTE:

Due to shelf size constraints, only two(2) relays are accessible from the CXCI HP controller. However, there are two(2) additional system alarm relays provided with the system, see Figure 3.

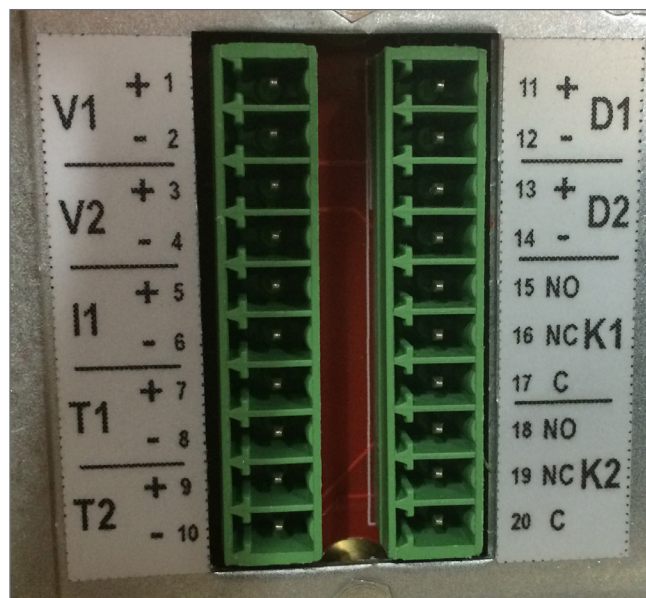


Figure 5 — Controller I/O Connections

### 4.2.3 Shelf Connections and Indicators (19" and 23" only)

Connections to the load and local alarm-sending unit are conveniently located on the side of each shelf.

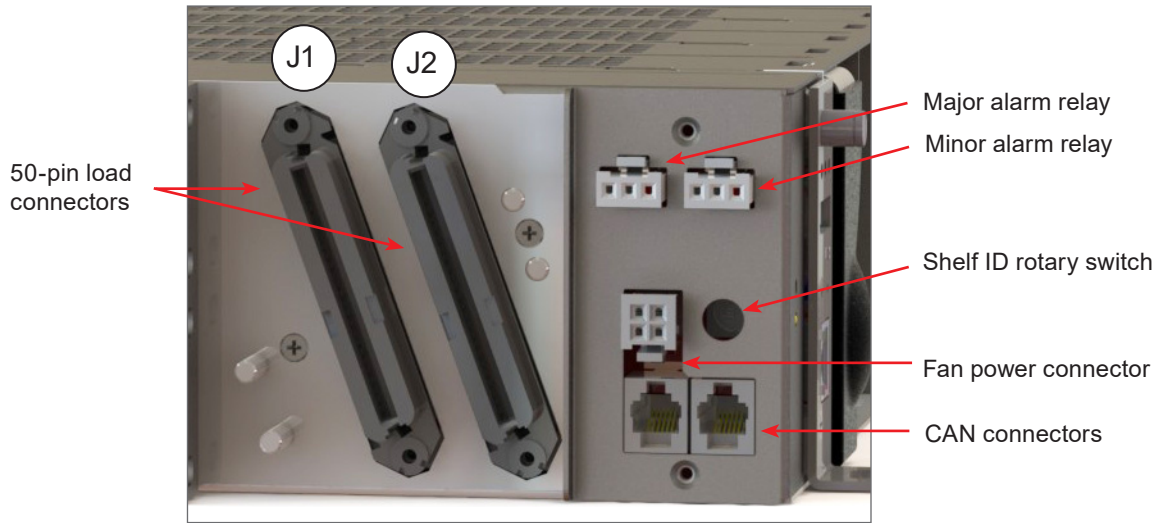


Figure 6 — Shelf Connections

### 4.2.4 Alarm Relays (Form C Contacts)

The converter shelf has an interface panel with terminal blocks for Major and Minor alarm outputs (Form C contacts). Both the Minor and Major alarm relay are designed to “fail safe” to ensure an alarm is registered when power is removed.

#### Major Alarm

The Major alarm relay de-energizes under any one of the following conditions:

- When two or more outputs have failed within a shelf
- When the DC input feed is below the normal operating voltage
- When the DC input feed is above the normal operating voltage



#### NOTE:

**If a Major alarm is activated, it "resets" the Minor alarm relay to an energized state.**

#### Minor Alarm

The Minor alarm relay is de-energized under any one of the following conditions:

- Single output has failed within a shelf
- Internal ambient temperature is out of range

#### Alarm LEDs

On the front of the interface panel, are two LEDs—one red and one yellow, which indicate the shelf alarm status (Figure 7).



Figure 7 — Shelf Alarm LEDs

## 4.2.5 Fan Tray and Baffle Tray

The optional fan tray and baffle tray are each 1RU high (Figure 8). Typically they are mounted together directly below the LPS36 shelf assembly.

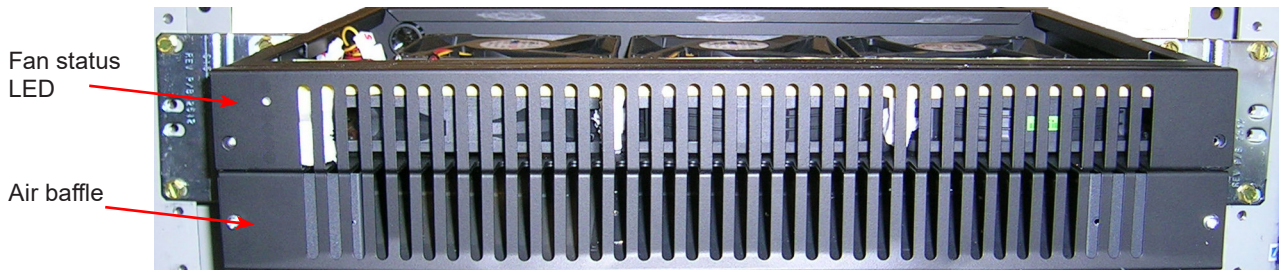


Figure 8 — Fan and Baffle Tray Rack, mounted (19" shown)

The fan tray has six fans with a total minimum flow of 200 CFM. The fans are powered from the LPS36 shelf directly above it. If any fan fails, a status LED on the front panel turns red (Figure 8). The fan tray also has a Form C fan fail alarm relay that can be connected to a local alarm-sending unit, see Figure 25 on page 32.

## 4.2.6 Mounting 19" Equipment in a 23" Rack

To mount a 19" shelf in a 23" rack, order 2x 2RU universal mounting brackets #5901456-002.

To mount a 19" fan or baffle tray in a 23" rack, order 2x 1RU universal mounting brackets #5901456-001.

## 4.2.7 Alarm Cable Kit

Terminal blocks for major and minor alarms use Molex connector 39-01-4031. This connector mates with Alpha alarm minifit JR. receptacle 5566-03A3-210. Kit #8700649-001 is available from Alpha with 1 connector.

## 4.3 LPS36 Compact System Features (6")

### 4.3.1 Shelf Connections

Connections to the load and local alarm-sending unit are conveniently located on the side of each shelf.

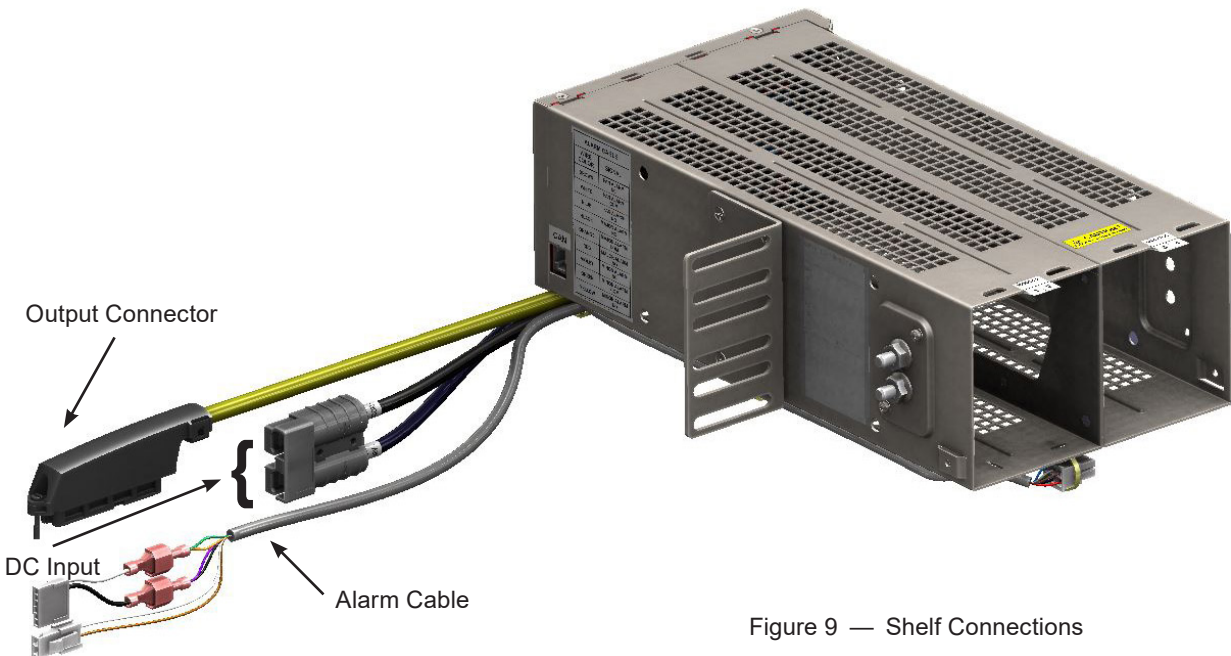


Figure 9 — Shelf Connections

### 4.3.2 Alarm Relays (Form C Contacts)

The LPS Compact system has Major and Minor alarm outputs (Form C contacts). The Major alarm relay is designed as a "fail safe" to ensure that the alarm is registered when power is removed.



#### NOTE:

**The Major and Minor alarms relays on each shelf are independent from the controller. They should work as described even if no controller is installed.**

#### Minor Alarm

The Minor alarm relay will be de-energized under any one of the following conditions:

- When a single output has failed within a shelf
- When internal ambient temperature is out of range

#### Major Alarm

The Major alarm relay will be de-energized under any one of the following conditions:

- When two or more outputs have failed within a shelf
- When the DC input feed is below normal operating voltage
- When the DC input feed is above normal operating voltage



#### NOTE:

**If a Major alarm is activated, it "resets" the Minor alarm relay to an energized state.**

### 4.3.3 Fan Tray

Refer to the fan tray installation section.

### 4.3.4 DC Input Cable Kit



Figure 10 — Fan Tray, (6" shown)

The Anderson connector can be used or mated with Alpha part number 8700870-001 which provides two #8AWG wires with 2 hole lugs. Check label on wire for connecting to proper polarity.

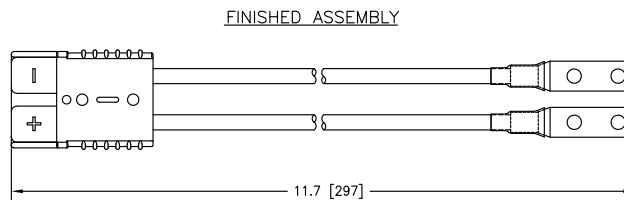


Figure 11 — DC Input Cable Kit Accessory (ordered separately)

# 5. Site Evaluation and Pre-Installation

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## 5.1 Pre-Installation Requirements

### 5.1.1 Effective Capacitance

The effective capacitance of each output of the LPS36 is 2.7 microfarads maximum between the output connections to the telecommunications network and 0.5 microfarads between each output connection to the telecommunications network and earth ground.

- At the time of installation, carry out a system assessment to ensure that the effective capacitance of the total system, including the capacitance of the LPS36 system, does not exceed 11 $\mu$ F (line to earth) and 40 $\mu$ F (line to line).

### 5.1.2 RFT-V Circuits

- At the time of installation, ensure that the voltage rating of the wiring of the telecommunication network is adequate for the normal RFT circuit voltage (+/-200Vdc), together with superimposed transients.
- Ensure that the circuits to be connected together are all RFT-V circuits.

### 5.1.3 Primary Protection

The LPS36 has built-in second level surge protection in compliance with the GR-1089 requirement. Primary protection must be in place at the customer site. External primary surge protection devices are necessary to optimally protect the RFT-V circuits from lightning surge and maintain safety certification to UL/CSA 60950-21.

Each channel (pair) must be properly protected by the upstream system using a 5-pin protector to a level corresponding to a Bourns 2410 Series. For example: 2410-33-G-MSP-S provides the part in a red color. This protector should be UL 497 listed and rated for 300-400 Volts voltage breakdown range.

### 5.1.4 Transient Response

The LPS36 has been designed to provide protection against typical input and output voltage surges. For example, in the event of any single isolated 75 Vdc/9.5ms overvoltage transient being applied between the input power terminals, the LPS36 will continue to operate properly, and will not be damaged or degraded in performance.

However, the RFT-V output may exhibit a momentary voltage over/under-shoot by as much as 25% of the nominal output voltage, depending on the characteristics of the equipment being connected as a load. The down-converter connected at the remote end is expected to tolerate this dynamic line voltage swing.

In the event of lightning surges and AC power faults, the RFT-V output ports of the LPS36 will experience voltage surges of up to a few thousand volts, but the equipment will not be damaged, and will continue to operate without manual intervention after normally expected electrical stresses and transients (i.e. first-level surges), and will remain safe under less frequently encountered severe stresses and transients (i.e. second-level surges).

For critical application that requires a more robust system such that any momentary interruption on the remote end is not acceptable (as caused by input or output transients described above), Alpha recommends using the AlphaCap 665 Short Duration Backup Supply Module (p/n 013-015-20) in conjunction with Alpha CSM46.








For more information on this subject, please refer to Telcordia Technologies Generic Requirements document for Electromagnetic Compatibility (EMC) and Electrical Safety – Generic Criteria for Network Telecommunications Equipment (GR-1089-CORE).

## 5.2 Packing Materials

Alpha is committed to providing products and services that meet our customers' needs and expectations in a sustainable manner, while complying with all relevant regulatory requirements. As such Alpha strives to follow our quality and environmental objectives from product supply and development through to the packaging for our products.

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

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

 PAP/PCB	 PET	 PE-LD	 PS	 FE	 ALU	 NW
<b>Cardboard</b>	<b>Polyethylene Terephthalate</b>	<b>Low Density Polyethylene</b>	<b>Polystyrene</b>	<b>Steel</b>	<b>Aluminum</b>	<b>Wood</b>
Packing boxes Caps	Flexible film Packaging	Bubble wrap Shrink wrap Plastic bags	Foam	Strapping on pallets	Strapping on pallets	Pallets Lumber

### 5.2.1 Returns for Service

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is unavailable, make sure that the product is packed with at least three inches of shock-absorbing material to prevent shipping damage.

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

### 5.2.2 Check for Damage

Before unpacking the product, note any damage to the shipping container. Unpack the product and inspect the exterior for damage. If any damage is observed, contact the carrier immediately.

Continue the inspection for any internal damage. In the unlikely event of internal damage, inform the carrier and contact Alpha Technologies for advice on the impact of any damage.

### 5.2.3 General Receipt of Shipment

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

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



# 6. LPS36 System Installation

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This chapter is provided for qualified personnel to install an LPS36 system.

## 6.1 General Instructions

This chapter provides cabling details and notes on cable sizing for DC applications.

Connections to the converter system must comply with all the local codes and ordinances.

## 6.2 Safety Precautions



### WARNING!

**The DC input to the modules (and the converter system) – though not dangerous in voltage – has a high short circuit current capacity that may cause severe burns and electrical arcing.**

**The DC output is a potentially dangerous voltage. Do not touch the output connections when under power. Ensure that power has been removed from the outputs before working on them.**



### WARNING!

**The intra-building ports (Ethernet, CAN, alarm relays) of the equipment or subassembly are suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallicity connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallicity to OSP wiring.**



### WARNING!

**CXCI HP controller Ethernet port is not designed to withstand lightning and AC power cross surges according to the NEBS requirements in GR-1089-CORE. Ensure that any Ethernet cable used (not provided by Alpha) does not exceed a maximum length of 6 meters.**

Before working with any live power system, take the following 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 insulated metallic tools.

Installers should follow all applicable local rules and regulations for electrical and battery installations; e.g., CSA, UL, CEC, NEC, OSHA, and local fire codes.



## **CAUTION!**

**The LPS36 is suitable for connection to the Central Office (NEC)**

**The LPS36 must be grounded via a copper ground conductor.**

**Before making connections all bare grounding connection points to the LPS36 must be cleaned and coated with an anti-oxidant solution.**

**Before making connections all surfaces on the LPS36 that are un-plated must be brought to a bright finish and treated with an anti-oxidant solution.**

**To ensure electrical continuity, all non-conductive surfaces on the LPS36 should be removed from all threads and all connection points.**

**The LPS36 utilizes a 2-hole compression lug with a #6 AWG wire that utilizes 8.8 ft-lbs torque to secure it to the frame and LPS36.**

### **6.3 Tools Required**

Various insulated tools are essential for product installation. The following list is a guide:

- Phillips head screwdriver, #2 (tip size 3/16")
- Slot head screwdriver (blade size 1/8")
- Digital voltmeter equipped with test leads
- Cutters, crimpers, and wire strippers 0.25 to 10mm<sup>2</sup> (#24 to #6 AWG)

## 6.4 Thermal Management

This section provides supplemental information regarding thermal management of the LPS36.

### ✓ NOTE: 1

Blanking plates must be installed in all the empty converter slots when forced air or fan cooling is used for the application.

### ✓ NOTE: 2

When the LPS36 is operating normally at maximum rated load, the shelf level rate of heat dissipation exceeds the allowable limit of 27.9 W/sq.ft. per Section 4.1.6 of GR-63-CORE (Issue 6).

Alpha recommends leaving a minimum of 27.3 (22.9) inches vacant vertical rack space for each 23" (19") shelf installation to meet the required shelf-level rate of heat dissipation. In addition, special equipment room cooling may be required.

### 6.4.1 Natural Convection ( $T_a = -40^{\circ}\text{C}$ to $+45^{\circ}\text{C}$ ) — One Shelf Only

The high efficiency of LPS36, given its high power density, makes it possible to operate up to  $45^{\circ}\text{C}$  ambient at full power without the need for fan tray or external airflow for **one shelf only**. When installing the LPS36 Shelf in a CO type installation that only relies on natural convection for cooling, proper spacing from surrounding equipment should be observed to facilitate effective ventilation as shown below in Figure 12.

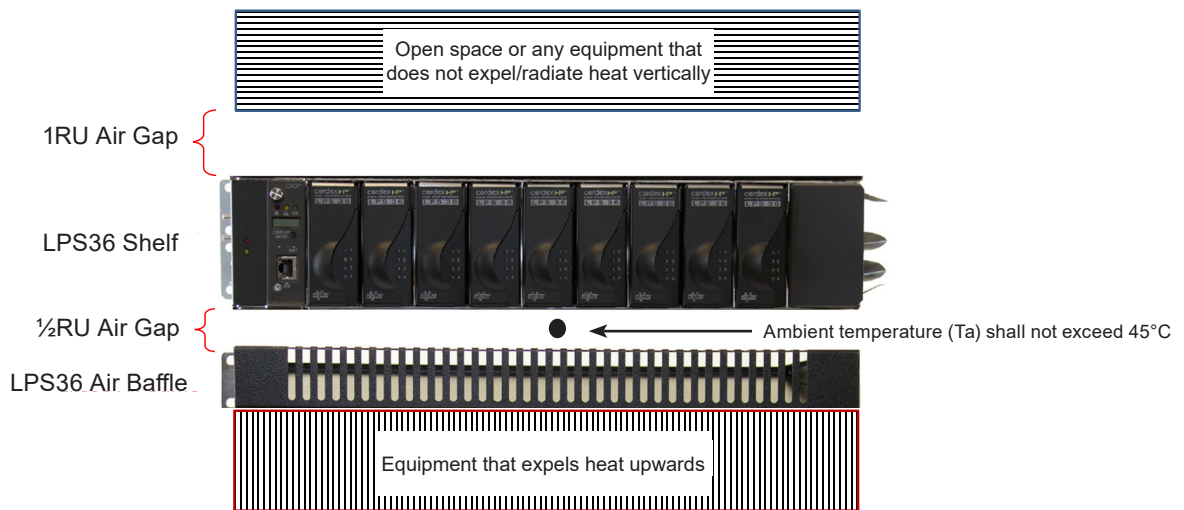


Figure 12 — Natural Convection 19"/23" Systems



### CAUTION!

**CAUTION:** For natural convection cooling the only orientation that can be used is the one pictured in Figure 12.

The temperature below the LPS36 shelf shall not exceed 45°C. If the temperature exceeds 45°C, then the output power is derated at 2.5W/°C as per the graph below.

**NOTE:**

**LPS36 Average Output = Line loss ( $I^2R$ ) + Remote down-conversion + Remote equipment load.**

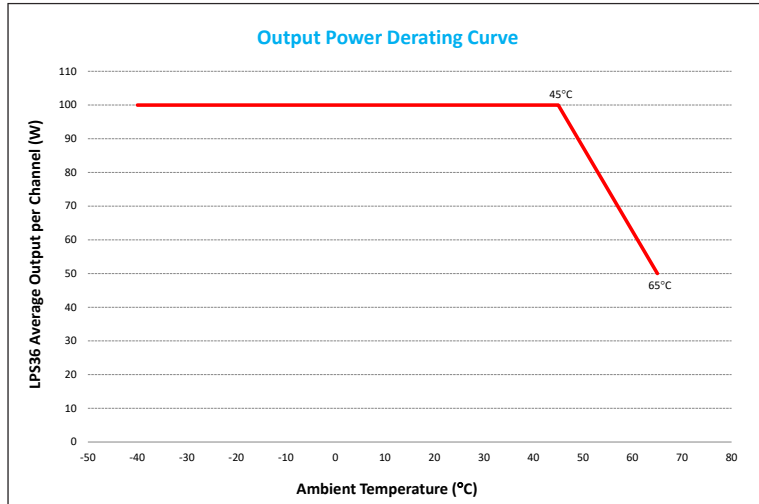


Figure 13 — Output Power Derating Curve

### 6.4.2 Forced Air Cooling with LPS Fan Tray — Two and Three Shelves

Two and three shelves require a fan tray and two baffles to meet the specified cooling requirements for both CO and OSP applications. Install the fan tray directly below either two or three converter shelves and a baffle tray below the fan tray as shown below in Figure 14. In addition, install a baffle tray above the converter shelves.

Up to nine converter shelves can be managed by a single controller, provided each three contiguous shelves has fan cooling.



Figure 14 — Multi-shelf System Mounting

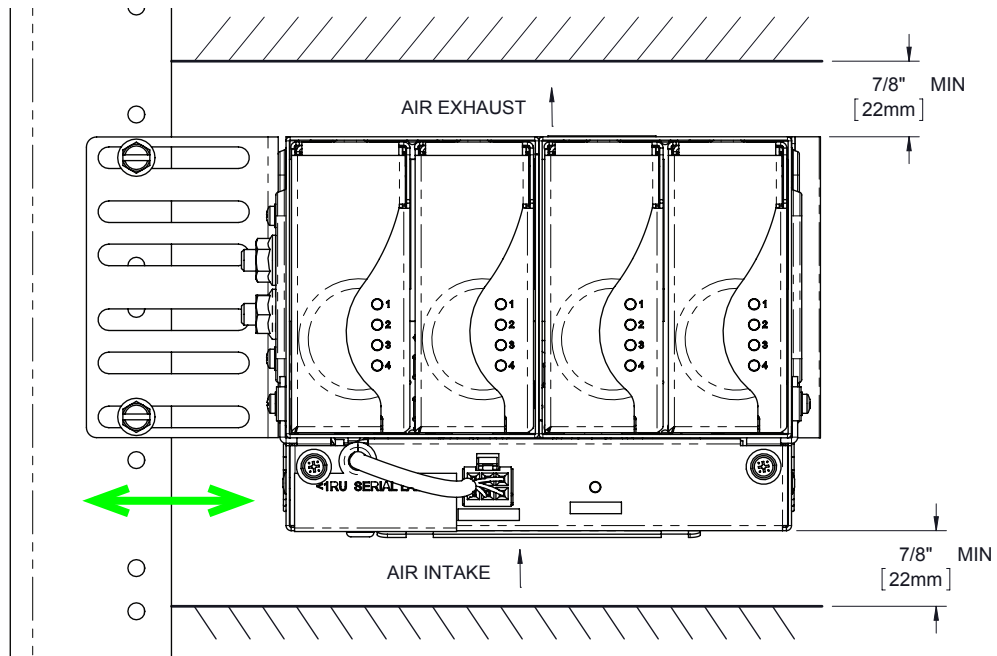


Figure 15 — LPS36 Compact Shelf with Fan Tray

### 6.4.3 LPS in OSP Cabinet Application

For operations where ambient temperature reaches 65°C maximum, forced air cooling is required. The LPS36 module has some flexibility to operate in high ambient temperature without using the standard LPS fan tray by utilizing the internal airflow inside the OSP cabinet.

Thermal testing must first be conducted on the cabinet with test results reviewed and approved by Alpha.

To determine the external airflow required for a given load, follow the graph below.

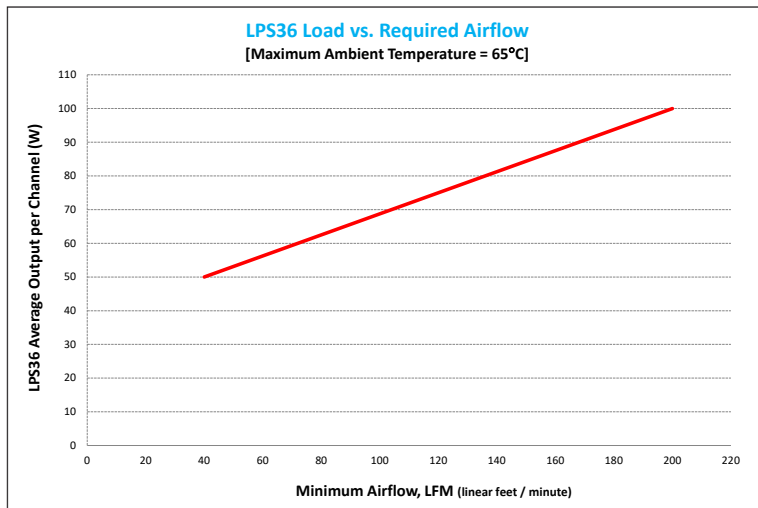


Figure 16 — Minimum Air Flow

## 6.5 LPS36 Set Up: 19" and 23" Systems

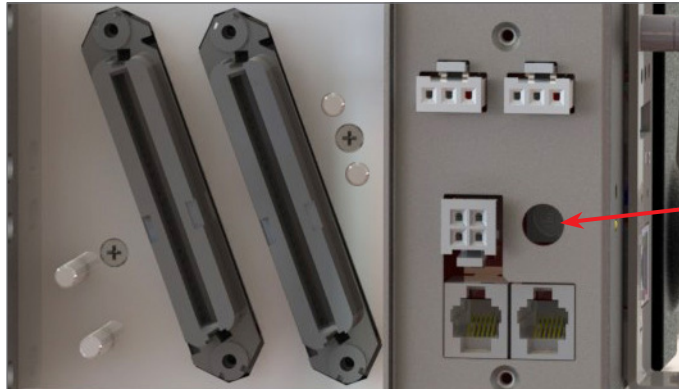
### 6.5.1 Rack Mounting

**NOTE:**

**Use thread forming screws with paint piercing washers to connect the LPS36 shelves and fan assembly to the frame.**

Use universal mounting brackets to mount the LPS36 shelf in a 19" or 23" rack. For bracket part numbers see section "4.2.6 Mounting 19" Equipment in a 23" Rack" on page 18.

### 6.5.2 Shelf ID



Set the rotary dial to a unique shelf ID before mounting. Do not use 0.

### 6.5.3 Input and Output Wiring (19"/23")

This power system is suitable for installation as part of a Common Bonding Network (CBN) and is intended to be used in a DC-I configuration (isolated from frame ground).

This system is intended to be used with a -48Vdc rectifier/ battery system at the input, and surge protectors and line terminators at the output.

### 6.5.4 Wiring Chassis Ground

**NOTE:**

**Ground connections are bright electro tin plated class B as per ASTM B545-97 Class B. No antioxidant is required before crimp connections are made.**

Protective earthing terminals are provided for chassis ground—two pair at the side and one pair at the rear (Figure 17).

1. Connect the power system chassis to the building master ground bus (MGB). This connection is necessary for personnel safety and to meet many telco-grounding requirements.
2. Use minimum #6 AWG (16mm) copper wire and standard 2-hole crimp lugs for 1/4" studs on 5/8" centers.
3. Secure the lugs with #10-32 serrated flanged nuts (supplied) to provide the anti-rotation necessary for primary ground connections.

#### Recommended torque values

#10-32	45 in-lbs.
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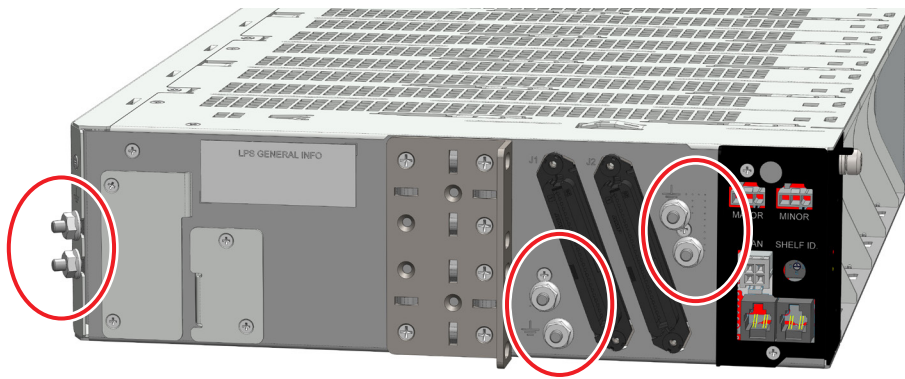


Figure 17 — Locations for Protective Earthing Terminals for Chassis Ground (LPS36 side view)

### 6.5.5 Connecting the DC Input

**NOTE:**

**Connect the LPS36 to a Safety Extra Low Voltage (SELV) <60VDC input power circuit.**

Connections are provided for either side-front or side-rear access (Figure 18).

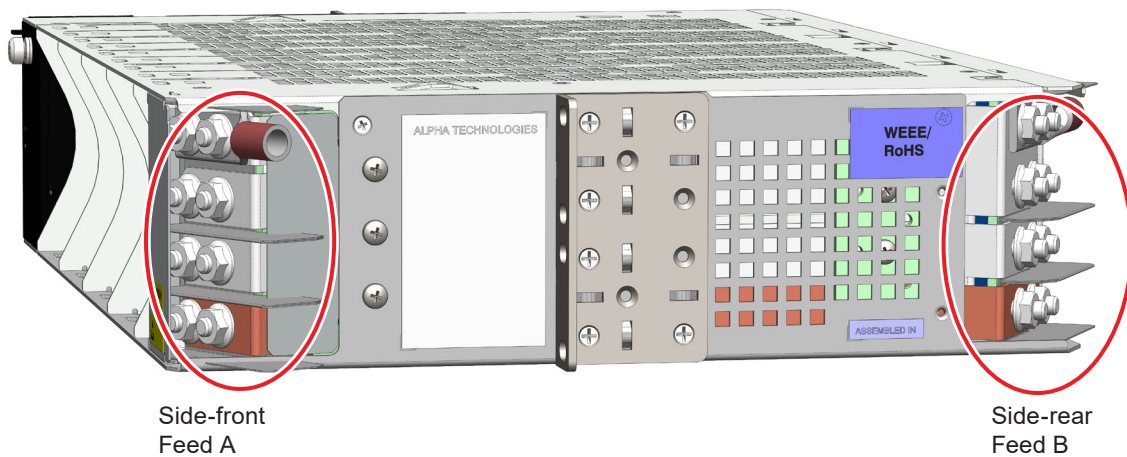


Figure 18 — DC input Connections (19")

**WARNING!**

**Ensure input feeder breakers are off before connecting inputs. Hazardous voltages and/or energy levels are present at the input of power systems.**

Each shelf has two negative inputs, A1/B1 and A2/B2, and two connections to a positive common input. Half the converters are powered by feed A1/B1, and half by feed A2/B2 as listed in the following table.

Alpha recommends that each LPS36 shelf had a dedicated circuit breaker for each input feed (a total of four circuit breakers are needed if full redundancy is required).

Refer to the specifications in Section 3 on page 12 for recommended breaker and cable sizes. Local electrical codes have precedence.

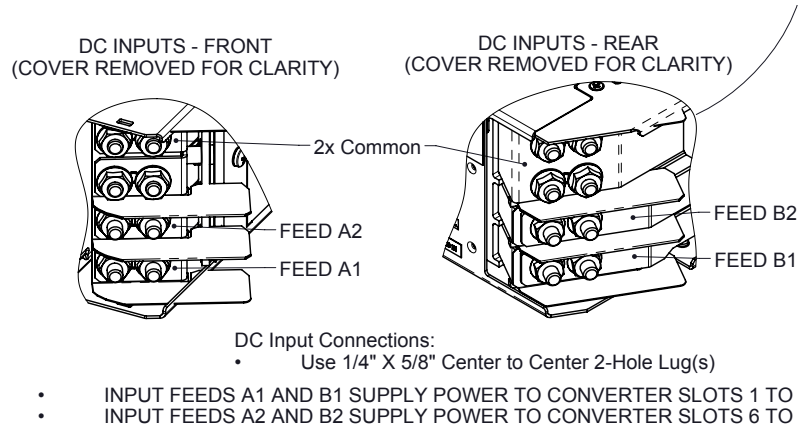


Figure 19 — DC Input Wiring Connections

Shelf width	Feed A1/B1 to Converter Slots	Feed A2/B2 to Converter Slots
19"	1-5*	6-9*
23"	1-6*	7-12*

\*Slots are numbered from left to right when viewed from the front.



**NOTE:**

Replace the older version of the shelf (03000xx-001) with the new version (03000xx-011).

**6.5.6 Making CAN Bus Connections**

Each module communicates with the controller using CAN protocol. The modules report alarms, converter output voltages, ambient temperature and the location of the module within a cabinet.

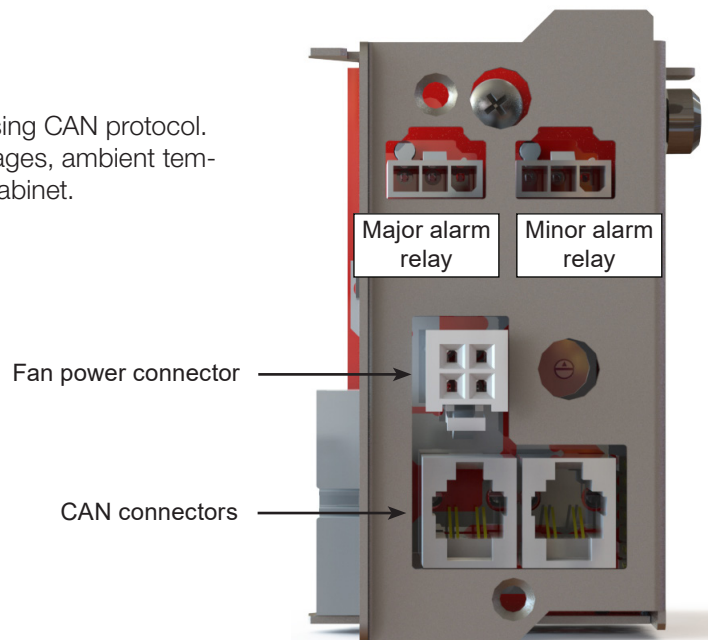


Figure 20 — CAN and Fan Connections on the Shelf Interface Panel (for reference only)



1. Connect the daisy-chained CAN bus cable from the top shelf to the last shelf or fan tray. Figure 22 shows the wiring for three shelves and a fan tray.
2. Insert the CAN terminator (P/N 5450228-001) in the last CAN OUT location. See Figure 21.

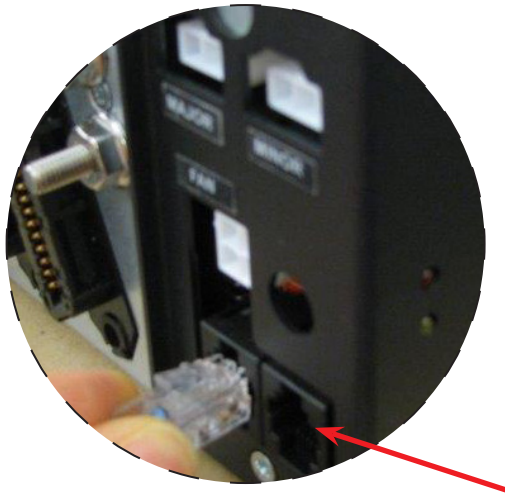


Figure 21 — CAN OUT Terminator

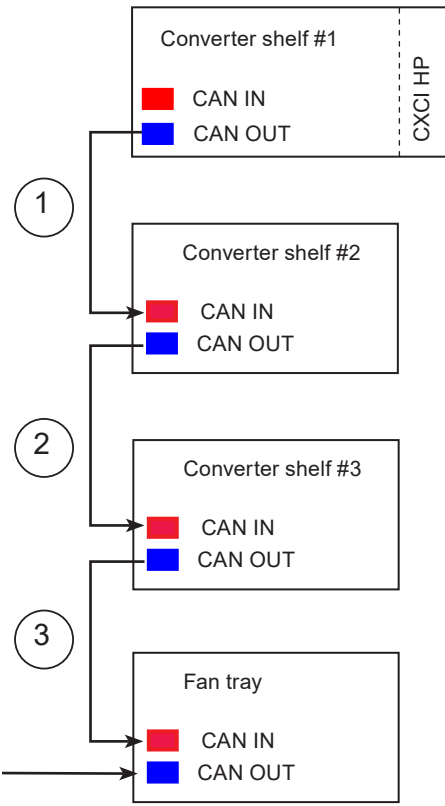


Figure 22 — CAN Bus Cabling



**NOTE:**

The CAN terminator ships in the plastic bag with the Installation & Operation manual.

**6.5.7 Connecting Power to the Fan Tray**

Power to the fans is provided by the converter shelf immediately above it. Plug the cable from the fan tray into the receptacle labeled FAN PWR in the converter shelf above it (see Figure 20 on page 30).

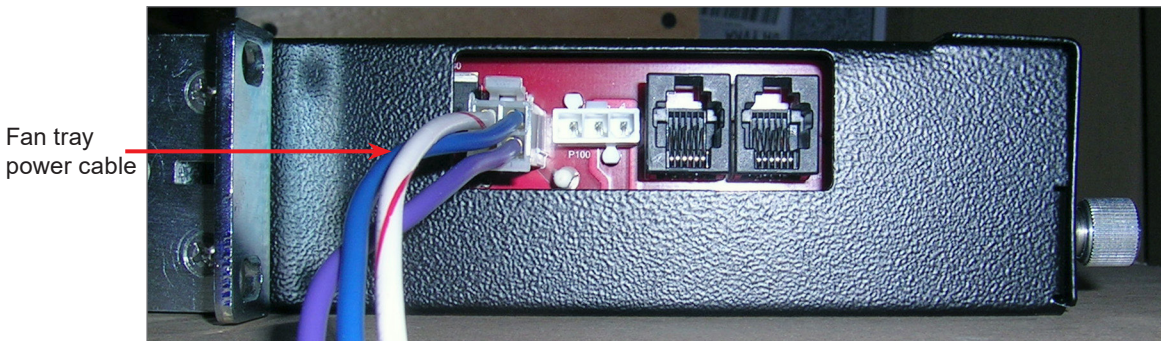


Figure 23 — Fan Tray Connections

## 6.5.8 Wiring the Alarm Relays

### 6.5.9 Converter Shelf

Two form C relay contacts are available for Major and Minor alarms.

Connect the relays (located on the side of the controller-side of the shelf) to the local alarm-sending unit using wire gauges from #28 to #16 AWG (0.08 to 1.31 mm<sup>2</sup>). The NO/C/NC positions for each alarm are shown here.

Outputs from the alarm relays can be ganged to produce one alarm at the alarm-sending unit.

**NOTE:** Terminal blocks for major and minor alarms use molex connector 39-01-4031. It mates with Alpha alarm minifit JR. receptacle 5566-03A3-210. Kit #8700649-001 is available with one connector.

Major Alarm Relay		
Alarm Condition Present?	NC to C	NO to C
No	Open	Closed
Yes	Closed	Open
Minor Alarm Relay		
Alarm Condition Present?	NC to C	NO to C
No	Open	Closed
Yes	Closed	Open

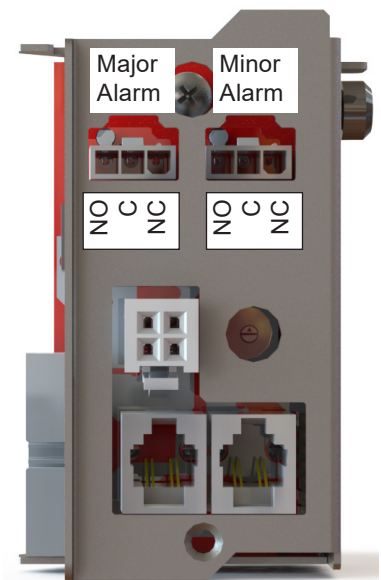


Figure 24 — Converter Shelf Alarm Relays

### 6.5.10 Optional Fan Tray

Failure of a fan generates a Major alarm. The form C relay, on the side of the fan tray, can also be connected to the local alarm-sending unit. Use wire gauges from #28 to #16 AWG (0.08 to 1.31 mm<sup>2</sup>). The NO/C/NC positions for each alarm are shown in Figure 25.

Outputs from the alarm relays can be ganged to produce one alarm at the alarm-sending unit.

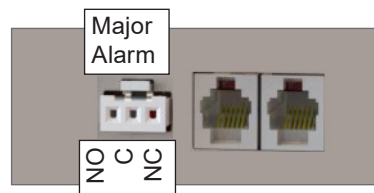


Figure 25 — Fan Tray Alarm Relay

## 6.6 LPS Compact Set Up: 6" Systems

Use the bracket provided to mount LPS36 Compact shelf to a structural component, typically one side of an equipment rack or a frame inside an outside plant enclosure. The bracket can be assembled to the left or right side of the shelf depending on the installation.

When a fan tray is used, the shelf can be in any orientation depending on the space available. When a fan tray is not used, the LPS36 Compact can only be orientated in the normal, upright position. In both situations, pay attention to air flow requirements around the shelf.

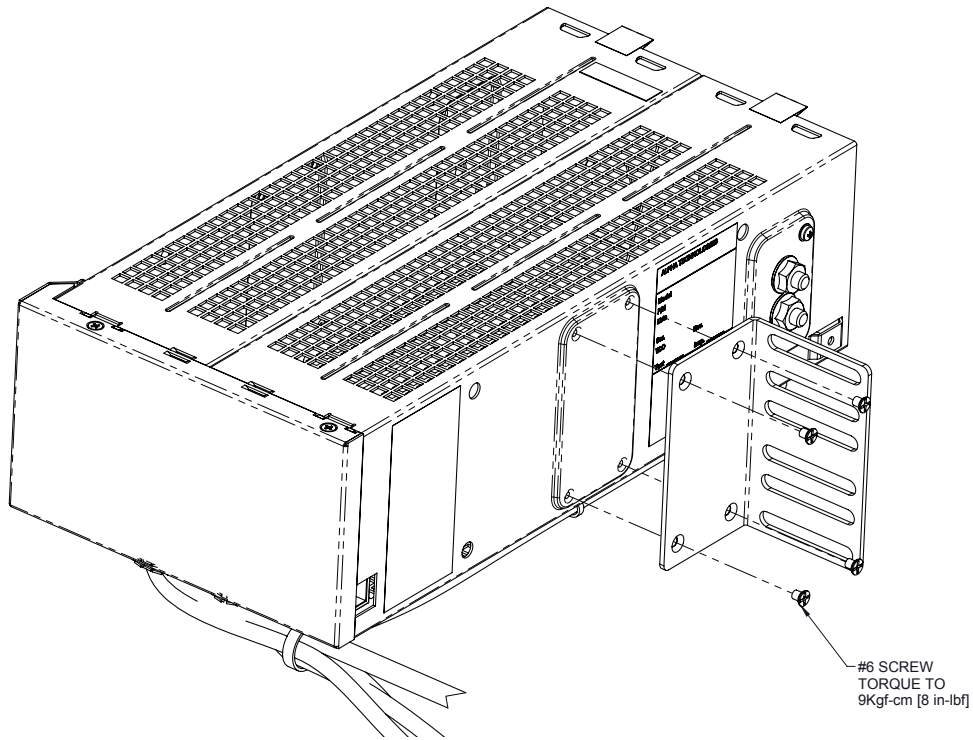


Figure 26 — Rack Mount Bracket Assembly (either side, based on installation)

## 6.6.1 LPS Compact Mounting Options

### Mounting without a Fan Tray

Without a fan tray the shelf can only be mounted in the 'right-side-up' position as shown below. The bracket can be installed on either the right- or left-side of the shelf.

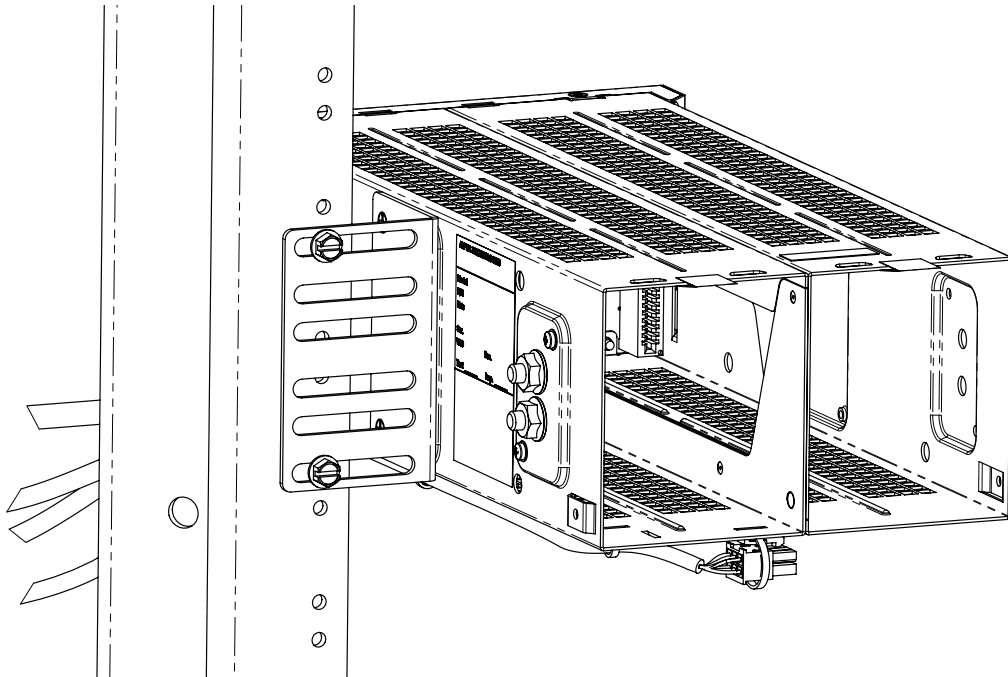


Figure 27 — Rack Mount (left side shown)

### Mounting with a Fan Tray

Additional options are available when using the LPS Compact fan tray accessory.

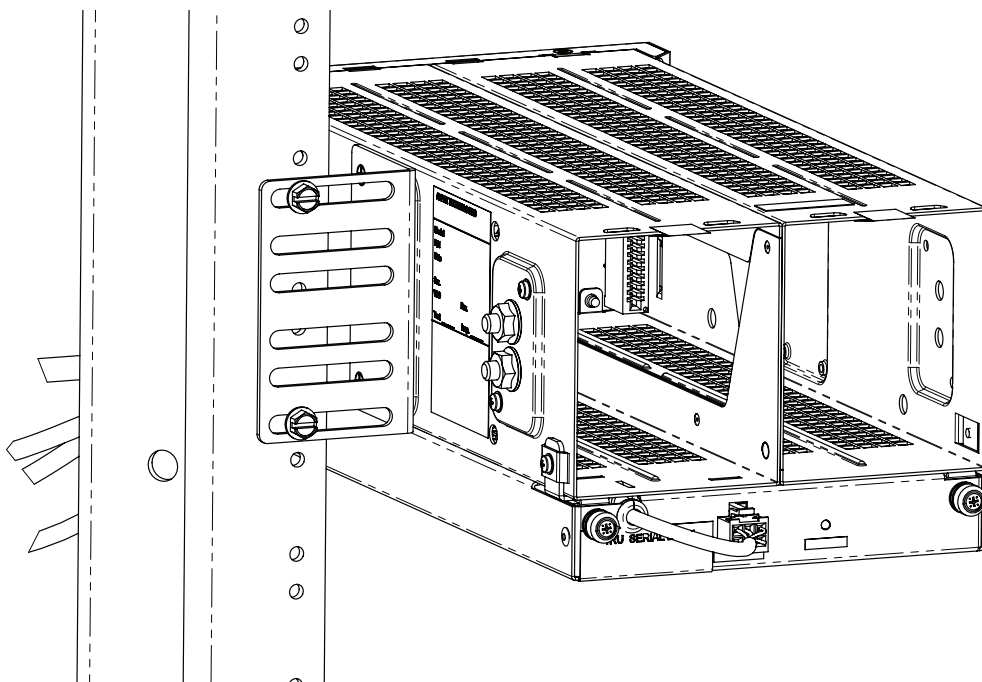


Figure 28 — Rack Mount, (left side with fan tray)

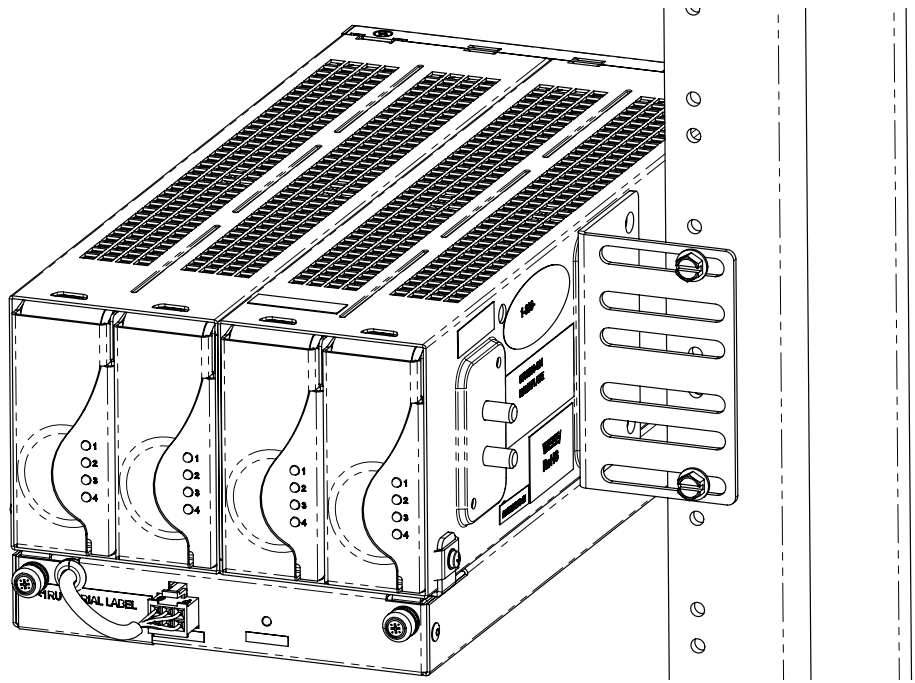


Figure 29 — Rack Mount (right side with fan tray)

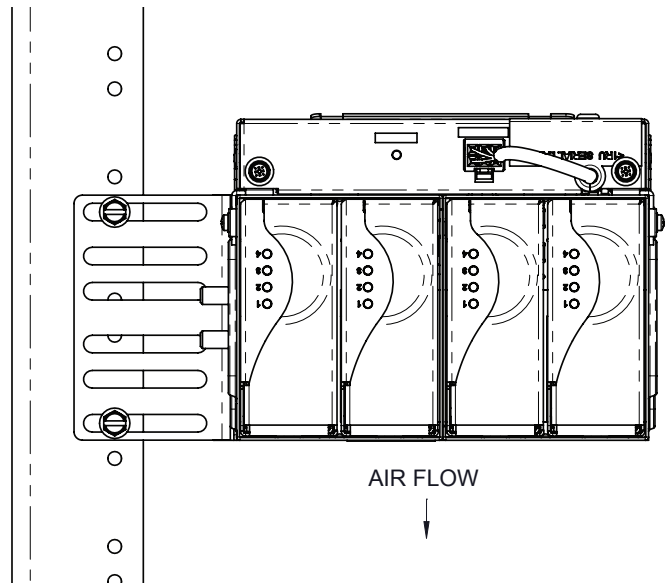


Figure 30 — Rack Mount (left side), LPS modules upside down

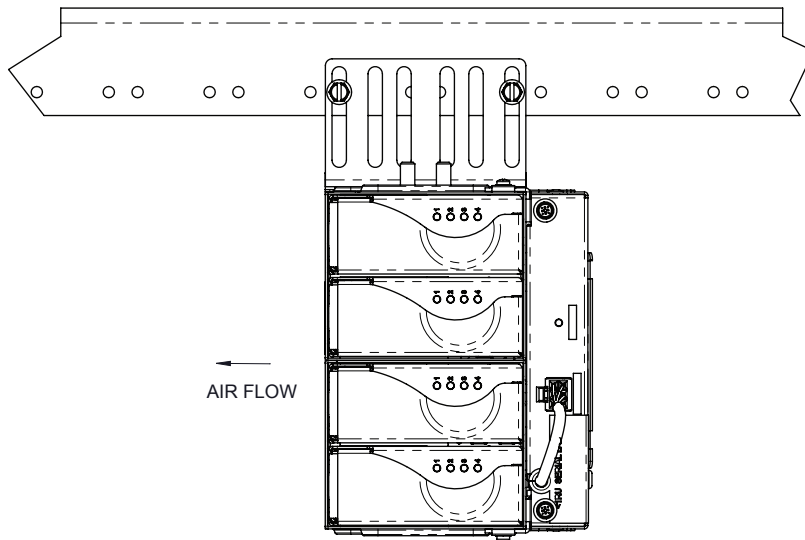


Figure 31 — Mounted Sideways (front of unit)

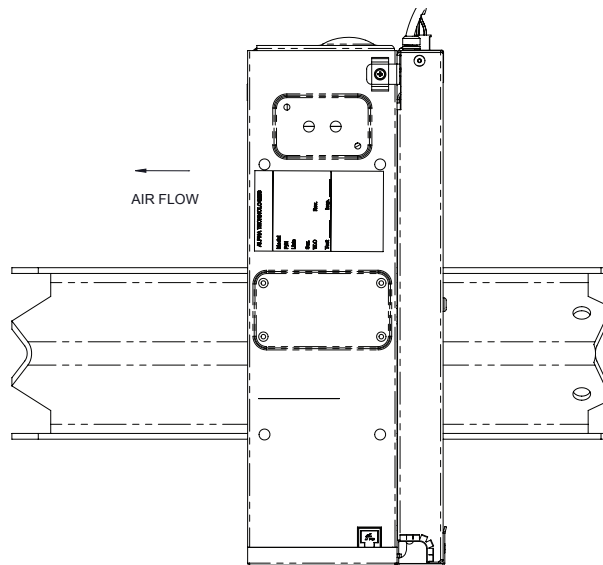
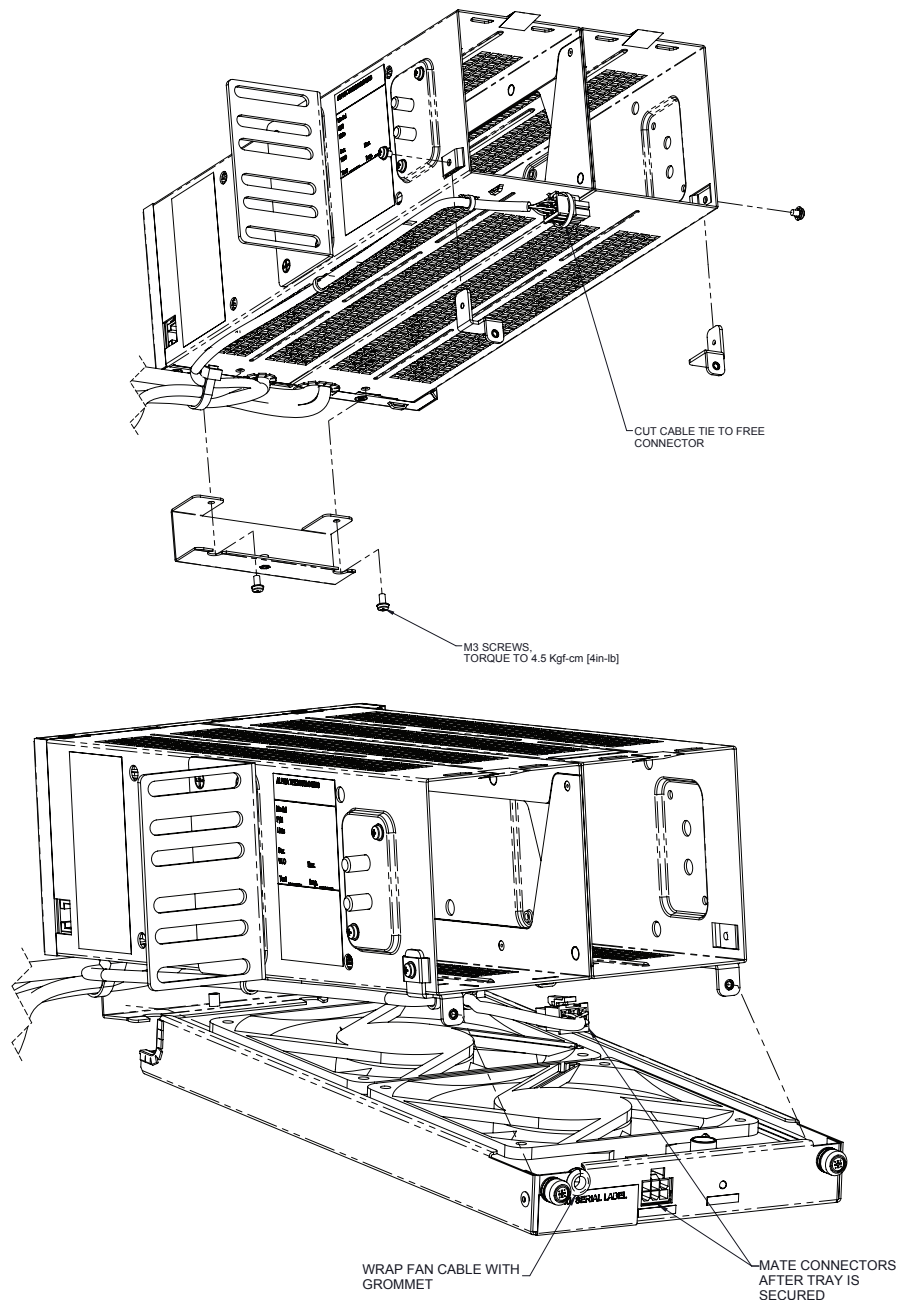


Figure 32 — Mounted Sideways (back of unit)

## 6.6.2 Fan Tray Installation

Fan tray installation should be completed before the shelf is mounted to the rack.

1. Assemble the fan holding cradle to the rear bottom of the shelf, secure with two screws.
2. Attach two fan mount brackets to the front, left and right side of the shelf and secure with screws on both sides.
3. Cut the cable tie holding the fan connector to free the fan wire.
4. Remove the wire grommet from the fan tray and wrap it on fan wire about 1-1/2" from the connector.
5. Slide the back side of the fan tray to the cradle at an angle.
6. Insert the wire grommet back to the slot with fan wire, and then move the fan tray front into position so that the two thumb screws can be engaged and tightened.
7. Plug the fan connector to the fan tray.



### 6.6.3 Input and Output Wiring (6" shelf)

This power system is suitable for installation as part of a Common Bonding Network (CBN) and is intended to be used in a DC-I configuration (isolated from frame ground).

This system is intended to be used with a -48Vdc rectifier/ battery system at the input, and surge protectors and line terminators at the output.

### 6.6.4 Wiring Chassis Ground

Protective earthing terminals are provided for chassis ground at the left front side of LPS36 Compact. If necessary, the terminal can be moved to the right side. Undo the two screws securing the terminal plate and move it to the right side, use the same two screw to secure the terminal plate.

1. Connect the power system chassis to the master ground bus (MGB). This connection is necessary for personnel safety and to meet many telco-grounding requirements.
2. Use minimum #6 AWG (16mm) copper wire and standard 2-hole crimp lugs for 1/4" studs on 5/8" centers.
3. Secure the lugs with 1/4-20 serrated flanged nuts (supplied) to provide the anti-rotation necessary for primary ground connections.
4. The screws for securing the ground terminal plate can also be reoriented on the opposite side of the module.

For additional information refer to the Customer Connections drawings at the end of this manual (0300189-08).

Recommended torque values	
1/4-20	105 in-lb [12 N-m]

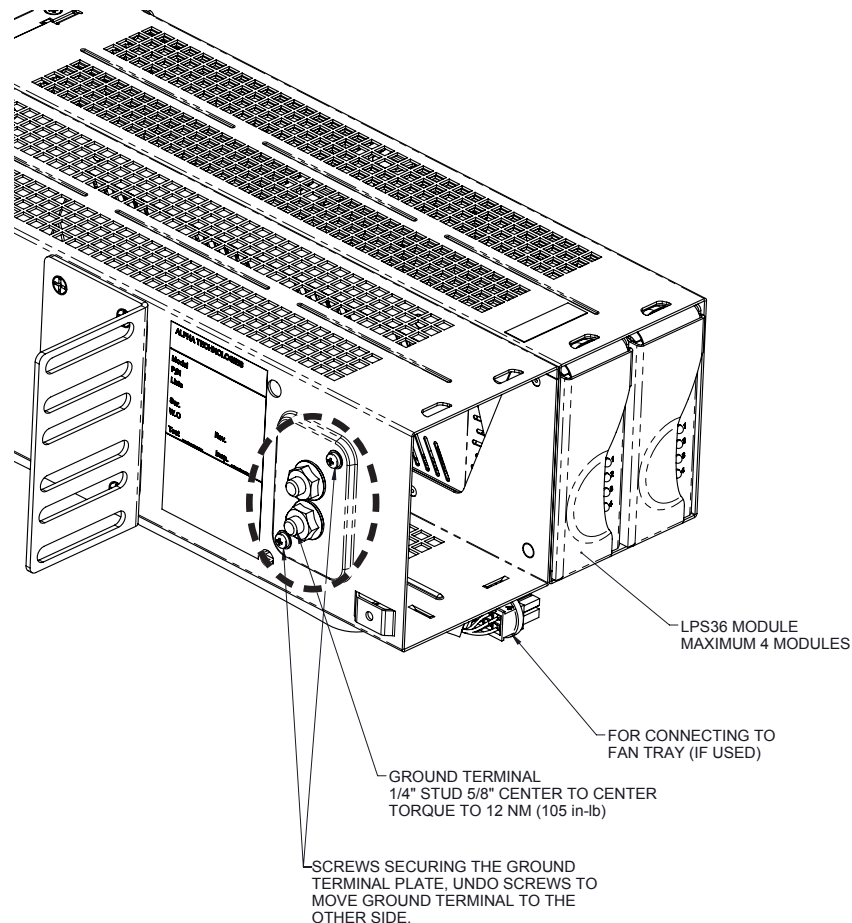


Figure 33 — Locations for Chassis Ground (LPS36 Compact, side view)



### 6.6.5 Connecting the DC Input

**NOTE:**  
Connect the LPS36 Compact to a Safety Extra Low Voltage (SELV) <60VDC input power circuit.

Two #8 AWG wires with Anderson Power Connector SB50 are provided for input connections. A cable kit terminated with 2-hole lugs is available, PN 8700870-001.

Check wire labelling for connecting to proper polarity.

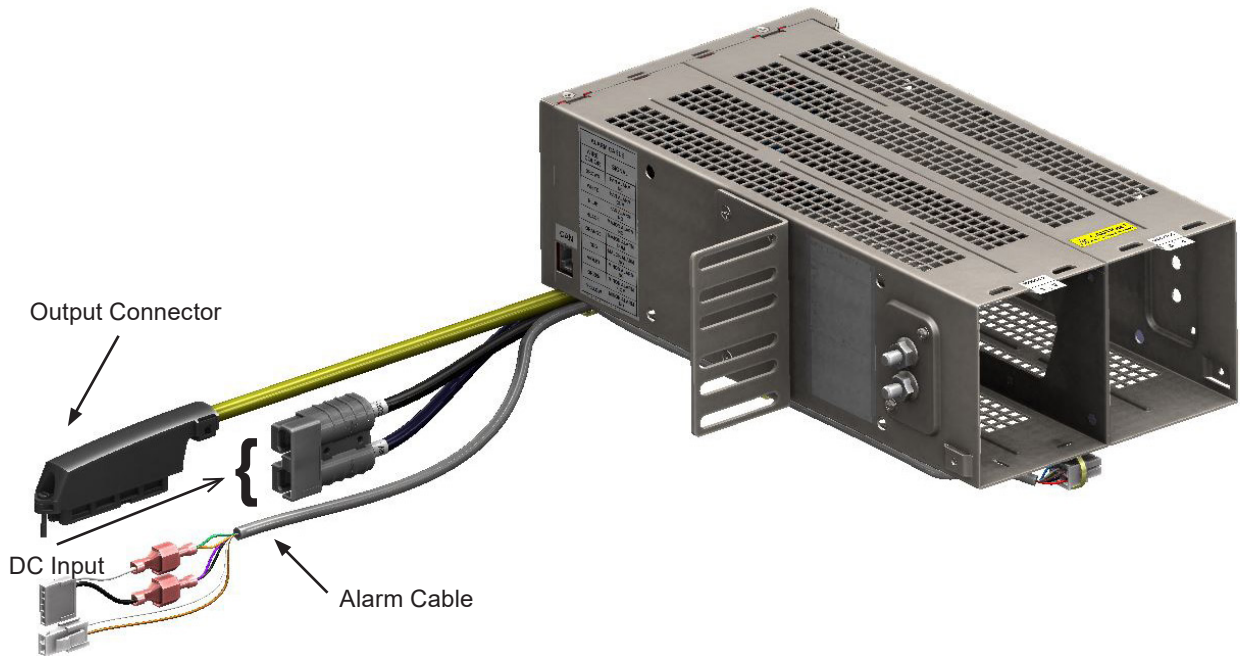


Figure 34 — DC Input Connections

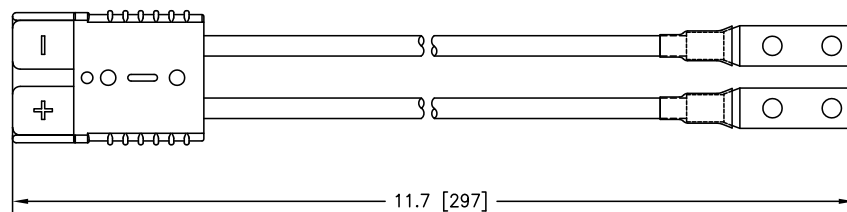


Figure 35 — DC Input Cable Kit Accessory (ordered separately)

### 6.6.6 Alarm Cable Designation

Two Form C contacts are available for Major and Minor alarms for the LPS modules. If a fan tray is used, a separate Form C contact is also provided in case of fan failure. All these alarms are available via the alarm cable, refer to the PIN Assignment table in Figure 36.



**NOTE:**

The LPS36 Compact is shipped with the Major and Minor alarm contacts (NC to C) paralleled together through a connector. If an independent alarm is required for each Minor and Major, the cable can be cut to remove the crimp and connector.

ALARM CABLE	
WIRE COLOR	SIGNAL
BROWN	FAN ALARM NC
WHITE	FAN ALARM COM
BLUE	FAN ALARM NO
BLACK	MAJOR ALARM NC
ORANGE	MAJOR ALARM COM
RED	MAJOR ALARM NO
VIOLET	MINOR ALARM NC
GREEN	MINOR ALARM COM
YELLOW	MINOR ALARM NO

Figure 36 — PIN Assignment Table

### 6.6.7 Connecting Power to the Fan Tray

Power to the fans is provided by the converter shelf immediately above it. Plug the cable from the fan tray into the receptacle labeled FAN PWR in the converter shelf above it, see section 6.6.2.

### 6.6.8 Making CAN Connection

The shelf can be connected to an Alpha controller (CXCI HP) via CAN. For CAN connection, refer to the drawings at the end of this manual (0300189-08).

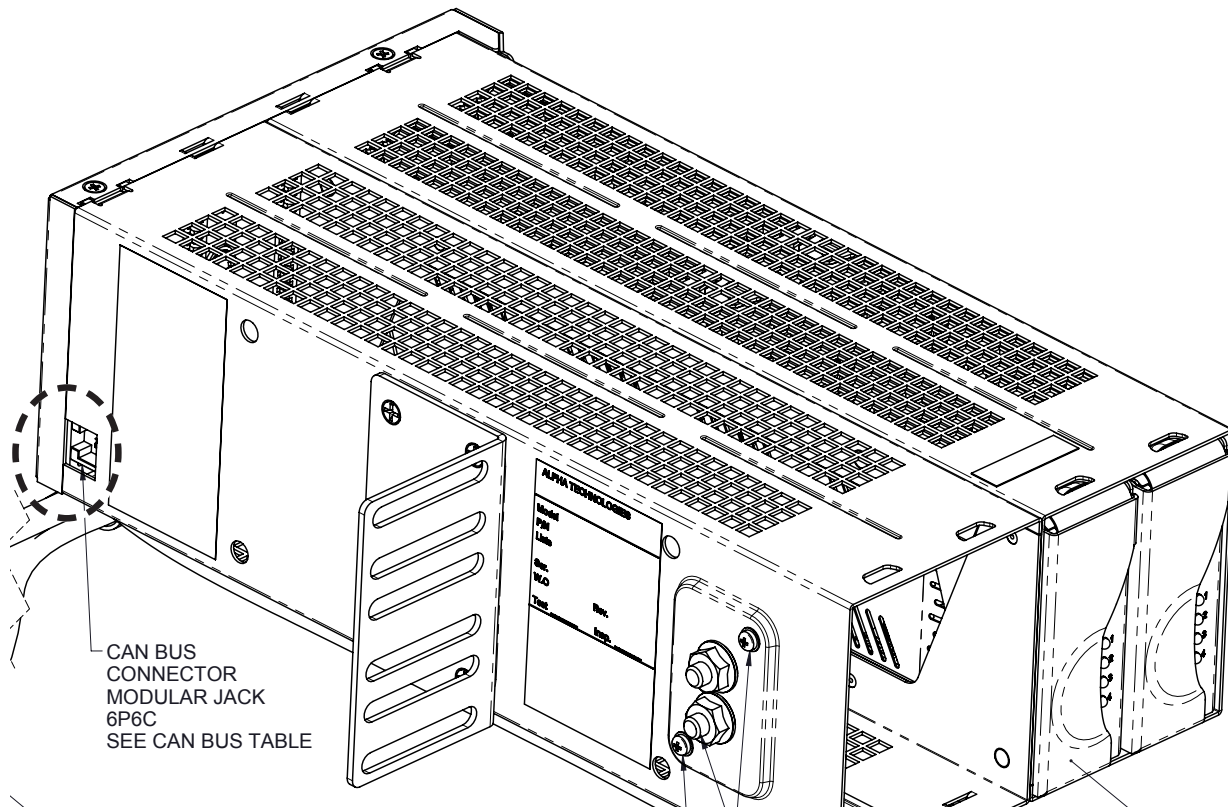


Figure 37 — CAN Connection

## 6.7 Making Load Connections

Connections to the loads are made with amp-champ style 50-pin connectors. (Figure 6 on page 17 shows connector locations.) Refer to Table C on page 41 for connector J1 pinouts and Table D on page 42 for connector J2 pinouts. The pinouts in these tables correspond to firmware version 1.03 or later.

PIN POS	6" Shelf	19" Shelf	23" Shelf	PIN POS	6" Shelf	19" Shelf	23" Shelf
1	Conv1_Ch1-	Conv1_Ch1-	Conv1_Ch1-	26	Conv1_Ch1+	Conv1_Ch1+	Conv1_Ch1+
2	Conv1_Ch2-	Conv1_Ch2-	Conv1_Ch2-	27	Conv1_Ch2+	Conv1_Ch2+	Conv1_Ch2+
3	Conv1_Ch3-	Conv1_Ch3-	Conv1_Ch3-	28	Conv1_Ch3+	Conv1_Ch3+	Conv1_Ch3+
4	Conv1_Ch4-	Conv1_Ch4-	Conv1_Ch4-	29	Conv1_Ch4+	Conv1_Ch4+	Conv1_Ch4+
5	Conv2_Ch1-	Conv2_Ch1-	Conv2_Ch1-	30	Conv2_Ch1+	Conv2_Ch1+	Conv2_Ch1+
6	Conv2_Ch2-	Conv2_Ch2-	Conv2_Ch2-	31	Conv2_Ch2+	Conv2_Ch2+	Conv2_Ch2+
7	Conv2_Ch3-	Conv2_Ch3-	Conv2_Ch3-	32	Conv2_Ch3+	Conv2_Ch3+	Conv2_Ch3+
8	Conv2_Ch4-	Conv2_Ch4-	Conv2_Ch4-	33	Conv2_Ch4+	Conv2_Ch4+	Conv2_Ch4+
9	Conv3_Ch1-	Conv3_Ch1-	Conv3_Ch1-	34	Conv3_Ch1+	Conv3_Ch1+	Conv3_Ch1+
10	Conv3_Ch2-	Conv3_Ch2-	Conv3_Ch2-	35	Conv3_Ch2+	Conv3_Ch2+	Conv3_Ch2+
11	Conv3_Ch3-	Conv3_Ch3-	Conv3_Ch3-	36	Conv3_Ch3+	Conv3_Ch3+	Conv3_Ch3+
12	Conv3_Ch4-	Conv3_Ch4-	Conv3_Ch4-	37	Conv3_Ch4+	Conv3_Ch4+	Conv3_Ch4+
13	Conv4_Ch1-	Conv4_Ch1-	Conv4_Ch1-	38	Conv4_Ch1+	Conv4_Ch1+	Conv4_Ch1+
14	Conv4_Ch2-	Conv4_Ch2-	Conv4_Ch2-	39	Conv4_Ch2+	Conv4_Ch2+	Conv4_Ch2+
15	Conv4_Ch3-	Conv4_Ch3-	Conv4_Ch3-	40	Conv4_Ch3+	Conv4_Ch3+	Conv4_Ch3+
16	Conv4_Ch4-	Conv4_Ch4-	Conv4_Ch4-	41	Conv4_Ch4+	Conv4_Ch4+	Conv4_Ch4+
17	Empty	Conv5_Ch1-	Conv5_Ch1-	42	Empty	Conv5_Ch1+	Conv5_Ch1+
18	Empty	Conv5_Ch2-	Conv5_Ch2-	43	Empty	Conv5_Ch2+	Conv5_Ch2+
19	Empty	Conv5_Ch3-	Conv5_Ch3-	44	Empty	Conv5_Ch3+	Conv5_Ch3+
20	Empty	Conv5_Ch4-	Conv5_Ch4-	45	Empty	Conv5_Ch4+	Conv5_Ch4+
21	Empty	Empty	Conv6_Ch1-	46	Empty	Empty	Conv6_Ch1+
22	Empty	Empty	Conv6_Ch2-	47	Empty	Empty	Conv6_Ch2+
23	Empty	Empty	Conv6_Ch3-	48	Empty	Empty	Conv6_Ch3+
24	Empty	Empty	Conv6_Ch4-	49	Empty	Empty	Conv6_Ch4+
25	Empty	Empty	Empty	50	Empty	Empty	Empty

The part number for the mating connector is Tyco 5229912.

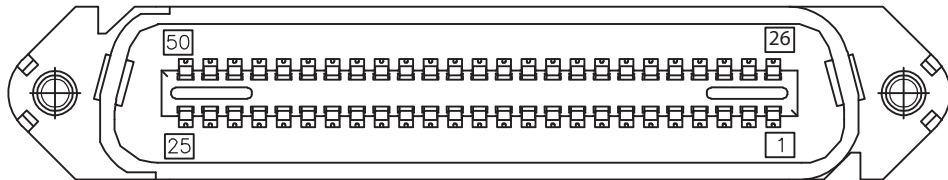


Figure 38 — Connector Pinouts

**Table D — Connector J2 Pinouts (19" and 23" shelves only)**

PIN POS	19" Shelf	23" Shelf	PIN POS	19" Shelf	23" Shelf
1	Conv6_Ch1-	Conv7_Ch1-	26	Conv6_Ch1+	Conv7_Ch1+
2	Conv6_Ch2-	Conv7_Ch2-	27	Conv6_Ch2+	Conv7_Ch2+
3	Conv6_Ch3-	Conv7_Ch3-	28	Conv6_Ch3+	Conv7_Ch3+
4	Conv6_Ch4-	Conv7_Ch4-	29	Conv6_Ch4+	Conv7_Ch4+
5	Conv7_Ch1-	Conv8_Ch1-	30	Conv7_Ch1+	Conv8_Ch1+
6	Conv7_Ch2-	Conv8_Ch2-	31	Conv7_Ch2+	Conv8_Ch2+
7	Conv7_Ch3-	Conv8_Ch3-	32	Conv7_Ch3+	Conv8_Ch3+
8	Conv7_Ch4-	Conv8_Ch4-	33	Conv7_Ch4+	Conv8_Ch4+
9	Conv8_Ch1-	Conv9_Ch1-	34	Conv8_Ch1+	Conv9_Ch1+
10	Conv8_Ch2-	Conv9_Ch2-	35	Conv8_Ch2+	Conv9_Ch2+
11	Conv8_Ch3-	Conv9_Ch3-	36	Conv8_Ch3+	Conv9_Ch3+
12	Conv8_Ch4-	Conv9_Ch4-	37	Conv8_Ch4+	Conv9_Ch4+
13	Conv9_Ch1-	Conv10_Ch1-	38	Conv9_Ch1+	Conv10_Ch1+
14	Conv9_Ch2-	Conv10_Ch2-	39	Conv9_Ch2+	Conv10_Ch2+
15	Conv9_Ch3-	Conv10_Ch3-	40	Conv9_Ch3+	Conv10_Ch3+
16	Conv9_Ch4-	Conv10_Ch4-	41	Conv9_Ch4+	Conv10_Ch4+
17	Empty	Conv11_Ch1-	42	Empty	Conv11_Ch1+
18	Empty	Conv11_Ch2-	43	Empty	Conv11_Ch2+
19	Empty	Conv11_Ch3-	44	Empty	Conv11_Ch3+
20	Empty	Conv11_Ch4-	45	Empty	Conv11_Ch4+
21	Empty	Conv12_Ch1-	46	Empty	Conv12_Ch1+
22	Empty	Conv12_Ch2-	47	Empty	Conv12_Ch2+
23	Empty	Conv12_Ch3-	48	Empty	Conv12_Ch3+
24	Empty	Conv12_Ch4-	49	Empty	Conv12_Ch4+
25	Empty	Empty	50	Empty	Empty

## 6.8 System Startup

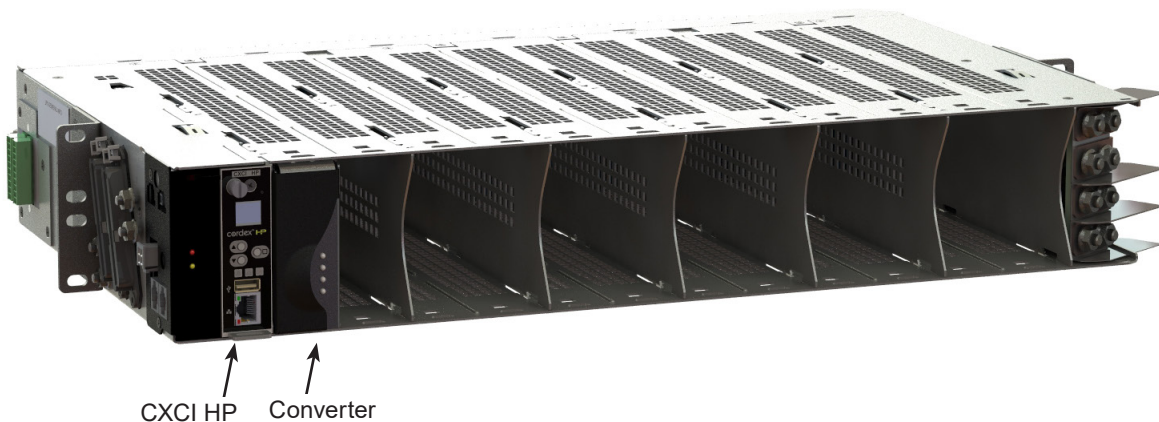
To ensure proper operation, perform the following startup and test procedure after completing the system installation wiring.

### 6.8.1 Procedure (6"/19"/23", without controller)

- Start with DC input breakers off.
- Connect the dry contacts.
- Install the converters in the slots.
- Turn on the DC breakers.

### 6.8.2 Procedure with controller (19"/23")

- Start with DC input breakers off.
- Install the CXCI HP into the left-most position. (19"/23" shelf options only). The 6" may be connected to a controller in a rectifier shelf via CAN (see "6.6.8 Making CAN Connection" on page 40).
- Install the converters in the slots.
- Turn on the DC breakers.



### 6.8.3 CXCI HP Controller Setup

- Set the network IP parameters to factory default.  
IP address: 10.10.10.201  
Subnet mask: 255.255.255.0
- Connect a laptop to the controller with a network cable.
- Laptop IP network settings (Start > Control Panel):  
IP address; 10.10.10.202  
Subnet mask: 255.255.255.0
- In the web address bar, enter 10.10.10.201.
- Login to the controller:  
User name: admin  
Password: admin
- Go to **Controller > Configure Controller > Date and Time** to set the correct date and time.

## 6.9 Creating a Line Power System

On a brand new controller, there is no existing line power system. You can create a new system from scratch or import one from a configuration file that contains a system from another controller. The current software release, only supports a single line power system per controller, which means that if a system already exists on the controller, the option to create a converter system will not be available.

A new power system can be created from the controller LCD or the web, via the **Controller > Inventory** or the **Modules > Unassigned Modules** menu. A wizard will help step you through the process to create the new system. The button to create a new system is only available if an LPS does not yet exist.

For detailed information on the controller go the Alpha website to download the software manual (0350058-J0).

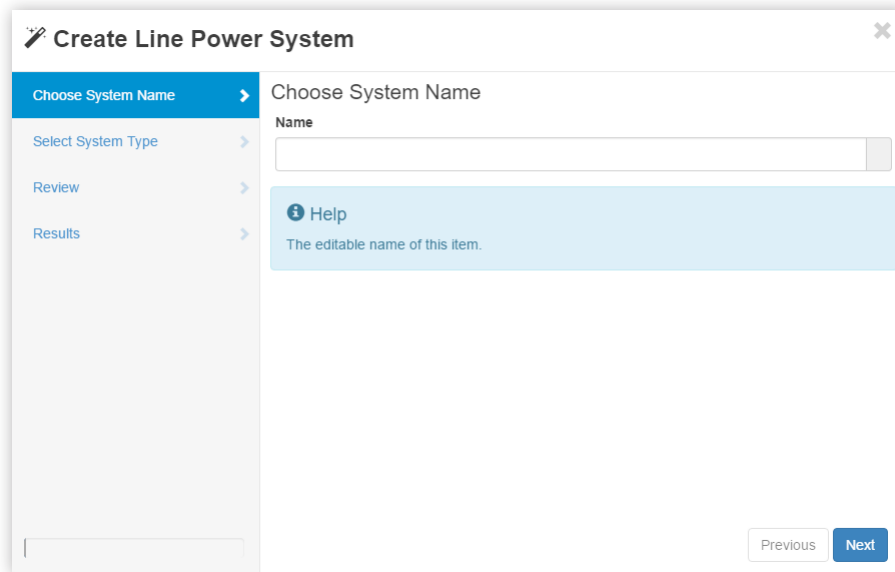


Figure 39 — Line Power System Wizard

## 6.10 Configuring a Line Power System

### 6.10.1 Quick Reference Map: Configuring a Line Power System

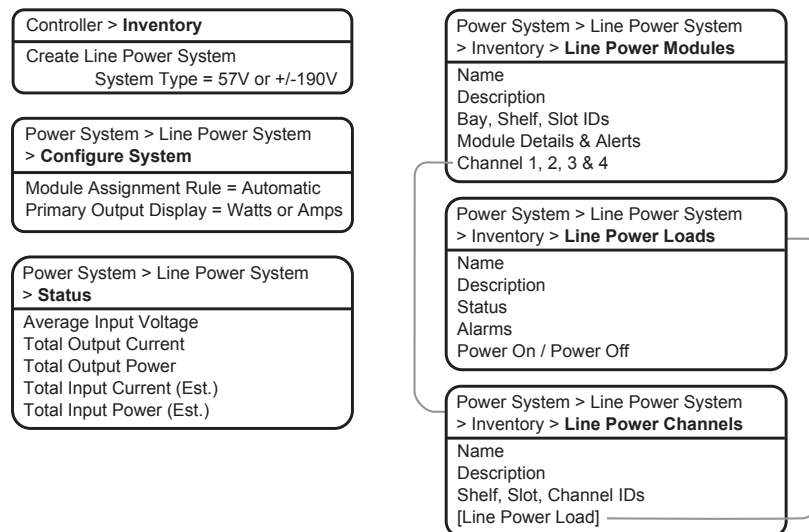


Figure 40 — Quick Reference: Configure a Line Power System

The new system will have a reasonable set of defaults and associated alarms where possible. Optional configurable values, such as name, description, system number, can be used to describe and organize your system.

The **Module Assignment Rule** setting controls how newly discovered LP modules are treated. The two options are **Manual** and **Automatic**. The **Manual** setting, groups all new LP modules into **Unassigned Modules**. Then you can add them to the system manually. Selecting **Automatic** adds new, compatible LP modules to the system automatically. This is usually the preferred setting.

You can configure the alarms associated with the LP system. You can enable or disable the alarms, change the priority, map relays to the alarms, and where applicable, modify the thresholds.

To create a Line Power System:

1. Go to **Controller > Inventory**.
2. Click **Create Line Power System**. Name the system if required.
3. From the **Select System Type** drop down, select the value that corresponds to your LPS module type. If there are modules already connected to the controller, this will be preselected with the correct option.
4. Follow the rest of the wizard instructions.

## 6.11 Configure the Line Power Modules

There are two settings that are applied to all LPS modules: **Input Voltage Low Shutdown** and **Input Voltage Low Restart**.

When the input voltage falls below the low shutdown threshold, the LP modules will power off all output channels. Set this threshold to a value that prevents over-discharge of the battery.

When the input voltage rises above the restart threshold, the units turn back on. The restart threshold must be at least two volts above the shutdown threshold or the LP Module Configuration Error alarm will activate (LPS36 only).

These settings are stored on the LP module itself which means that even if disconnected from the controller the LP modules will still perform in this way.

To configure the LP modules:

1. Go to **Power Systems > Line Power System > Configure System**.
2. From the **Configuration** table, set the **Input Voltage Low Shutdown** threshold to the desired value.
3. In the same table, set the **Input Voltage Low Restart** threshold to the desired value.

Dashboard Controller **Power System** Modules Alarms and Events Shelf Layout

Home / Power System / Line Power System 57V/950 / Configure System

Configuration		
Name	Value	Actions
Name	---	
Description	---	
System Number	---	
System Serial Number	---	
Input Voltage Low Shutdown	42.0 V	
Input Voltage Low Restart	50.0 V	Click to edit

System Properties		
Name	Value	Actions
Module Assignment Rule	Automatic	
Primary Output Display	Watts	

## 6.12 Configure Line Power Channels

Each LP module has four channels that can be given a name, description and assigned to a load. All channels are listed in table that can be sorted and searched. You can also export all channel details to a file.

To configure the channels:

1. Go to **Power System > Line Power System > Inventory > Line Power Channels**. You will see a table of channels in the system. There is also a **Export Channel Details** button to export the information to a .csv file.
2. Channels cannot be added or removed. It is also possible to configure channels and get detailed channel information from **Power System > Line Power System > Inventory > Line Power Modules** and clicking the more details icon for the module.
3. Click the more details icon for the channel you want to configure.
4. In the channel table, assign an optional name and description. This might be a channel address, wire color or customer name.
5. In the channel table, assign an optional **Line Power Load**. To assign a load it is necessary to first create a load. Refer to section 6.13 to do this.

## 6.13 Configure the Line Power Loads

A line power load represents the remote load that is powered by the LP module channels. Create a load when you want to monitor and alarm separate remote loads. Creating a load allows all channels that have been assigned to the load to be powered on or off as a group. To turn all the channels assigned to a load on or off, use the **Power On** or **Power Off** buttons on the **Configuration** table.

You may add or remove loads as needed. Removing a load does not affect the power delivered.

**Note:** To assign channels to a load, refer to the section on **LPS Layout** or **Configure Line Power Channels**.

To configure the loads:

1. Go to **Power Systems > Line Power System > Inventory > Line Power Loads**. You will see a table for loads in the system. This table shows how many channels are assigned to the load and the loads total output current and power. Add or remove loads from this screen.
2. Click the more details icon for the load you want to configure.
3. In the **Configuration** table, assign the load a name and a description. Alpha recommends that you assign the load a name that represents the actual load.
4. Configure the load alarms as needed.

## 6.14 Line Power System Layout

The line power system **Layout** screen shows a graphical view based on the shelf and slot ID as reported by the line power modules. This view allows a convenient way to view module status and to configure and interact with individual channels.

### 6.14.1 Using the Layout Screen to View Module Status

The line power Layout screen provides a convenient way to find the following status information:

- Module shelf and slot position
- Output voltage, power and current for each module
- Module and channel alert status
- Module and channel information (detailed)

The following steps describe how to use the Layout screen to view module and channel status:

1. Go to **Power Systems > Line Power System > Layout**. This screen shows a grid of LP modules organized by shelf ID vertically, and slot ID horizontally. Each module is represented by a rectangle showing the output voltage and the output power for each channel. The information in the rectangle is green to indicate that a module is operating normally.



It is possible to display channel output power or channel output current on this screen. Change the **Primary Output Display** to the desired value in the **System Properties** table at **Power Systems > Line Power System > Configure System**.

2. Select a channel for detailed information. If a module has an active alert then the green turns to red to indicate an alert with the module or with a channel. If the alert is on a specific channel then the specific channel will be highlighted red. If it is module alert only, then the channels will all show green but there will be red border around the module. To get more detail on the active alert, select the channel that has the alert (if it is a module alert select any channel that belongs to the module. This shows a new table with channel details.
3. In the **Channel Details** table, click the more details icon for the **Line Power Module** to view active alert information.
4. In the **Module Alerts** table sort by **Value** to bring the active alerts to the top of the table.

### 6.14.2 Using Screen Layout to Assign Channels to Loads

The line power Layout screen provides a convenient way to:

- View which channels have been assigned to the LP Loads
- Assign channels to LP Load
- Unassign channels from Loads

The following steps describe how to use the Layout screen to view and configure channels assigned to LP Loads:

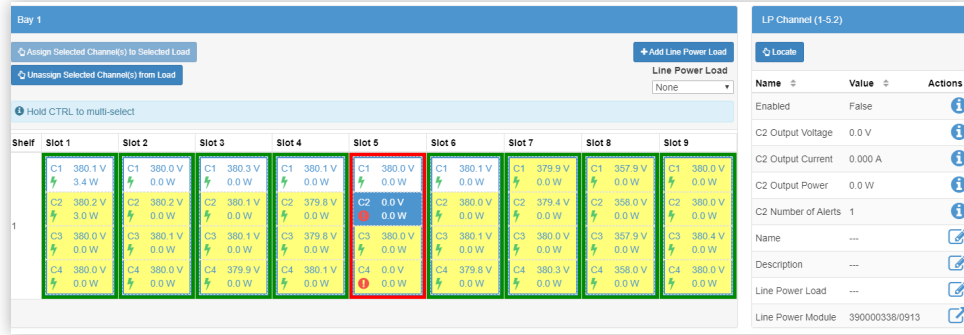
1. Navigate to **Power Systems > Line Power System > Layout**. At the top of the table notice that there is a drop down box to choose one of the LP loads. If no load have been created, navigate to **Power Systems > Line Power System > Inventory > Line Power Loads** and create one now.

Shelf	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9
1	C1 380.0 V 3.4 W	C1 380.1 V 0.0 W	C1 380.0 V 0.0 W	C1 380.0 V 0.0 W	C1 380.2 V 0.0 W	C1 380.0 V 0.0 W	C1 380.3 V 0.0 W	C1 380.1 V 0.0 W	C1 380.0 V 0.0 W
	C2 380.4 V 3.0 W	C2 379.9 V 0.0 W	C2 379.9 V 0.0 W	C2 380.0 V 0.0 W	C2 380.1 V 0.0 W	C2 379.9 V 0.0 W	C2 380.0 V 0.0 W	C2 379.8 V 0.0 W	C2 380.1 V 0.0 W
	C3 380.0 V 0.0 W	C3 380.0 V 0.0 W	C3 380.1 V 0.0 W	C3 380.0 V 0.0 W	C3 380.2 V 0.0 W	C3 380.1 V 0.0 W	C3 380.3 V 0.0 W	C3 380.3 V 0.0 W	C3 379.8 V 0.0 W
	C4 380.1 V 0.0 W	C4 380.0 V 0.0 W	C4 380.1 V 0.0 W	C4 380.1 V 0.0 W	C4 379.9 V 0.0 W	C4 379.9 V 0.0 W	C4 380.4 V 0.0 W	C4 380.0 V 0.0 W	C4 357.8 V 0.0 W

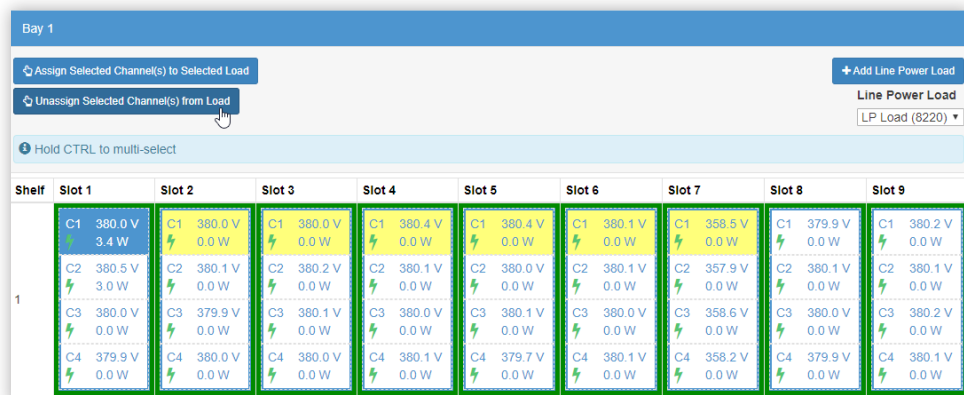
2. Select a load in the drop down box. The channels assigned to this load will appear highlighted as shown below.

Shelf	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9
1	C1 380.1 V 3.4 W	C1 380.0 V 0.0 W	C1 380.3 V 0.0 W	C1 380.1 V 0.0 W	C1 380.0 V 0.0 W	C1 380.1 V 0.0 W	C1 379.9 V 0.0 W	C1 357.9 V 0.0 W	C1 380.0 V 0.0 W
	C2 380.2 V 3.0 W	C2 380.2 V 0.0 W	C2 380.1 V 0.0 W	C2 379.8 V 0.0 W	C2 0.0 V 0.0 W	C2 380.0 V 0.0 W	C2 379.4 V 0.0 W	C2 358.0 V 0.0 W	C2 380.0 V 0.0 W
	C3 380.0 V 0.0 W	C3 380.1 V 0.0 W	C3 380.1 V 0.0 W	C3 379.8 V 0.0 W	C3 380.0 V 0.0 W	C3 380.1 V 0.0 W	C3 380.0 V 0.0 W	C3 357.9 V 0.0 W	C3 380.4 V 0.0 W
	C4 380.0 V 0.0 W	C4 380.0 V 0.0 W	C4 379.9 V 0.0 W	C4 380.1 V 0.0 W	C4 0.0 V 0.0 W	C4 379.8 V 0.0 W	C4 380.3 V 0.0 W	C4 358.0 V 0.0 W	C4 380.0 V 0.0 W

- To add a new channel to the load, select it. The channel rectangle will turn blue to indicate it is selected.



- In the channel details table, click the **Assign** button. This will assign the channel to the load. The **Assign** button will become disabled and the **Unassign** button will become enabled. In the channel details table, the **Line Power Load** field will be populated with the name of the load.
- By default, the **Assign** and **Unassign** buttons are disabled unless a load is selected.



- To unassign a channel from the selected load, click on a highlighted channel and click the **Unassign** button. This will unassign the channel from the load. The **Assign** button will become enabled and the **Unassign** button will become disabled. In the channel details table, the **Line Power Load** field will be set to "- - -"



**NOTE:**

Highlighting a specific channel and then pressing the **Locate** button, enables you to locate the physical LPS module associated with that specific channel.

Once pressed, the LEDs on the selected module cycle briefly for easy identification.

## 6.15 Powering Off and On Line Power Loads

A line power load usually has multiple channels from different LP modules assigned to it. It may be necessary to occasionally power off then power on the load.

To power off or on a load:

1. Go to Power Systems > Line Power System > Inventory > Line Power Loads and click on the details icon for the load to be powered off.
2. In the Status table, verify that the Channels value is at least 1. The Power On/Off buttons will only work if there are one or more channels assigned to the load.
3. In the Configuration table, click the Power Off button. After a few moments the Channels Enabled, Total Output Current and Total Output Power values in the Status table will go to zero. This indicates that the load has been turned off. The Power Off button will become disabled and the Power On button becomes enabled.
4. To turn on the load, press the Power On button.

# 7. Maintenance and Troubleshooting

Although very little maintenance is required with Alpha systems, routine checks and adjustments are recommended to ensure optimum system performance. Qualified service personnel should do the repairs.



## WARNING!

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



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

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

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

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

## 7.1 Troubleshooting Converter Status LEDs

### 7.1.1 Card Alarms (All 4 LEDs)

<b>LED State</b>	<b>Individual Converter status</b>	<b>Action</b>
<b>Green</b>	Normal	None
<b>Blinking Green</b>	Shelf is not compatible with the module	Ensure that the shelf is correct. Note: Slots for the eLimiter+ and LPS36 shelves are mechanically identical and the modules can be interchanged.
	Module not seated properly	Re-seat module
<b>Yellow</b>	Recoverable: • Ambient temperature high	Resets automatically when ambient temperature reduces to approximately 85°C or below.
<b>Blinking Yellow</b>	Input quality not OK	Output is disabled if input voltage is not within the range of 40-60Vdc.
<b>OFF</b>	Recoverable: • No power	Check input wiring.
	Non-recoverable: • Main input fuse cut-off	Potential component failure. Replace with new module.
<b>Chasing Red/Green Pattern</b>	Locate feature enabled	None

## 7.1.2 Individual Channel Alarms

LED State	Individual Converter Status	Action
Green	Normal	None
Blinking Green	Remote shutdown enabled on individual channel/converter	Can be reset by toggling Startup / Shutdown button through the CXCI HP controller.
Blinking Yellow	Recoverable: <ul style="list-style-type: none"> <li>• OCP/Overload</li> <li>• Vout low</li> </ul>	Ensure the load is within rated current. Check that output is within the regulation range.
	Non-recoverable: <ul style="list-style-type: none"> <li>• Converter input fuse fail</li> </ul>	Potential component failure. Replace with new module.
Red	Recoverable: <ul style="list-style-type: none"> <li>• OVP</li> </ul>	OVP will cause the output to restart every two seconds until the fault is removed. If the fault persists for 60 seconds, the output will shutdown for 60 seconds and attempt a restart every 60 seconds until the fault is cleared.
	Non-recoverable: <ul style="list-style-type: none"> <li>• Converter output fuse fail</li> </ul>	Failed fuses are not field replaceable. Replace with new module.
Blinking Red	Recoverable: <ul style="list-style-type: none"> <li>• GFI</li> </ul>	If the fault persists for 60 seconds the output will shutdown for 30 seconds and attempt to restart every 30 seconds until the fault is cleared.

## 7.1.3 Troubleshooting the Fan Tray Status LED

LED State	Module Status	Action	Shelf Size
Green	Normal	None	6", 19", 23"
Blinking Green	Ambient temperature <20°C	None	19", 23"
Yellow	Recoverable: <ul style="list-style-type: none"> <li>• Ambient temperature high</li> </ul>	Resets automatically when ambient temperature reduces to approximately 85°C or below.	19", 23"
Blinking Yellow	Recoverable: <ul style="list-style-type: none"> <li>• Input voltage out of range (high/low)</li> </ul>	Fan operation is disabled if input voltage is not within the range of 40-60Vdc.	19", 23"
	Non-recoverable: <ul style="list-style-type: none"> <li>• Fan voltage low</li> </ul>	Possible component failure. Replace fan tray.	19", 23"
Red	Fan fail	Replace fan tray.	6", 19", 23"

## 7.2 Fan Filter Maintenance and Installation (19/23" only)

Alpha LPS36 Fan Filter use Universal's Quadrafoam™ permanent cleanable filter. The filter needs to be regularly cleaned to remove accumulated dust and debris. The maintenance interval should be set for every 90 days - to be cleaned or replaced.

### 7.2.1 Regular Filter Cleaning Procedure

1. Remove the LPS36 Fan Filter from the Fan Tray. Clean the filter material as follows:
  - Vacuum Clean - A few passes of a vacuum cleaner will remove accumulated dust and dirt in seconds.  
or
  - Blow with compressed air - point compressed air nozzle in opposite direction of operating air flow (blow from exhaust side toward intake side).
2. If dirt persist on the filter after vacuuming or blowing air, it is recommended to proceed with washing:
  - Cold water rinse. Contamination is washed away quickly and easily using just a standard hose nozzle with tap water.  
or
  - Immerse in warm, soapy water - where stubborn air-borne dirt is present, the filter may be dipped in a solution of warm water and mild detergent. Then simply rinse in clear water, let stand until completely dry and free of moisture before returning to normal operation.
3. If the filter still retains visible contamination, it is recommend to replace the LPS36 Fan Filter with a new one.
4. Follow the LPS36 Fan Filter Installation steps in the following section to return to service the cleaned or replacement new Fan Filter.

### 7.2.2 LPS36 Fan Filter Installation Procedure

Use the following steps to install the fan filter in the Alpha LPS36.

1. Make sure the baffle is installed at the bottom of fan tray (19 inch version shown).

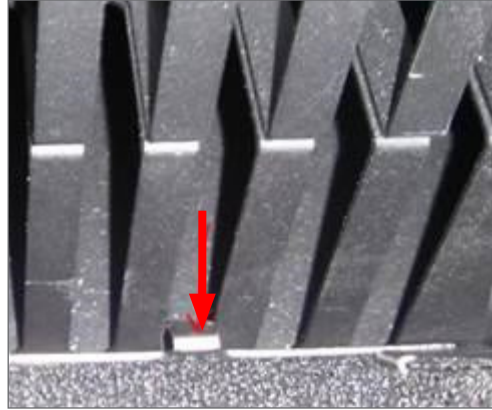


2. Visually align the tabs to the slots so that the filter is covering all slots and angle them less than 30-45° as per blue angle lines (in step 5).

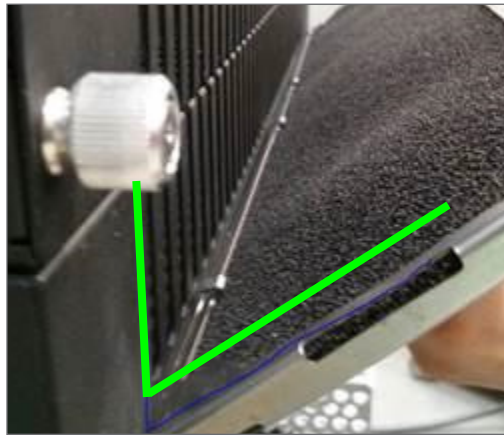


3. It is recommended to align a filter tab to the 4th baffle slot from the left.

- Align a filter tab to 3rd baffle slot from the right.



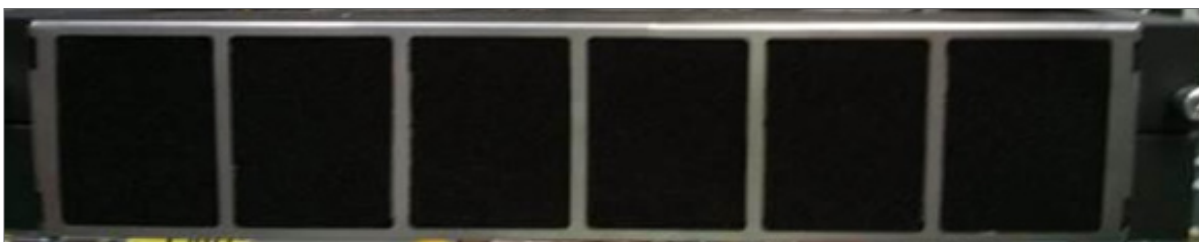
- Angle the filter at 30-45° for visual alignment and then hinge towards the top. Softly push downwards when the filter frame is at approximately 10° to the front face of the fan tray.



- Affix the filter by allowing the top right and left corners to magnetically attach to the fan tray.



Installed fan tray should look like the following image.



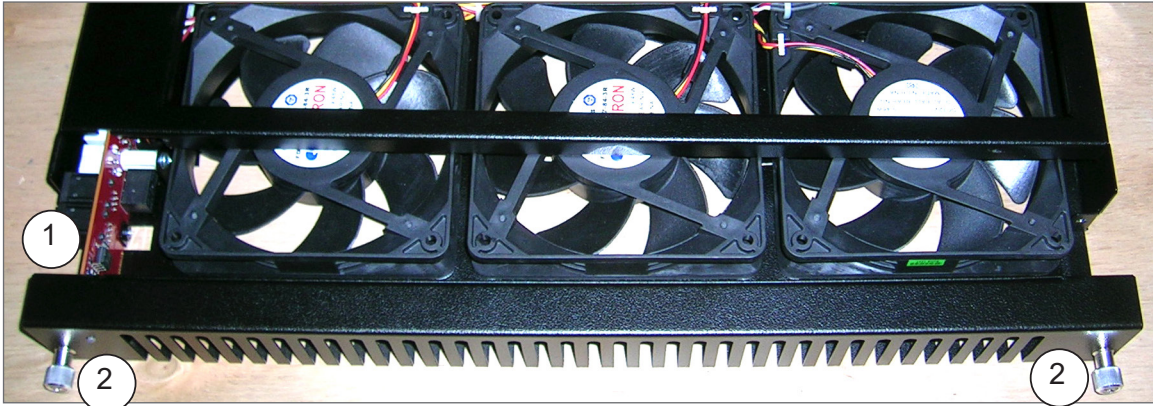
## 7.3 Replacing the Fan Tray

### NOTE:

The recommended maintenance interval for a fan tray is 6-years at 30°C. Individual fans are not replaceable. The fan tray is replaced as a single unit.

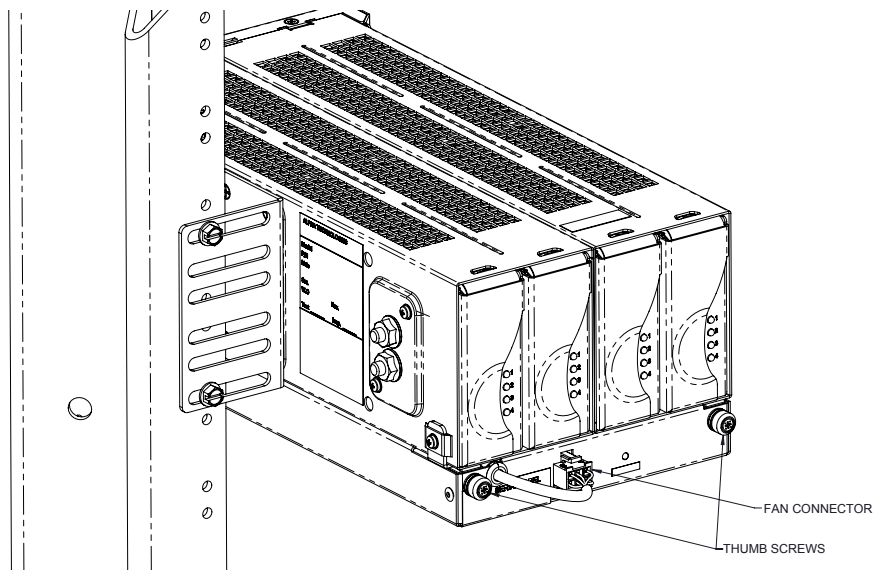
#### 7.3.1 Fan Tray Replacement 19"/23" Shelves

1. Unplug power cable and remove signal wiring, if applicable.
2. Loosen the two front panel screws and slide assembly forward to remove. Replace with new assembly.
3. Re-plug power cable and attach signal wiring if applicable.



#### 7.3.2 Fan Tray Replacement 6" Shelves

1. Disconnect the fan connector.
2. Loosen the two thumb screws securing the fan tray.
3. Drop down the front of the fan tray, remove fan wire and grommet from the slot.
4. Pull the fan tray out to the front gently and remove from the shelf.
5. Slide the back side of the fan tray to the cradle at an angle.
6. Insert the wire grommet back to the slot with fan wire, and then move the fan tray front into position so that the two thumb screws can be engaged and tightened.
7. Plug the fan connector to the fan tray.





## 7.4 Replacing a Converter (when using a controller)

The LPS36 converter modules are plug and play. When a converter module is added to the system, the controller will detect and update the inventory automatically.

Replacing an installed converter requires a manual **Inventory Update** from the controller web interface to clear the removed converter from its current list of rectifiers.

1. Connect a laptop to the controller with a network cable.
2. Laptop IP Network settings (**Start > Control Panel**)
  - IP address: 10.10.10.202
  - Subnet mask: 255.255.255.0
3. Turn off Pop-up Blocker.
4. 10.10.10.201 in the web address bar.
5. Login to the controller:
  - User name: admin
  - Password: admin
6. Go to **Power Systems > Line Power System > Layout** to identify the shelf and slot of the failed module. A module causing an alarm will be highlighted with a red border. If there is more than one module in alert it may be necessary to click on the channel, then click on the module details link to determine the cause of the failure.
7. Unplug the failed module and replace it with a new module.
8. Press the **Forget All in Comms Lost** button in order to clear the **LP Module Comms Lost** alarm.

Once completed, the new module is acquired and its channels are automatically assigned to the same load that the old module was assigned to.

## 7.5 Replacing an Alarm Relay Module (19"/23" only)

The following two procedures cover how to replace an alarm relay for shelves with or without the CXCI HP controller. The system is operational even without the controller during the alarm relay interface board change.

1. Remove the controller using the steps for 'Replacing the Controller' in section .7.4.
2. Leave the locking tab in the 'unlock' position (pushed all the way to the left).

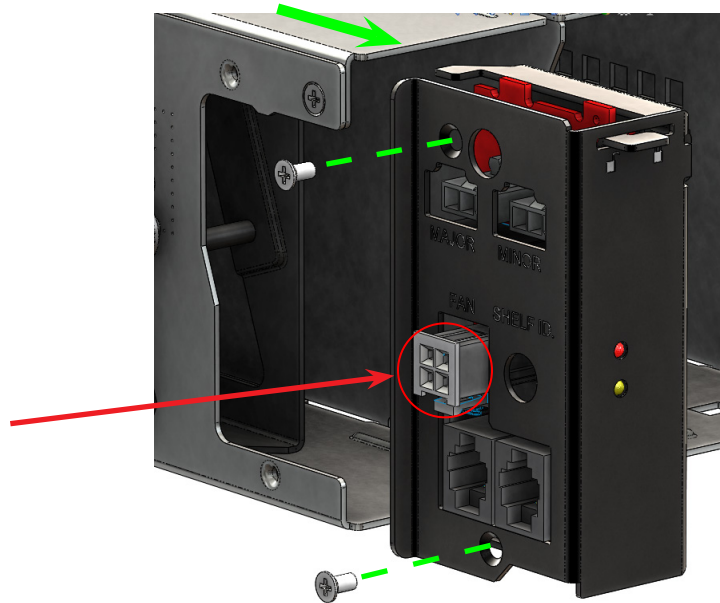


3. Unwind the 2 screws shown in a counterclockwise direction, using a stubby Phillips driver. ATTENTION!! Keep the screws for the replacement kit.
4. Remove the two screws and then slowly slide the entire interface bracket out for about 2 inches. At this distance, the ribbon cable (not shown) should still maintain some slack.

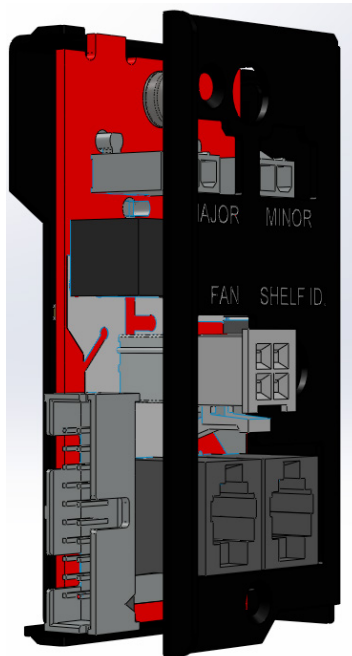


- Carefully disconnect the female end of the 20-pin ribbon cable from the male end socket (shown below). The 20-pin connectors are directional, so you can only place it in one way due to the notch on the male-end and tab design on the female end.

Outlined is part of the fan tray power cable (for reference ) it may or may not to be connected depending on the required system setup .



- Insert the new interface Kit 0380148-001 and reverse the instructions.
  - Make sure that the ribbon cable maintains some slack during the pin connection.



- Re-insert the controller (if applicable).

## 7.6 Spare Parts

Blanking plate kit (contains 2 plates)	0380070-001
Alarm relay replacement kit (19/23")	0380148-001 (includes PCB and bracket)
Fan tray connector (19/23")	8700590-001
Can Bus terminator (19/23")	5450228-001
Fan tray replacement assembly (19")	0300055-004
Fan tray replacement assembly (23")	0300090-004
Fan tray (6")	0300189-002
Input cable kit (6" shelf)	8700870-001

## 8. Warranty Statement and Service Information

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### 8.1 Technical Support

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

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

### 8.2 Warranty Statement

For full information details review Alpha's online Warranty Statement at [www.alpha.ca/support](http://www.alpha.ca/support).

### 8.3 Product Warranty

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

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

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

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

### 8.4 Battery Warranty

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

### 8.5 Warranty Claims

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

Claims must be made online at: [www.alpha.ca](http://www.alpha.ca).

### 8.6 Service Information

For a list of international service centers, refer to the Alpha website: [www.alpha.ca](http://www.alpha.ca)

## 9. 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
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ERM	Electromagnetic Compatibility and Radio Spectrum Matters
ESD	Electrostatic Discharge
FCC	Federal Communications Commission (for the USA)
GFI	Ground fault interrupt
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
OSP	Outside plant
OVP	Over voltage protection
RFT circuit	Remote feeding telecommunication circuit: A secondary circuit within the equipment, intended to supply or receive DC power via a telecommunication network at voltages exceeding the limits for TNV circuits, and on which overvoltages from telecommunication networks are possible.
RFT-V circuit	An RFT circuit, which is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited and the accessible area of contact is limited.
RU	Rack unit (1.75")
SELV	Safety Extra Low Voltage
TCP/IP	Transmission Control Protocol / Internet Protocol
THD	Total harmonic distortion
UL	Underwriters Laboratories

# 10. Certification

## About CSA and NRTL

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

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

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

Alpha rectifier and power system products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 60950-1 (2nd Ed) and UL 60950-1 (2nd Ed). Alpha UPS products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 107.3 and UL 1778.

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

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

### 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

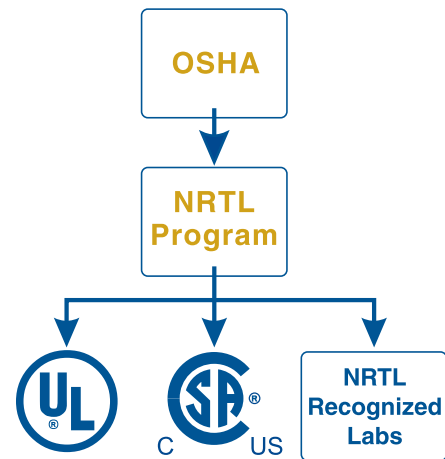
The NRTL Program is both national and international in scope with foreign labs permitted.

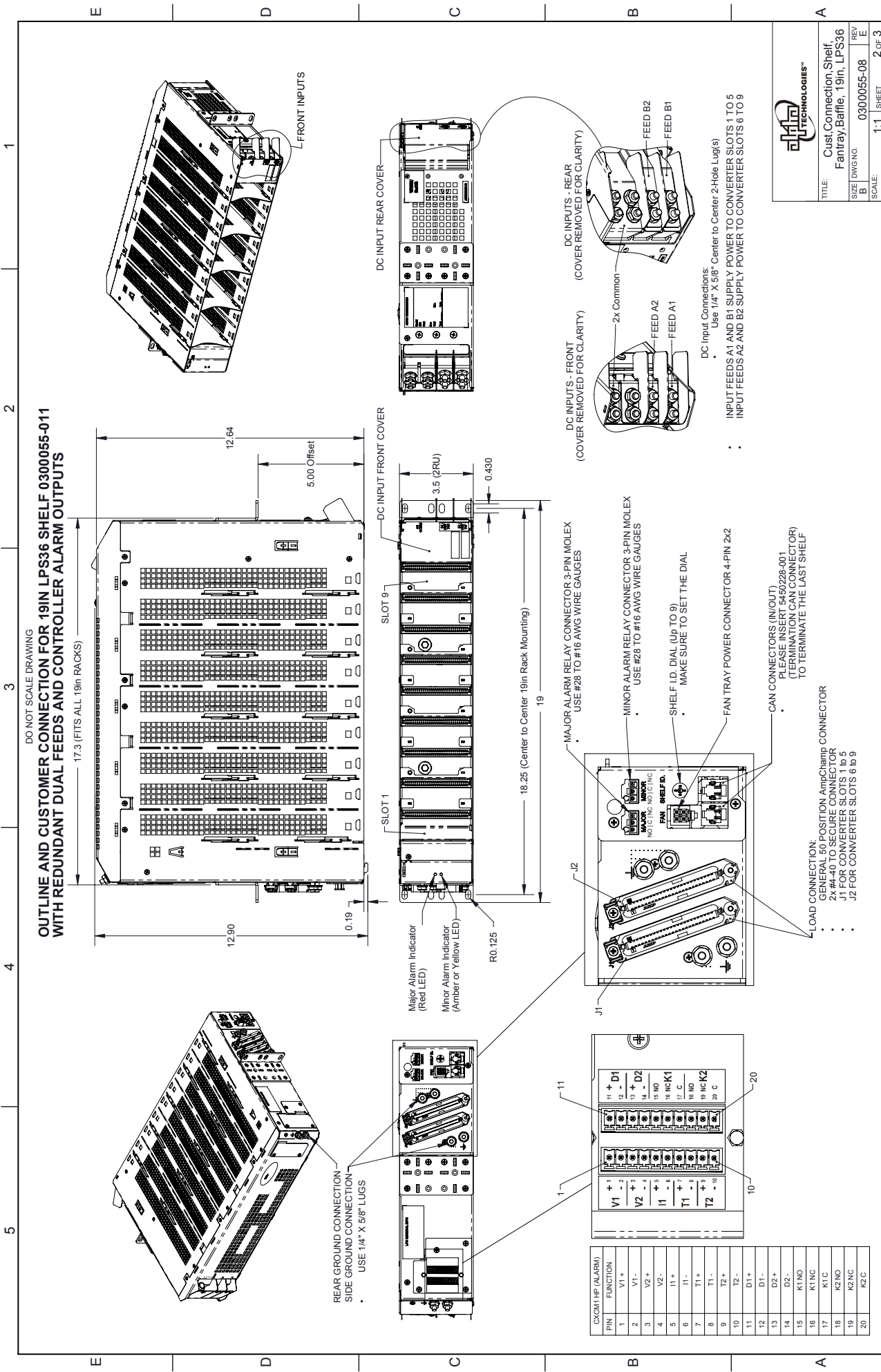
(1) [www.csagroup.org](http://www.csagroup.org)

(2) [www.scc.ca](http://www.scc.ca)

(3) [www.ulc.ca](http://www.ulc.ca)

(4) [www.osha.gov](http://www.osha.gov)





**DO NOT SCALE DRAWING**  
**OUTLINE AND CUSTOMER CONNECTION FOR 19IN LPS36 SHELF 0300055-011**  
**WITH REDUNDANT DUAL FEEDS AND CONTROLLER ALARM OUTPUTS**

17.3 (FITS ALL 19in RACKS)

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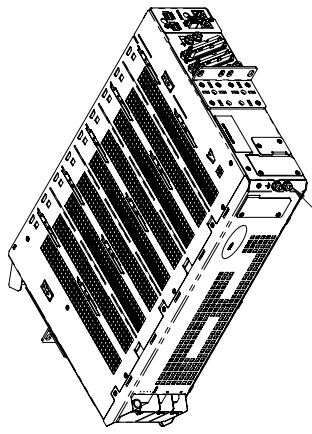
C

B

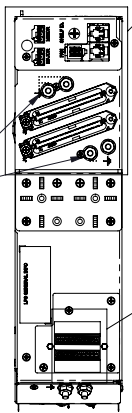
B

A

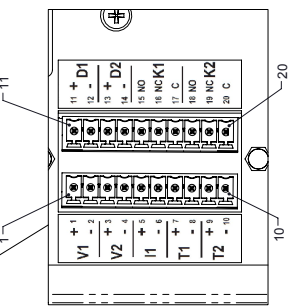
A



REAR GROUND CONNECTION  
 SIDE GROUND CONNECTION  
 USE 1/4" X 5/8" LUGS



PIN	FUNCTION
1	V1 +
2	V1 -
3	V2 +
4	V2 -
5	I1 +
6	I1 -
7	T1 +
8	T1 -
9	T2 +
10	T2 -
11	D1 +
12	D1 -
13	D2 +
14	D2 -
15	K1 NO
16	K1 NC
17	K1 C
18	K2 NO
19	K2 NC
20	K2 C



MAJOR ALARM RELAY CONNECTOR 3-PIN MOLEX  
 USE #28 TO #16 AWG WIRE GAUGES

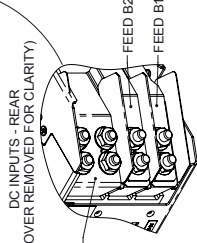
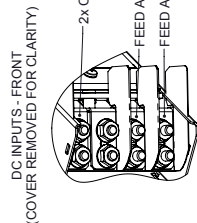
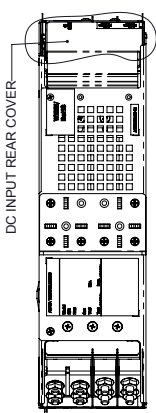
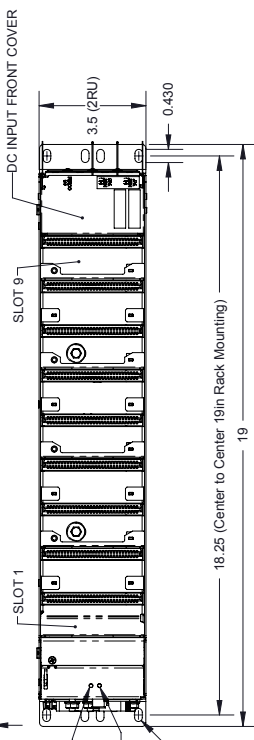
MINOR ALARM RELAY CONNECTOR 3-PIN MOLEX  
 USE #28 TO #16 AWG WIRE GAUGES

SHELF I.D. DIAL (UP TO 9)  
 MAKE SURE TO SET THE DIAL

FAN TRAY POWER CONNECTOR 4-PIN 2x2

CAN CONNECTORS (IN/OUT)  
 PLEASE INSERT 5450228-001  
 (TERMINATION CAN CONNECTOR)  
 TO TERMINATE THE LAST SHELF

LOAD CONNECTION:  
 GENERAL 50 POSITION AmpChomp CONNECTOR  
 2x #4-40 TO SECURE CONNECTOR  
 J1 FOR CONVERTER SLOTS 1 to 5  
 J2 FOR CONVERTER SLOTS 6 to 9



DC Input Connections:  
 Use 1/4" X 5/8" Center to Center 2-Hole Lug(s)

DC INPUTS - FRONT  
 (COVER REMOVED FOR CLARITY)

DC INPUTS - REAR  
 (COVER REMOVED FOR CLARITY)

INPUT FEEDS A1 AND B1 SUPPLY POWER TO CONVERTER SLOTS 1 TO 5  
 INPUT FEEDS A2 AND B2 SUPPLY POWER TO CONVERTER SLOTS 6 TO 9

**ALPION TECHNOLOGIES™**

TITLE: Cust Connection Shelf  
 Fantray, batfile, 19in, LPS36

SIZE DWG NO. 0300055-08

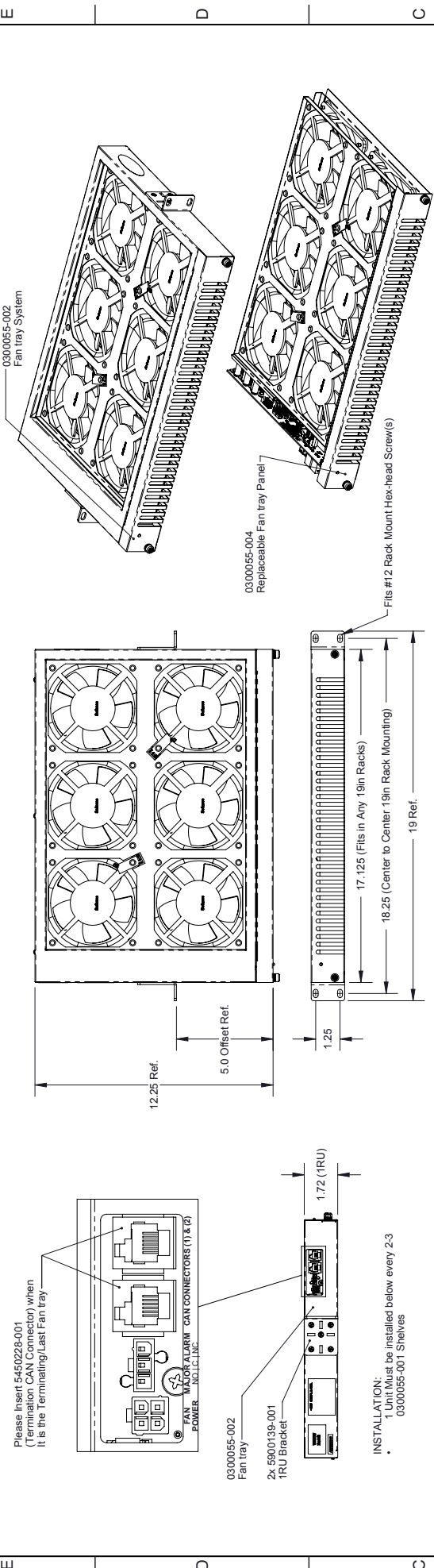
REV E

SCALE: 1:1 SHEET 2 OF 3

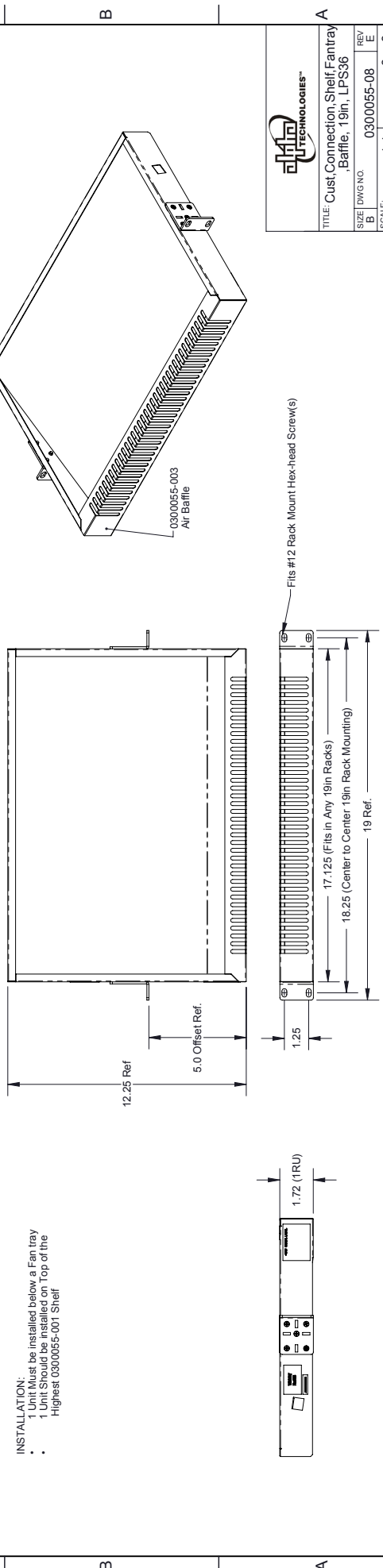


DO NOT SCALE DRAWING

### OUTLINE AND CUSTOMER CONNECTION FOR 19IN FAN TRAY



### OUTLINE AND CUSTOMER CONNECTION FOR 19IN AIR BAFFLE



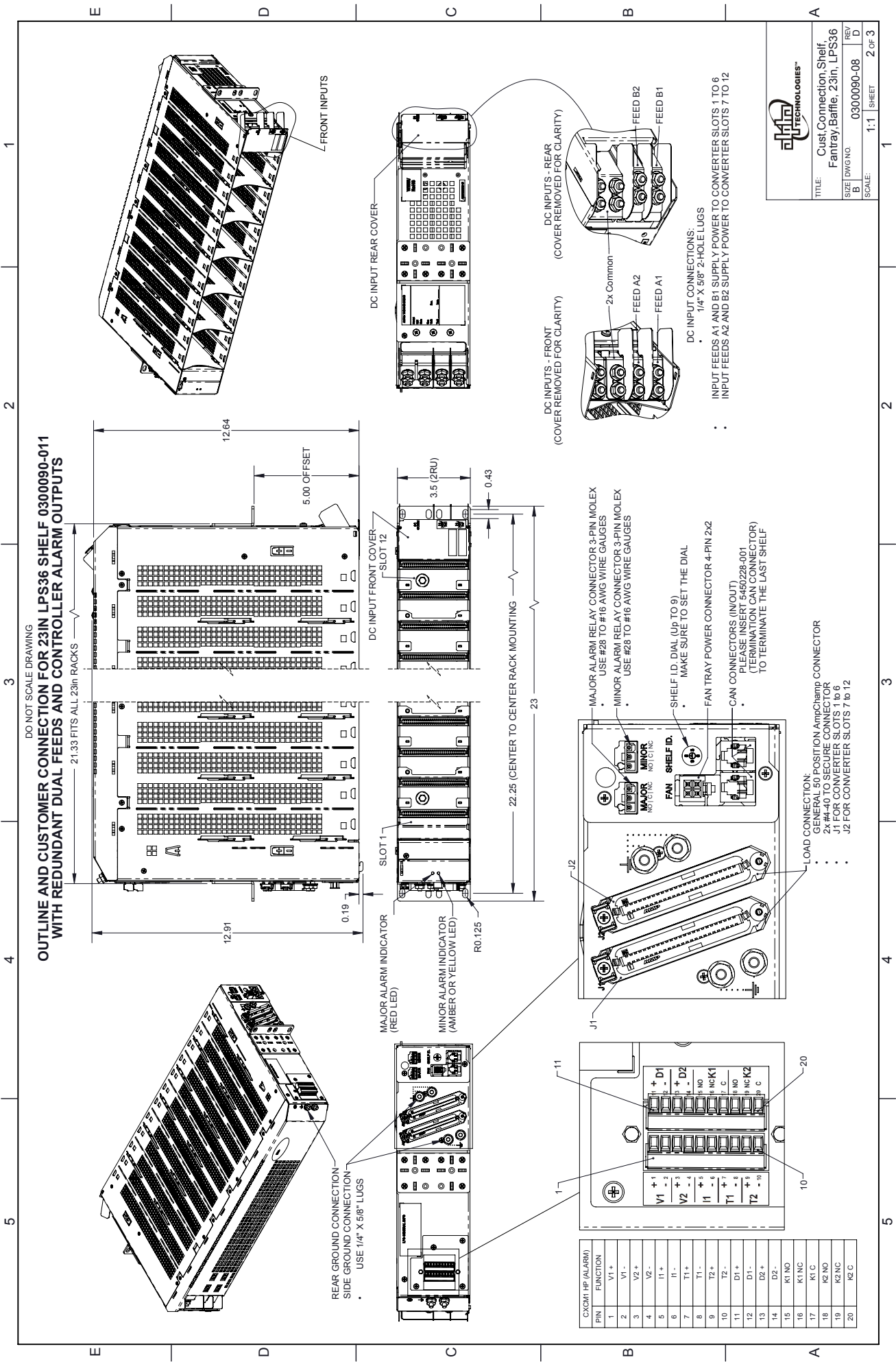
**ALTRON TECHNOLOGIES™**

TITLE: Cust. Connection Shelf Fantray  
 ,Baffle, 19in, LPS36

SIZE	DWG NO.	REV
B	0300055-08	E
SCALE:	1:1	SHEET 3 OF 3

**OUTLINE AND CUSTOMER CONNECTION FOR 23IN LPS36 SHELF 0300090-011 WITH REDUNDANT DUAL FEEDS AND CONTROLLER ALARM OUTPUTS**

DO NOT SCALE DRAWING



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B

C

D

E

TITLE:	Cust Connection Shelf
REV	Fantry, batfile, Z3in, LPS36
SIZE	DWG NO. 0300090-08
B	D
SCALE:	1:1 SHEET 2 OF 3

PIN	FUNCTION
1	V1 +
2	V1 -
3	V2 +
4	V2 -
5	I1 +
6	I1 -
7	T1 +
8	T1 -
9	T2 +
10	T2 -
11	D1 +
12	D1 -
13	D2 +
14	D2 -
15	K1 NO
16	K1 NC
17	K1 C
18	K2 NO
19	K2 NC
20	K2 C

MAJOR ALARM RELAY CONNECTOR 3-PIN MOLEX  
 USE #28 TO #16 AWG WIRE GAUGES  
 MINOR ALARM RELAY CONNECTOR 3-PIN MOLEX  
 USE #28 TO #16 AWG WIRE GAUGES

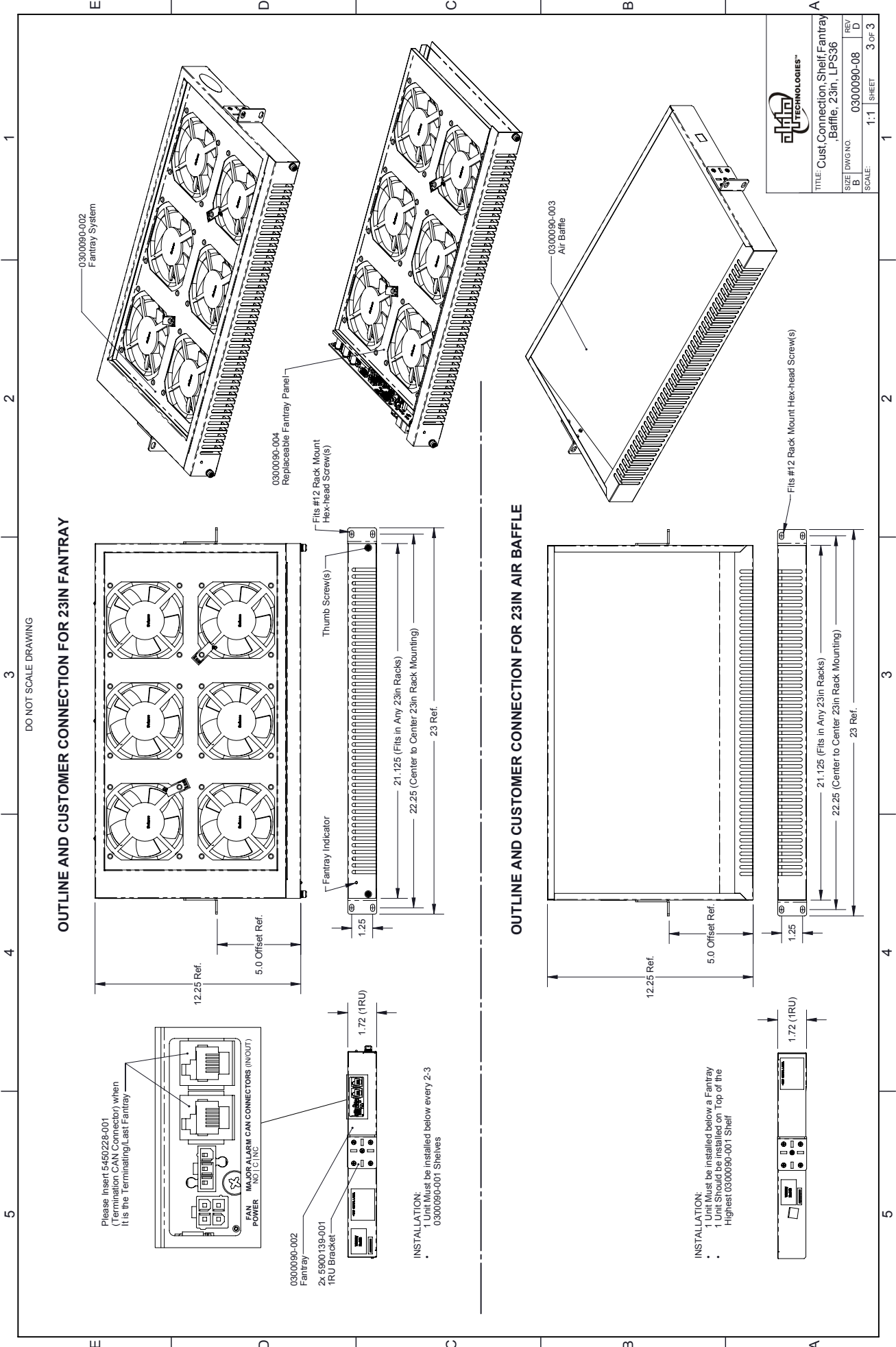
FAN SHELF I.D. (UP TO 9)  
 MAKE SURE TO SET THE DIAL

FAN TRAY POWER CONNECTOR 4-PIN 2X2  
 CAN CONNECTORS (INQUIRY)  
 PLEASE INSERT 5450228-001  
 (TERMINATION CAN CONNECTOR)  
 TO TERMINATE THE LAST SHELF

LOAD CONNECTION:  
 GENERAL 50 POSITION AmpChamp CONNECTOR  
 2x #4-40 TO SECURE CONNECTOR  
 J1 FOR CONVERTER SLOTS 1 to 6  
 J2 FOR CONVERTER SLOTS 7 to 12

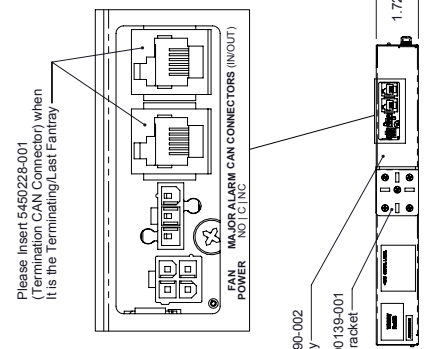
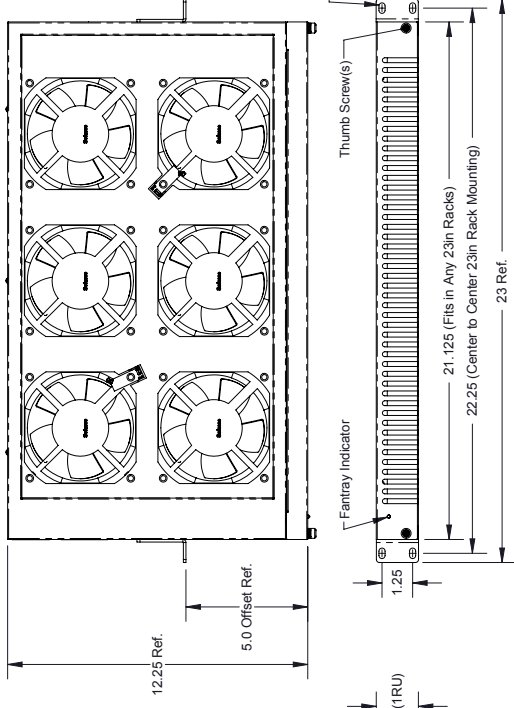
DC INPUT CONNECTIONS:  
 1/4" X 5/8" 2-HOLE LUGS  
 INPUT FEEDS A1 AND B1 SUPPLY POWER TO CONVERTER SLOTS 1 TO 6  
 INPUT FEEDS A2 AND B2 SUPPLY POWER TO CONVERTER SLOTS 7 TO 12





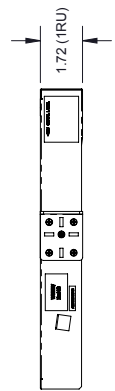
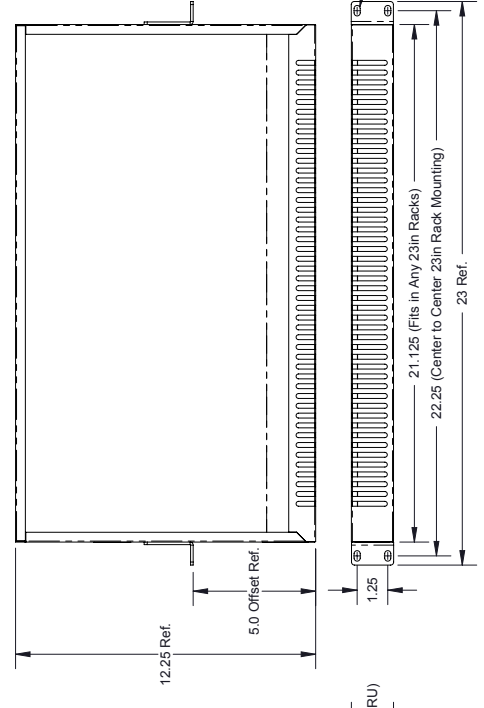
DO NOT SCALE DRAWING

**OUTLINE AND CUSTOMER CONNECTION FOR 23IN FANTRAY**



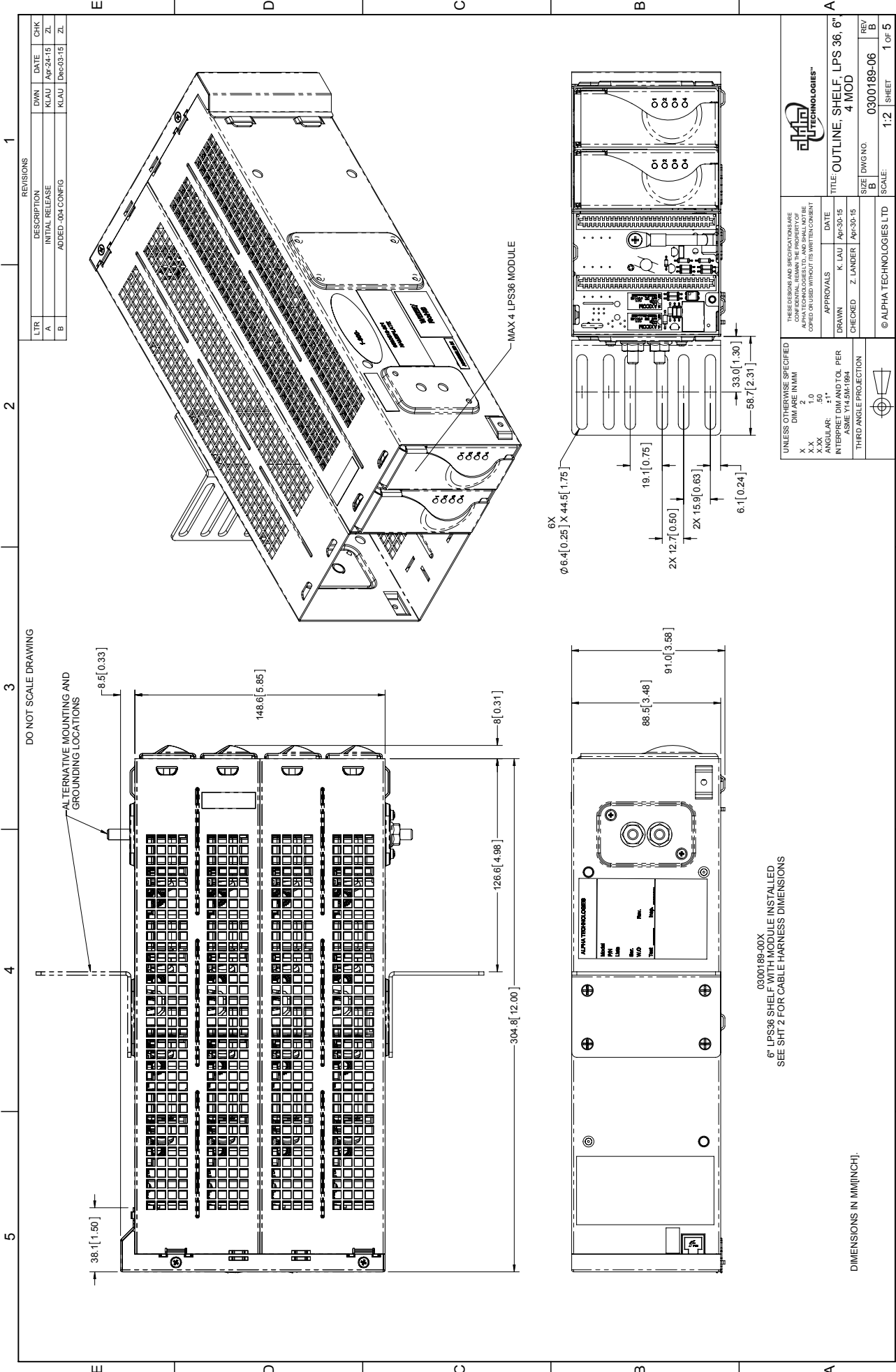
**INSTALLATION:**  
 • Unit must be installed below every 2-3 0300090-001 Shelves

**OUTLINE AND CUSTOMER CONNECTION FOR 23IN AIR BAFFLE**



**INSTALLATION:**  
 • 1 Unit Must be installed below a Fantray  
 • 1 Unit Should be installed on Top of the Highest 0300090-001 Shelf

TITLE: Cust. Connection, Shelf Fantray, Baffle, 23in, LPS36	
SIZE	DWG NO.
B	0300090-08
D	REV
3 OF 3	SHEET
1:1	SCALE



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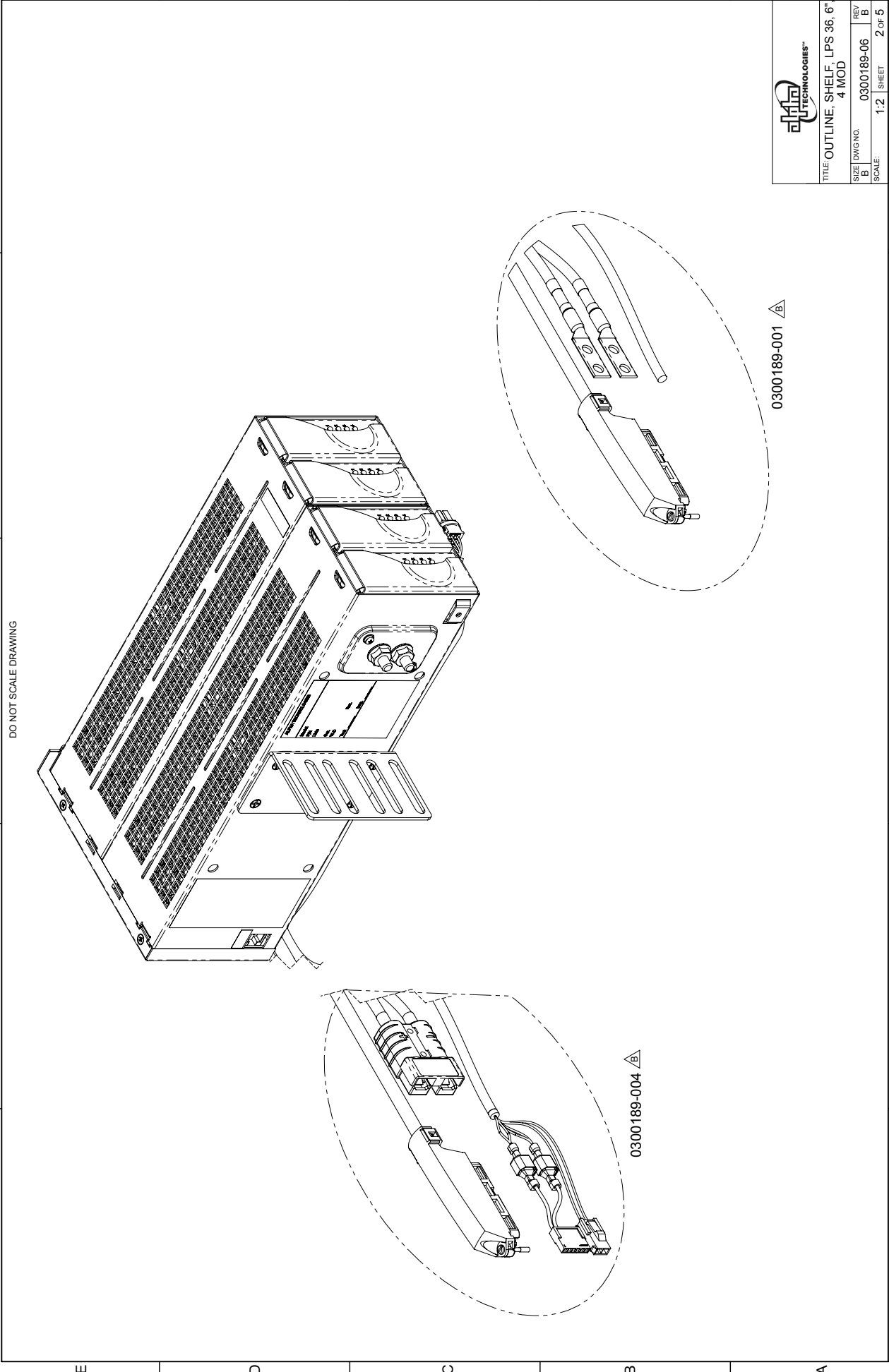
E

D

C

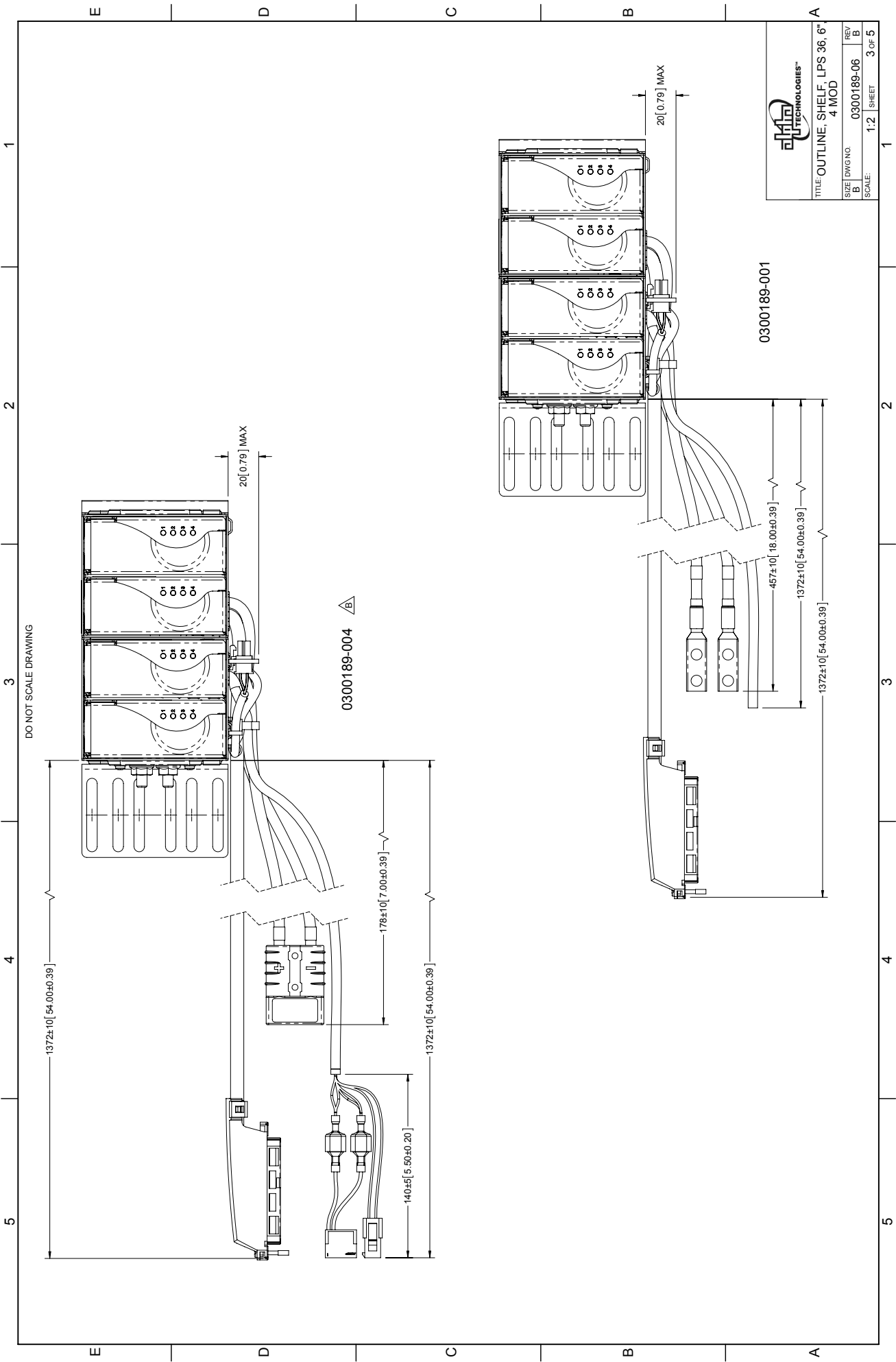
B

A



TITLE: OUTLINE, SHELF, LPS 36, 6",  
4 MOD

SIZE	DWG NO.	REV
B	0300189-06	B
SCALE:	1:2	SHEET 2 OF 5



DO NOT SCALE DRAWING

0300189-004  $\triangle$

0300189-001



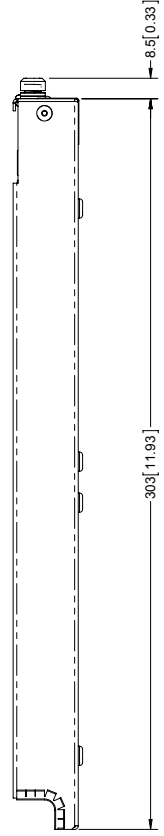
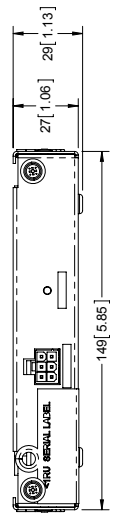
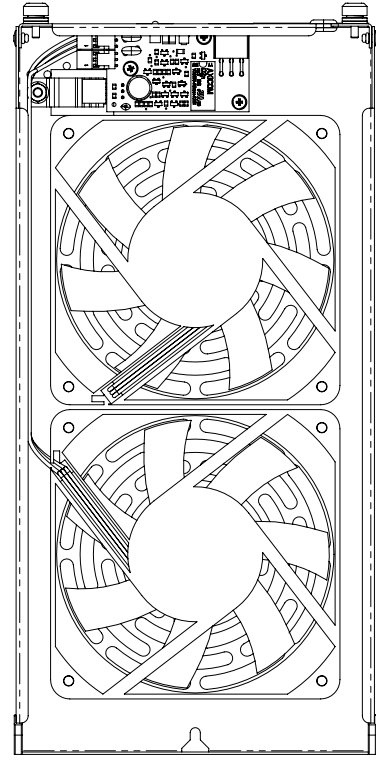
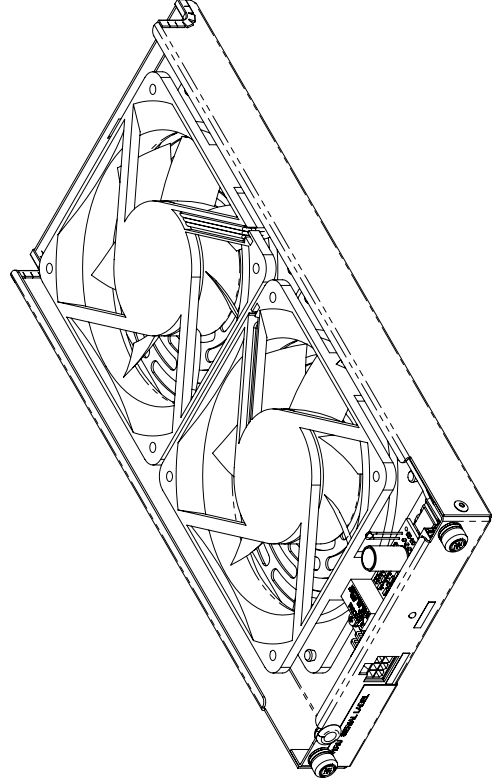
TITLE: OUTLINE, SHELF, LPS 36, 6",  
4 MOD

SIZE	DWG NO.	REV
B	0300189-06	B
SCALE:	1:2	SHEET 3 OF 5

1 2 3 4 5

DO NOT SCALE DRAWING

E D C B A



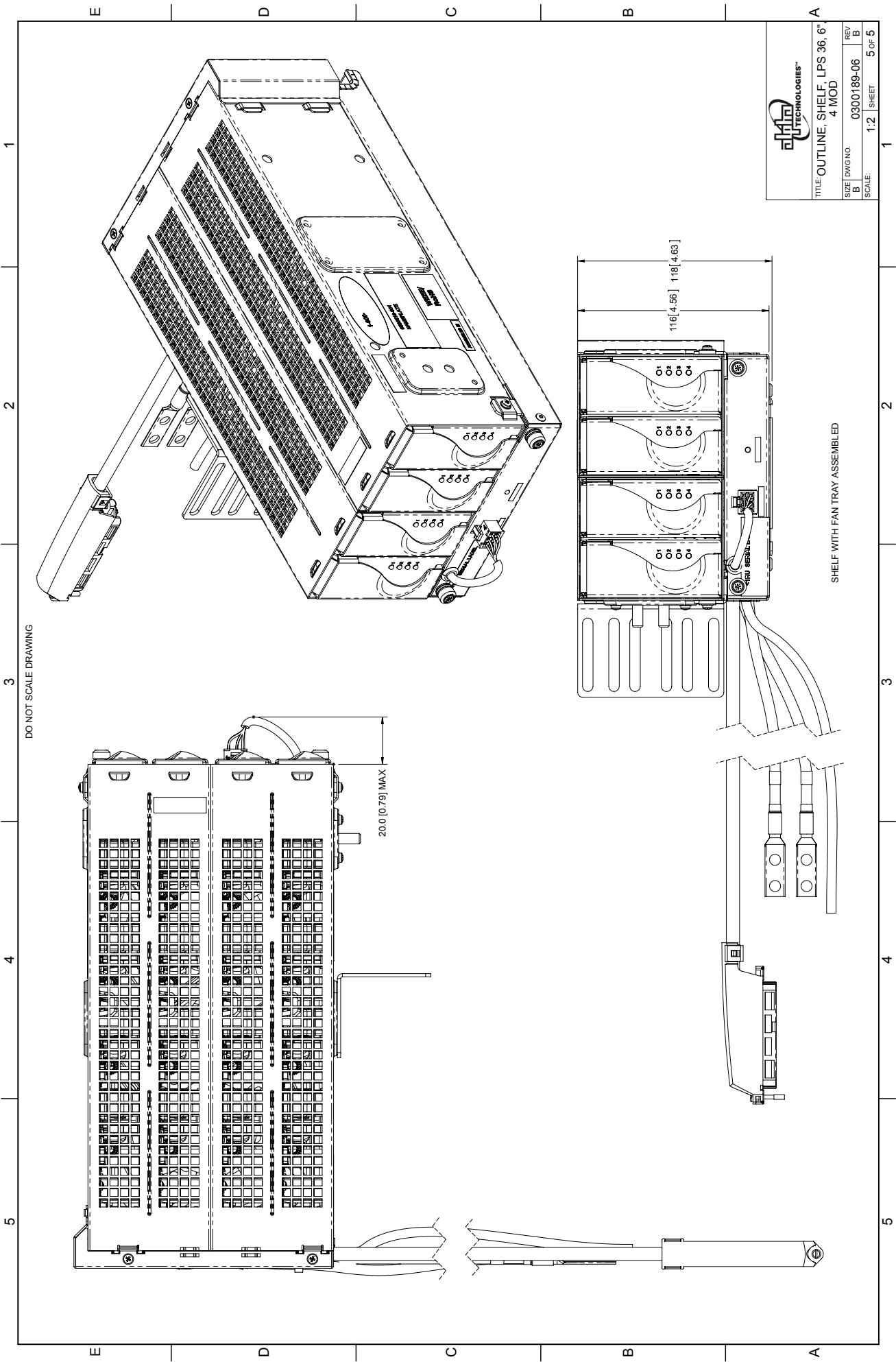
0300189-002  
OPTIONAL FAN TRAY



TITLE: OUTLINE, SHELF, LPS 36, 6"  
4 MOD

SIZE	DWG NO.	REV.
B	0300189-06	B
SCALE:	1:2	SHEET 4 OF 5

1 2 3 4 5



DO NOT SCALE DRAWING

**ALPHA TECHNOLOGIES™**

TITLE: OUTLINE, SHELF, LPS 36, 6",  
4 MOD

SIZE	DWG NO.	REV
B	0300189-06	B
SCALE:	1:2	SHEET 5 OF 5

SHELF WITH FAN TRAY ASSEMBLED



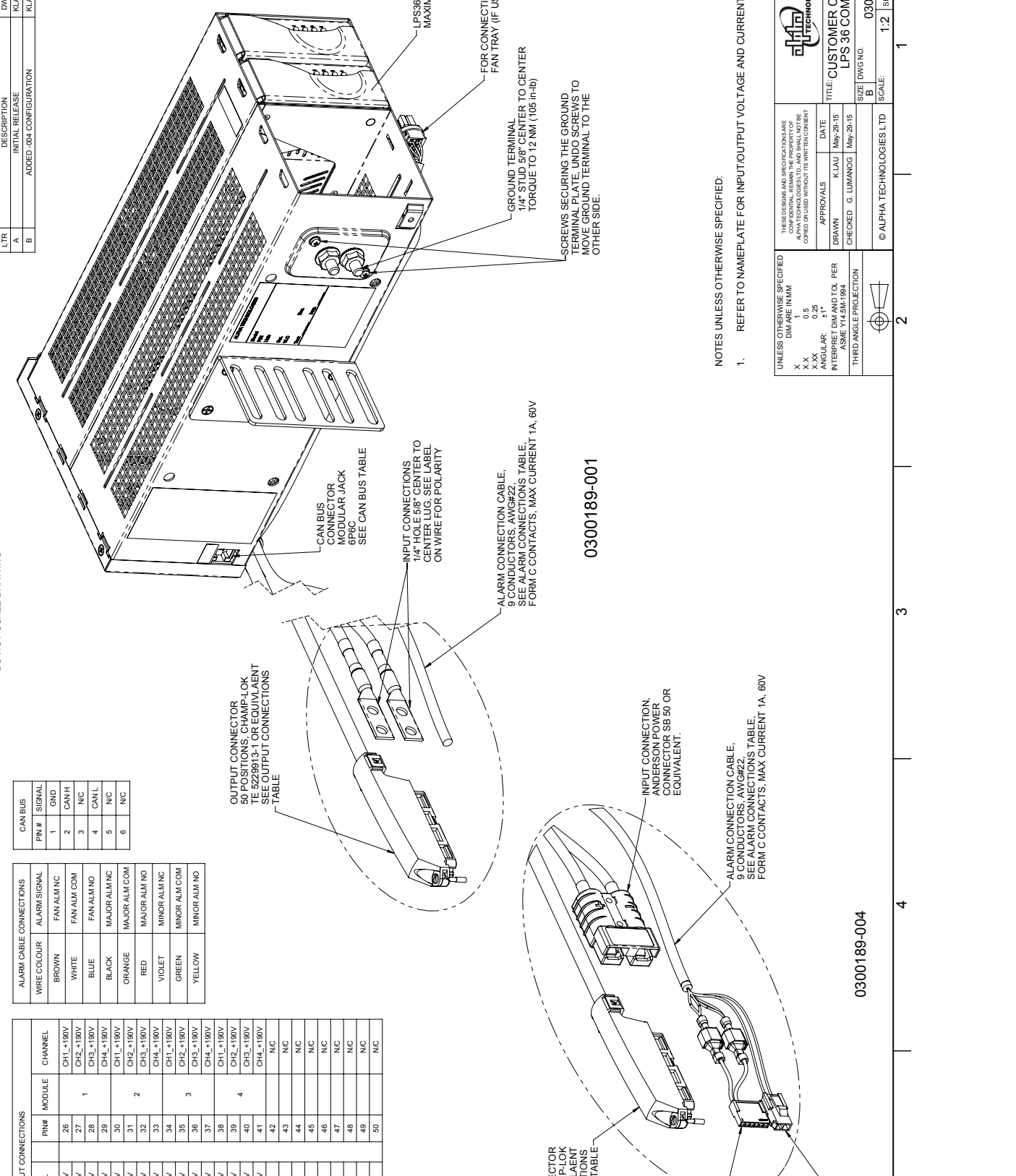
REVISIONS			
LTR	DESCRIPTION	DWN	DATE
A	INITIAL RELEASE	KLAU	May-29-15
B	ADDED -04 CONFIGURATION	KLAU	Dec-03-15

OUTPUT CONNECTIONS		CAN-BUS	
PIN#	MODULE	PIN #	SIGNAL
1	CH1 -190V	1	GND
2	CH2 -190V	2	CANH
3	CH3 -190V	3	NC
4	CH4 -190V	4	CANL
5	CH1 -190V	5	NC
6	CH2 -190V	6	NC
7	CH3 -190V		
8	CH4 -190V		
9	CH1 -190V		
10	CH2 -190V		
11	CH3 -190V		
12	CH4 -190V		
13	CH1 -190V		
14	CH2 -190V		
15	CH3 -190V		
16	CH4 -190V		
17	NC		
18	NC		
19	NC		
20	NC		
21	NC		
22	NC		
23	NC		
24	NC		
25	NC		

ALARM CABLE CONNECTIONS	
WIRE COLOUR	ALARM SIGNAL
BROWN	FAN ALM NC
WHITE	FAN ALM COM
BLUE	FAN ALM NO
BLACK	MAJOR ALM NC
ORANGE	MAJOR ALM COM
RED	MAJOR ALM NO
VIOLET	MINOR ALM NC
GREEN	MINOR ALM COM
YELLOW	MINOR ALM NO

OUTPUT CONNECTIONS		ALARM SIGNAL	
PIN#	MODULE	PIN#	MODULE
26	CH1 -190V	26	CH1 -190V
27	CH2 -190V	27	CH2 -190V
28	CH3 -190V	28	CH3 -190V
29	CH4 -190V	29	CH4 -190V
30	CH1 -190V	30	CH1 -190V
31	CH2 -190V	31	CH2 -190V
32	CH3 -190V	32	CH3 -190V
33	CH4 -190V	33	CH4 -190V
34	CH1 -190V	34	CH1 -190V
35	CH2 -190V	35	CH2 -190V
36	CH3 -190V	36	CH3 -190V
37	CH4 -190V	37	CH4 -190V
38	CH1 -190V	38	CH1 -190V
39	CH2 -190V	39	CH2 -190V
40	CH3 -190V	40	CH3 -190V
41	CH4 -190V	41	CH4 -190V
42	NC	42	NC
43	NC	43	NC
44	NC	44	NC
45	NC	45	NC
46	NC	46	NC
47	NC	47	NC
48	NC	48	NC
49	NC	49	NC
50	NC	50	NC

0300189-001



OUTPUT CONNECTOR 50 POSITIONS, CHAMP-LOK TE 5229913-1 OR EQUIVALENT SEE OUTPUT CONNECTIONS TABLE

ALARM CONNECTION CABLE, 9 CONDUCTORS, AWG#22, SEE ALARM CONNECTIONS TABLE, FORM C CONTACTS, MAX CURRENT 1A, 60V

INPUT CONNECTION, ANDERSON POWER CONNECTOR, SB 50 OR EQUIVALENT.

ALARM CONNECTION CABLE, 9 CONDUCTORS, AWG#22, SEE ALARM CONNECTIONS TABLE, FORM C CONTACTS, MAX CURRENT 1A, 60V

OUTPUT CONNECTOR 50 POSITIONS, CHAMP-LOK TE 5229913-1 OR EQUIVALENT SEE OUTPUT CONNECTIONS TABLE

MAJOR/MINOR ALARM NC ALARM NC CONNECTOR, PIN 1 AND 2

FAN ALARM NC MOLEX 59-01-2028 CONNECTOR

0300189-004

NOTES UNLESS OTHERWISE SPECIFIED:  
 1. REFER TO NAMEPLATE FOR INPUT/OUTPUT VOLTAGE AND CURRENT RATINGS.

UNLESS OTHERWISE SPECIFIED DIM ARE IN MM		THESE DESIGNS AND SPECIFICATIONS ARE CONFIDENTIAL. REMAIN THE PROPERTY OF ALPHA TECHNOLOGIES LTD. AND ARE NOT TO BE COPIED OR USED WITHOUT ITS WRITTEN CONSENT	
X, X	0.5	APPROVALS	DATE
X, X	0.25	K. LAU	May-29-15
ANGULAR:	±1°	CHECKED	G. LUMANOG
THROUGH PROJECTION			

TITLE: CUSTOMER CONNECTIONS		LPS 36 COMPACT SHELF	
SIZE	DWG NO.	0300189-08	REV.
B			B
SCALE:		1:2	SHEET
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