

# Public Safety Enclosure PS41-2730

Technical Guide: 9400020-J0


Effective: 12/2018







# PS41-2730

## Public Safety Backup Power Enclosure

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

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

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# 1. Safety

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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.

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



### **NOTE:**

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



### **CAUTION!**

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



### **WARNING!**

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



### **HOT!**

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

## 1.2 General Warning and Cautions



### **WARNING!**

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

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

## 1.3 Electrical Safety

### WARNING!

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

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

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

### WARNING!

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

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Input voltages can range up to 240 Vac. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.
- The enclosure which contains the DC or AC power system along with customer installed radios must remain locked at all times, except when authorized service personnel are present.
- Always assume electrical connections or conductors are live. Turn off all circuit breakers and double-check with a voltmeter before performing installation or maintenance.
- Place a warning label on the utility panel to warn emergency personnel that a reserve battery source is present which will power the loads in a power outage condition or if the AC disconnect breaker is turned off.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

## 1.4 Battery Safety

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

### WARNING!

**Follow battery manufacturer's safety recommendations when working around battery systems. Do not smoke or introduce an open flame when batteries (especially vented batteries) are charging. When charging, batteries vent hydrogen gas, which can explode.**

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



## 2. Introduction

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### 2.1 Product Overview

The Alpha PS41-2730 is a NEMA Type 4 public safety indoor enclosure. The PS41-2730 can be configured to support the following power system configurations:

- AC power system with battery tray
- DC power system with battery tray

The NEMA Type 4 rated enclosure is designed to protect its internal backup power system in accordance with NFPA 1221 standard requirements.

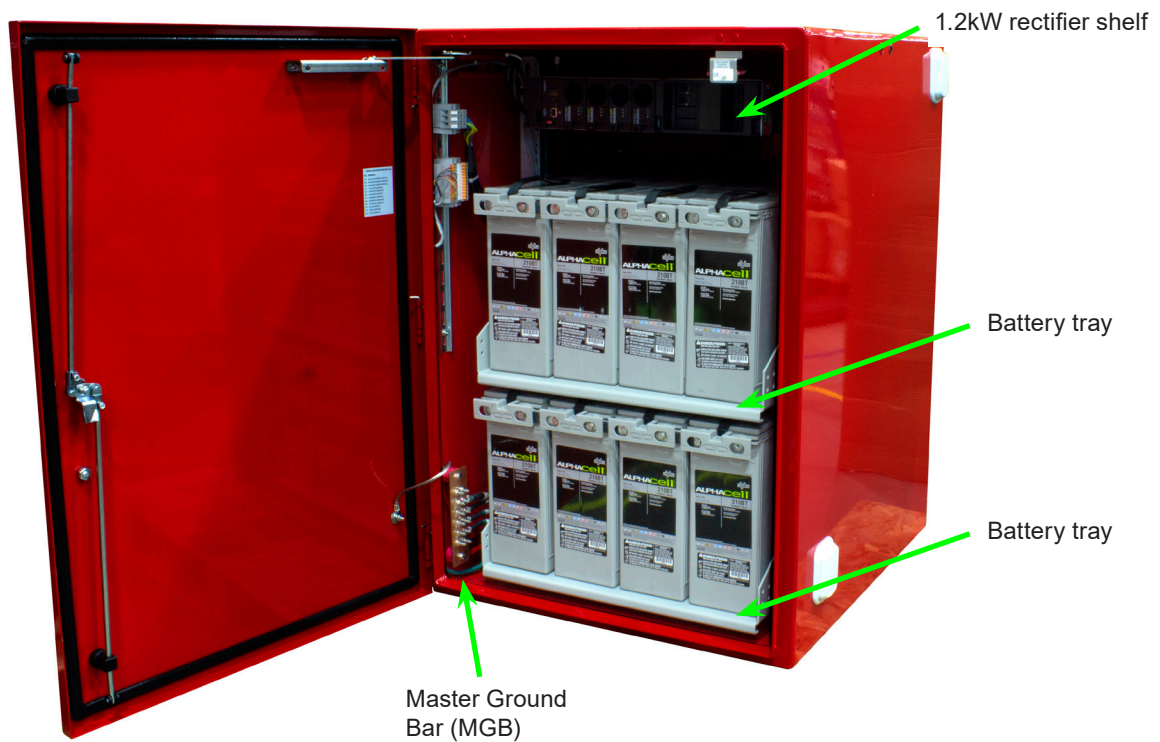


Figure 1 — Alpha PS41-2730 Interior View (CXRF 1.2kW power option)

### 3. Specifications

**Table A — Specifications for PS41-2730**

Electrical	
<b>CXRF 1.2kW</b> <b>AC Input:</b> 120/208 ~240V, 15A Max, 60Hz, 1PH <b>Battery Voltage:</b> Nominal 48V <b>DC Output:</b> 42 to 58Vdc (48V nominal), 2.4kW maximum <b>Recommended AC input breaker:</b> 20A (customer specified)	
<b>FXM650-24</b> <b>AC Input:</b> 120V, 8.0A maximum, 60Hz, 1PH <b>Battery Voltage:</b> 120V, 30A maximum, 60Hz, (UATS) - optional <b>AC Output:</b> Nominal 24V <b>DC Output:</b> 120V, 650W/VA maximum, 60Hz, 1PH <b>Recommended AC input breaker:</b> 21-27V (24V nominal) 15A	
<b>FXM1100-48</b> <b>AC Input:</b> 120V, 15A maximum, 60Hz, 1PH <b>Battery Voltage:</b> 120V, 30A maximum, 60Hz, (UATS) - optional <b>AC Output:</b> Nominal 48V <b>DC Output:</b> 120V, 1100W/VA maximum, 60Hz, 1PH <b>Recommended AC input breaker:</b> 42-54V (48V nominal) 20A	
Mechanical	
<b>Dimensions (H x W x D):</b>	1051mm x 701mm x 775mm (41.4in x 27.6in x 30.5in)
<b>Enclosure Weight (w/o battery):</b>	52kg (115lbs)
<b>Mounting:</b>	Ground with plinth (option)
<b>Construction:</b>	High strength corrosion resistant aluminum
<b>Finish:</b>	Powder coat, red
<b>Equipment rails:</b>	23" (19" to 23" adapter plates available as option)
<b>Door latch:</b>	3 point latch with L-handle for padlock
<b>Installation access:</b>	Front access as well as rear access with a removable gland plate
Environmental	
<b>Operating temperature:</b>	-0 to 40°C (32 to 95°F) for indoor installations
<b>Storage temperature:</b>	-40 to 85°C (-40 to 185°F)
Agency Compliance	
<b>Enclosure rating:</b>	Type 4 (UL50e)
<b>CSA:</b>	C22.2 No. 60950
<b>NFPA:</b>	Meets applicable NFPA 1221 requirements

## 4. Features

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### 4.1 AC and DC Power Options

The following power options are available with the PS41-2730

- CXRF 1.2kW – 48V, Cordex Rectifier Shelf Unit
- FXM 650-24 – 24V, 650W Uninterruptible Power Supply (UPS) Module
- FXM 1100-48 – 48V, 1100W Uninterruptible Power Supply (UPS) Module

#### 4.1.1 CXRF 1.2kW (model 030-834-20)

Figure 2 shows the 1.2kW option for AC to DC power conversion. The 48-1.2kW rectifier system is designed for front access to the following DC components:

- Controller shelf I/O
- CXCM1 HP controller
- Up to four hot-swappable 1.2kW rectifiers
- Four circuit breakers: 2 battery breakers and 2 load breakers
- 10-position GMT fuse block

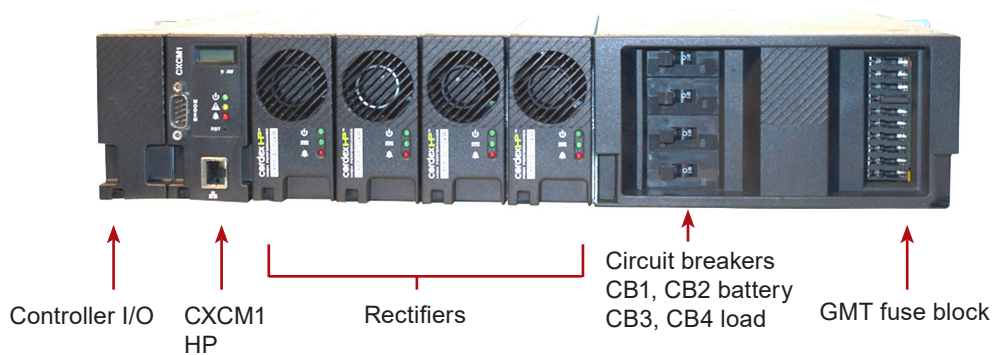


Figure 2 — Cordex 1.2kW Shelf with Controller and Distribution

### 4.1.2 FXM 650, 1100 UPS

The Alpha FXM uninterruptible power supply (UPS) modules provide clean, reliable power control and management as part of a complete UPS solution. Temperature compensated battery charging protects batteries from overcharging at extreme temperatures, extending battery life. Event and alarm logging with time and date stamping simplifies and accelerates troubleshooting.



Figure 3 — Alpha FXM 650 (top) and FXM 1100 (bottom)

### 4.1.3 UATS Option

The Universal Automatic Transfer Switch (UATS) is an optional add-on switching unit specifically designed for the FXM UPS family (FXM 650 and 1100). These switching units provide power and/or bypass capacity (automatic or manual) so that the operator can safely disconnect the UPS from line or generator power for easy removal and servicing.

In bypass mode, the loads are directly connected to the line or generator power without any conditioning. Depending on the use of one and/or the other, the UATS allows the use of up to 3 different back-up sources (line, batteries and generator). Refer to the UATS Installation Manual (Alpha P/N 020-165-B0) for details.



Figure 4 — Universal Automatic Transfer Switch

## **4.2 Alarms, Controls, and Communications**

### **4.2.1 Standard Alarm Function Description**

Form C Dry Contacts are available for standard annunciation of the following conditions.

- Low Battery: Triggered when the battery is discharged below 1.75vpc.
- Charger Fail: This alarm will be triggered on an AC fail and the failure of 1 or more rectifier modules in the system.
- AC Fail: The input line has dropped below the Low VAC or is above the High VAC settings of the power system.

### **4.2.2 Customer Configured Alarms**

Alarms are user programmable via the web interface. Please reference applicable power equipment manual(s) for instructions.

### **4.2.3 Battery Test and Estimated State of Health (Cordex 48-1.2kW)**

This feature will lower the voltage of the rectifiers and allow the battery to discharge into the load for a period of time. The output of the battery is monitored and logged by the system and the data is used to Estimate the State of Health of battery. The system controller will monitor both the batteries and the rectifiers to ensure that the load is not put at risk by the test procedure. Refer to the Cordex HP Software manual for further information on set up and enabling this function.

### **4.2.4 Temperature Compensation**

The temperature compensation feature will adjust the output float/equalize voltage of the rectifier to protect against thermal runaway and reduce life degradation due to heat.

Each system is equipped with temperature probes to support the function and must be installed on the battery and enabled at time of commissioning.

The Public Safety System design is shipped with default settings for float and temperature compensation for Alpha-Cell BT batteries.

### **4.2.5 Event and Data Logs (Cordex 48-1.2kw)**

The Event log table keeps a record of changes to the state of the system to help with troubleshooting.

### **4.2.6 Communication**

- Ethernet: 10/100Base-T Ethernet connection on both the front and rear of the controller for remote or local communication.
- Web based User Interface for local or remote via an Ethernet 10/100Base-T Ethernet Connection.
- Email notification. Integrators guide and protocol available online.
- SNMP Communications protocol. Integrators guide and protocol available online.
- MODBUS Integrators. Integrators guide and protocol available online. (Cordex 48-1.2kw)



### 4.3 Battery Storage

The PS41-2730 enclosure can support one or two strings (for 48V systems), or four strings (for 24V systems) of VRLA batteries on the battery tray. The tray will accommodate up to four (recommended) AlphaCell 210BT sized VRLA batteries, or equivalent.

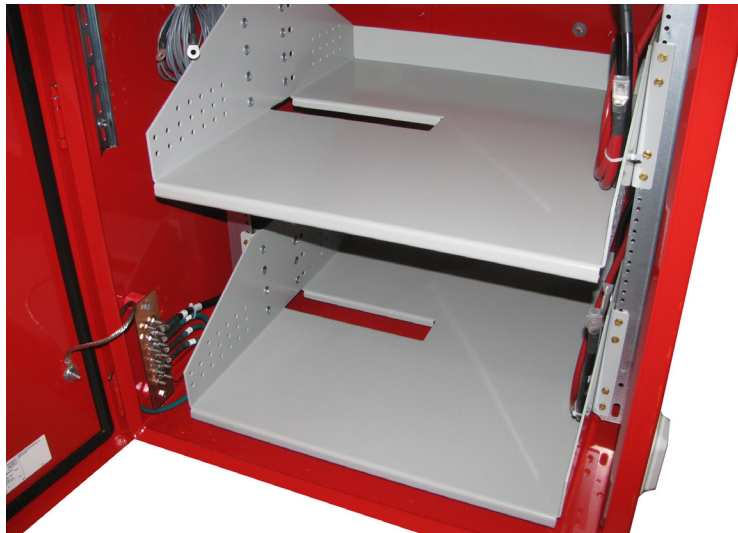


Figure 5 — Battery Tray

### 4.4 Enclosure Venting

The system has been evaluated for hydrogen gas venting.



Figure 6 — NEMA Type 4 Enclosure Vent

### 4.5 Security

Opening the front door activates a panel switch which is wired directly to the enclosure alarm terminal block. An enclosure intrusion alarm detection can be extended to a monitoring device using the Form C dry contacts found on the terminal block. The door open/intrusion alarm can be disabled by pulling out the switch plunger (defeat position) during servicing.

The front door can be secured with a separate padlock installed on door handle as required.

## 4.6 Power Enclosure System – Options, Components and Parts

**Table B — Standard Part Numbers**

<b>AC Power Options</b>	
FXM 650, 24V, 1 Battery Tray	0570188-001
FXM 650, 24V, 2 Battery Tray	0570187-001
FXM 1100, 48V, 2 Battery Tray	0570189-001
<b>DC Power Options</b>	
CXRF 1.2kW, 48V, 1 Battery Tray	0570191-001
CXRF 1.2kW, 48V, 2 Battery Tray	0570192-001
<b>Accessories</b>	
UATS (Universal Automatic Transfer Switch)	0370498-001
Plinth Mounting, 4.75" high	0370231-002

## 5. Site Evaluation and Pre-Installation

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### 5.1 Site Selection

Consider the following before selecting a mounting location:

- The Alpha PS41-2730 enclosure is designed for front and rear access. Only front access is required for maintenance.
- Avoid areas that may be subjected to hot air exhaust from nearby equipment.
- The cabinet should not be installed in direct sunlight.
- Find out if your intended area is subjected to architectural controls or environmental restrictions.
- Avoid areas that are prone to flooding

The PS41-2730 indoor power enclosure has been designed for the following mounting options:

- Plinth, mounted on a concrete slab, floor, or similar surface. (Alpha kit P/N: 0370231-002)

### 5.2 Tools Required

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

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



## 6. Installation

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

### 6.1 Safety Precautions

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

### 6.2 Plinth Mounting for Concrete Pad

#### 6.2.1 Mounting the Plinth to the Concrete Floor (Alpha Kit P/N: 0370231-002)

A fully equipped power enclosure with two shelves of AlphaCell 210BT batteries weighs approximately 760lb. The mounting site must be built in accordance with local building practices and codes.

Concrete pad installation requiring seismic compliance requires approval by the appropriate engineering discipline, e.g., civil or structural. Cast-in-place or pre-cast concrete slabs can be used.

Use the template in Figure 7 to place the anchor bolts. Follow the specific recommendations from the fastener manufacturer to ensure that the securing device achieves its full structural capacity.

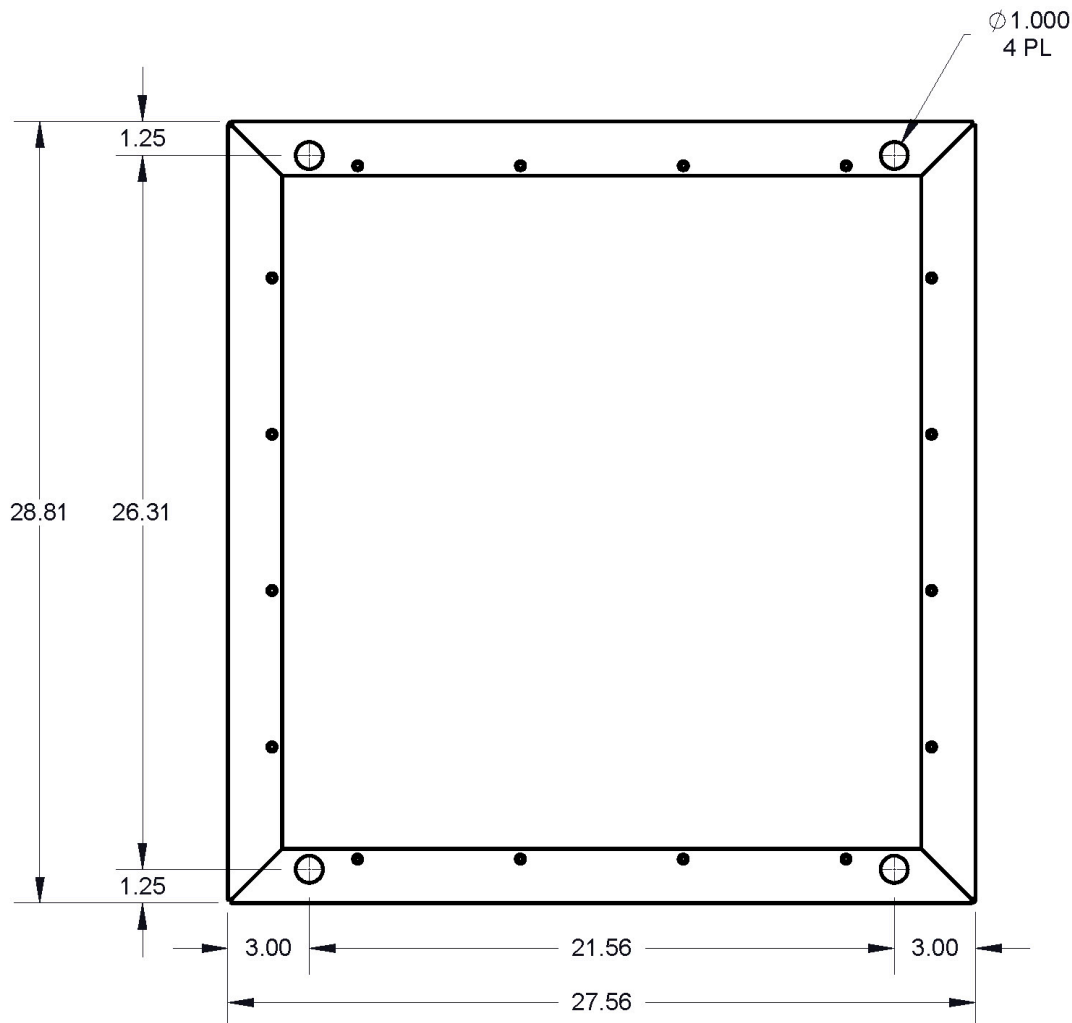


Figure 7 — Plinth Template for Mounting Bolts

1. Place the plinth in position over the anchor holes.
2. Install the anchoring hardware for each anchor FINGER TIGHT.
3. Check that the plinth is level front-to-back and side-to-side.
4. Add shims as needed under one or two of the corners of the plinth, placing the shims as close as possible to the bolts.
5. Once the plinth is level, tighten all bolts to the appropriate torque.

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

## 6.2.2 Unpacking the Power System



### CAUTION!

**Do not hoist/lift the enclosure with batteries installed.**

1. Remove the protective covering from the system. The doors are designed to be locked with a padlock and are secured with tie-wraps for shipping. Cut the tie-wraps and open the doors.
2. Inspect the packing slip to verify that you have received all the equipment that you ordered.
  - All documentation is packed inside the equipment compartment.
  - Inspect all moving parts, hardware, connectors, and other equipment.
3. Report any damage to the shipper and Alpha Technologies.

### 6.2.3 Mounting Enclosure to the Plinth

1. Unstrap the enclosure from the shipping pallet.
2. Remove the bottom battery tray to access the mounting holes at the edges of the enclosure—eight screws per side as shown in Figure 8.
3. Use a mallet or hammer and slotted screwdriver to remove the 16 mounting hole knockouts at the base of the enclosure. Figure 9 shows the location of all 16 mounting holes.
4. Lift the enclosure onto the plinth.
5. Secure the enclosure to the plinth with the sixteen M6 x 16 screws and rubber washers included with the plinth.
6. Replace the battery tray.



Figure 8 — Battery Tray Screws

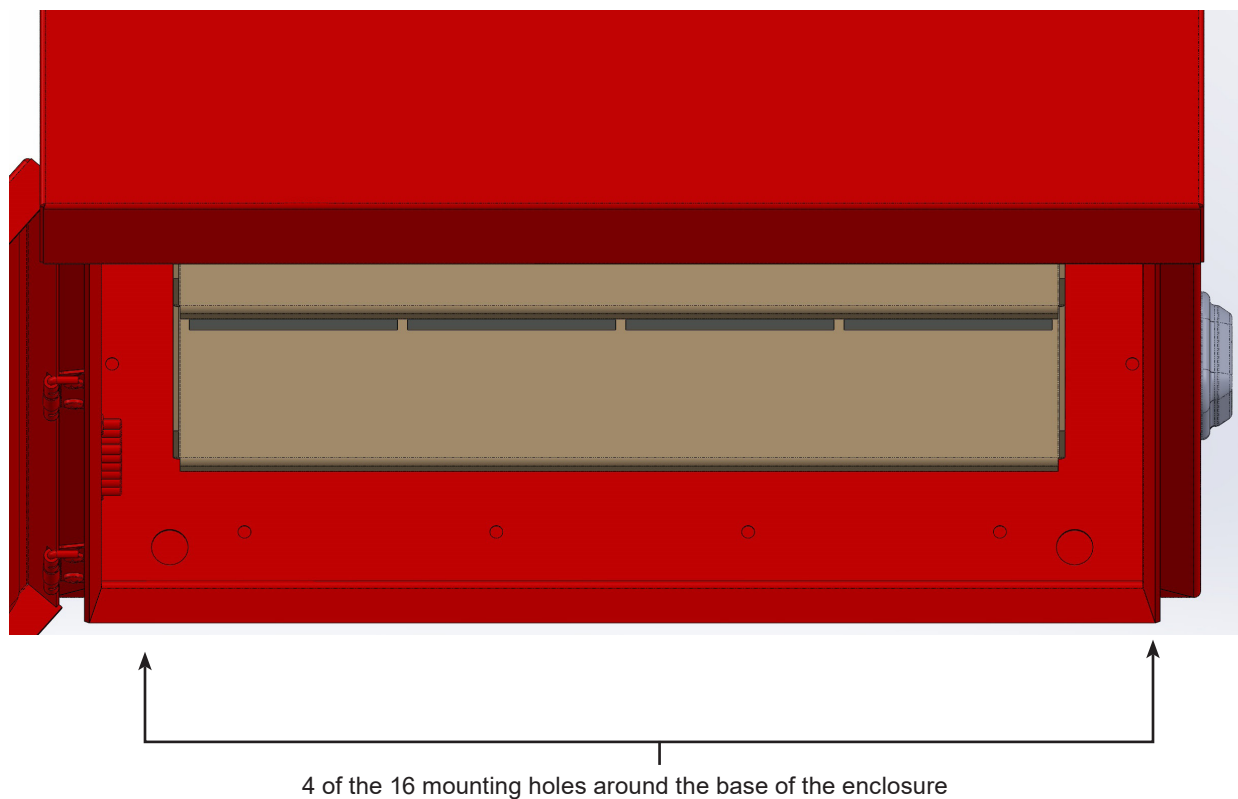


Figure 9 — Mounting the Enclosure to the Plinth

## 7. Wiring

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

### 7.1 Grounding the Enclosure



#### WARNING!

**An enclosure that is not properly grounded presents an electrical hazard.**

A proper grounding system that meets or exceeds the specifications of the equipment must be designed and installed prior to or in conjunction with the construction of the mounting slab/floor. The ground system must be bonded to the enclosure to ensure a "common" or "single-point" ground. Refer to local building codes.



#### NOTE:

Chassis ground is connected to the enclosure frame and is terminated at the master ground bar (MGB) within the enclosure.

1. Locate the enclosure master ground bar (MGB) at the left front sidewall of the enclosure.
2. With enclosure securely mounted, select an appropriate location on the enclosure wall for the site ground wire entry. Make a suitable clearance hole and use fittings rated NEMA Type 4 or better to maintain enclosure integrity rating.
3. Connect the site ground wire to the bottom position (1/4 holes on 5/8" centers) of the enclosure master ground bar (MGB).

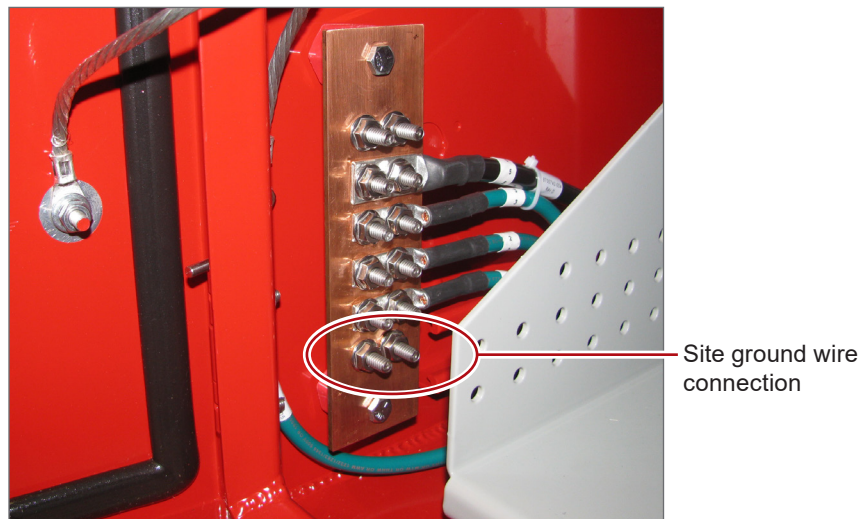


Figure 10 — Enclosure MGB and Chassis Ground

### 7.2 Input/Output Wiring into Power Enclosure System

With enclosure securely mounted, select an appropriate location on an enclosure wall for system input and output wire entry. Use fittings rated NEMA Type 4 or better to maintain enclosure integrity rating.

## 7.3 Installation with Cordex HP 48-1.2kW Rectifier System

### 7.3.1 DC Output

The DC cable connections to the system are made to the integrated distribution module located on the right side of the shelf. Refer to the 1.2kW rectifier manual, part number 030-834-J0, for wiring details.

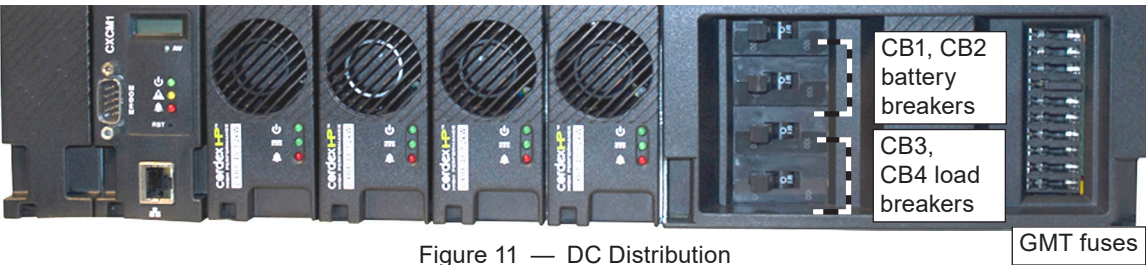


Figure 11 — DC Distribution

### 7.3.2 Power Enclosure Alarm Wiring Block

The alarm wiring block, located on the left side wall of the enclosure, uses Phoenix type DIN rail mounted terminal blocks. Connect designated alarm outputs to the local alarm-sending unit/device using appropriate wire with gauge sizes from #28 to #16 AWG (0.08 to 1.31 mm<sup>2</sup>). Wires do not need to be stripped when the connections are made.

Table C — Alarms for CXRF 1.2kW system option

Pin	Description
#1	Enclosure Intrusion Alarm (N.O.)
#2	Enclosure Intrusion Alarm (COM)
#3	Enclosure Intrusion Alarm (N.C.)
#4	Low Battery Alarm (N.O.)
#5	Low Battery Alarm (COM)
#6	Low Battery Alarm (N.C.)
#7	Charger Fail Alarm (N.O.)
#8	Charger Fail Alarm (COM)
#9	Charger Fail Alarm (N.C.)
#10	AC Fail Alarm (N.O.)
#11	AC Fail Alarm (COM)
#12	AC Fail Alarm (N.C.)

Table D — Alarms for FXM UPS system option

Pin	Description
#1	Enclosure Intrusion Alarm (N.O.)
#2	Enclosure Intrusion Alarm (COM)
#3	Enclosure Intrusion Alarm (N.C.)
Relay Assignment on FXM	
C3	Low Battery Capacity Alarm (N.O.)
	Low Battery Capacity Alarm (COM)
	Low Battery Capacity Alarm (N.C.)
C4	Charger Fail Alarm (N.O.)
	Charger Fail Alarm (COM)
	Charger Fail Alarm (N.C.)
C5	AC Fail Alarm (N.O.)
	AC Fail Alarm (COM)
	AC Fail Alarm (N.C.)

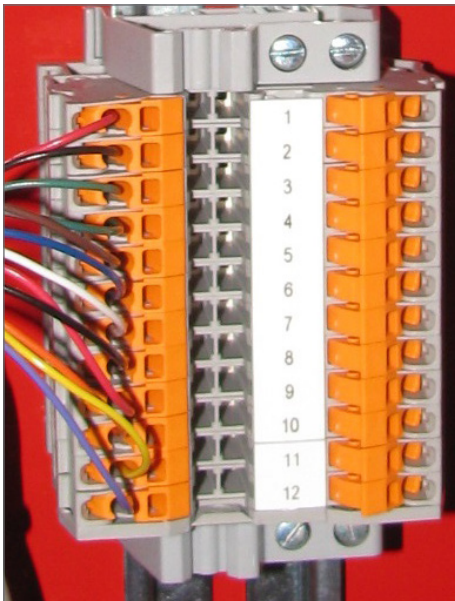


Figure 12 — Enclosure Alarm Block Wiring

### 7.3.3 System Startup

1. Remove all power modules from the shelf.
2. Ensure that the AC input power circuit breaker feeding the power enclosure system is turned off at the main AC load center (customer furnished).
3. Ensure battery breakers are off on the rectifier shelf.
4. Install one power module.
5. Verify feeder AC input voltage is correct and turn on the corresponding AC input feeder breakers.  
The power module OK LED should illuminate after a preset start delay.
6. Verify correct battery polarity at connectors on all battery cables using a voltmeter.
7. Refer to next section for battery installation.
8. Install remaining power modules.



Figure 13 — Battery Breakers, 1.2kW Rectifier Shelf

### 7.3.4 Battery Installation

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



#### **WARNING!**

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



#### **WARNING!**

**Verify that the battery and load breakers, and GMT fuses on the 48-1.2kW rectifier distribution panel are either in the OFF position or removed.**

1. Clean the batteries cells according to the battery manufacturer's recommendations. First neutralize any acid with a baking soda and water solution, rinse the batteries with clean water, and then wipe them dry.
2. Apply a corrosion-inhibiting agent, such as NO-OX-ID "A", on all battery terminal connections.
3. Ensure that the battery output cabling can reach the [+] and [-] terminals of the series battery string and that the batteries are oriented correctly for easy installation of the inter-unit "series" connectors.
4. Remove any NO-OX-ID "A" grease from battery terminals.
5. Burnish the terminal posts with a non-metallic brush, polishing pad or 3M Scotch Brite scouring pad.
6. Apply a light coating of NO-OX-ID "A" grease to the terminal posts after cleaning.
7. If lead plated inter-unit connectors are used, they should also be burnished and NO-OX-ID "A" grease applied as above.
8. Lift each battery onto the front edge of the battery tray, and then slide the battery onto the tray.
9. **Connect the battery temperature probe to the negative terminal in the middle of an installed battery string.**
10. Install the inter-unit connectors.
11. Connect battery cables to terminals with the correct torque settings as per the battery manufacturer's specifications (typically 100 in-lbs).

**Refer to the system startup procedure before turning on the battery breakers.**

7.3.5 Battery Maintenance Report

After assembly, number the batteries and take “as received” readings, including specific gravity, cell voltage, and temperature. Designate one cell as the pilot cell. This is usually the cell with either the lowest specific gravity or voltage. Refer to the manufacturer's literature for guidelines. See the following table for typical maintenance report:

Company: \_\_\_\_\_ Date: \_\_\_\_\_  
Address: \_\_\_\_\_  
Battery location and/or number: \_\_\_\_\_  
No. of cells: \_\_\_\_\_ Type: \_\_\_\_\_ Date new: \_\_\_\_\_  
Date installed: \_\_\_\_\_ Float voltage: \_\_\_\_\_ Ambient temp.: \_\_\_\_\_

Table E — Typical VRLA battery maintenance report						
Cell #	Serial #	Voltage	Specific	Ohms	Mhos	Observations

Remarks and recommendations: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Readings taken by: \_\_\_\_\_



## 7.4 Installation with an FXM UPS



### WARNING!

The Alpha FXM is intended for permanent AC connection only.

The Alpha FXM must be correctly grounded for proper operation. Older facilities may have inadequate electrical grounding. Inspection must be performed by a qualified electrician before installation to ensure that grounding meets the local electrical code.

The utility line attached to the Alpha FXM input **MUST** be protected by a circuit breaker certified for this use in accordance with the local electrical code. The UPS must be connected only to a dedicated branch circuit.

The UPS equipment that is powered by this service panel requires the neutral to be permanently bonded to the ground. Always disconnect the batteries before servicing the circuit breaker panel.

**The input and output lines to and from the Alpha FXM MUST have disconnect devices attached.**

The Alpha FXM is suitable for installations in network telecommunication facilities and locations where the National Electrical Code applies.

**Grounding:** The Alpha FXM is suitable both for installation as part of a common bonding network (CBN) and an isolated bonding network.

For installations above 1400m (4500ft) elevation, additional cooling may be needed to reduce the operating temperature of the Alpha FXM. The maximum allowable operating temperature must be reduced by 2°C (3.5 °F) for every 300m (1000ft) above 1400m (4500ft).



## 7.4.1 Electromagnetic Compatibility (EMC) Requirements

Observe the following EMC requirements when setting up the Alpha FXM and its internal equipment:

- All AC mains and external supply conductors must be enclosed in a metal conduit or raceway when specified by local, national, and/or other applicable government codes and regulations.
- The customer facilities must provide suitable surge protection.

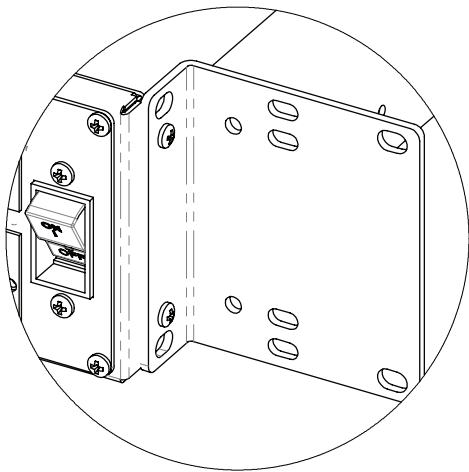
## 7.4.2 Mounting the Alpha FXM in the PS41-2730 Enclosure



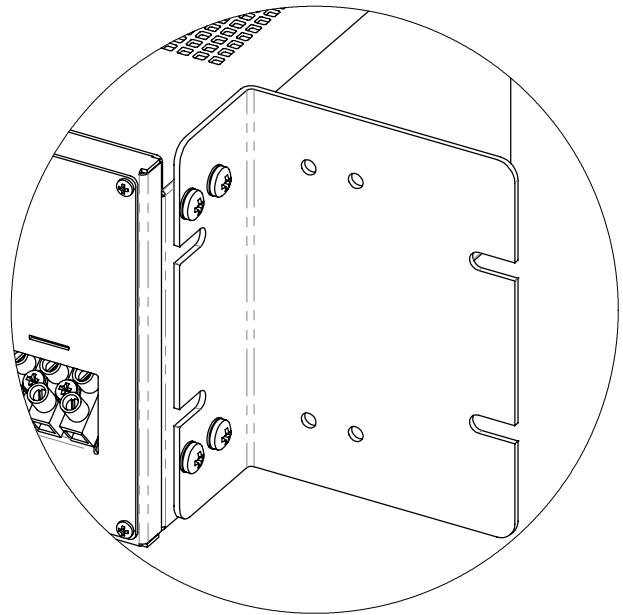
### WARNING!

**The Alpha FXM is heavy, up to 16 kg (35 lb). Use proper lifting techniques. The lifting and moving should be done by at least two people to avoid injury.**

1. Attach the mounting brackets to each side of the FXM UPS with the screws with toothed washers provided with the brackets to ensure adequate grounding between the FXM UPS chassis and the rack.
2. Mount the Alpha FXM UPS to the equipment rack in the PS41-2730 enclosure.



Mount the brackets from the FXM650 rack mount kit in an offset position with the M5 screws provided in the kit (2 per bracket).



Mount the brackets from the FXM 1100 rack mount kit in an offset position with the M5 screws provided in the kit (4 per bracket).

Figure 14 — Assembling Brackets from Rack Mount Kit

### 7.4.3 Wiring the Alpha FXM



#### WARNING!

Make sure the AC line power is off. Switch off all circuit breakers on the Alpha FXM UPS before making any electrical connections.

If stranded wires are used to connect the input and output terminal blocks, ferrules or equivalent crimping terminals must be used.

#### Procedure

1. If used, connect the following ports (refer to the FXM manual 017-230-B0 for more detail):
  - Ethernet port
  - RS-232 port
  - Dry contacts
  - User inputs
2. Connect the load cable to the Alpha FXM Output terminal block (see Figure 15). Torque to 1.4 N-m (12 lb-in).
3. Connect the line power to the Alpha FXM AC Input terminal block (see Figure 15). Torque to 1.4 N-m (12 lb-in).



#### WARNING!

Before proceeding, verify that the individual AC power cable wires are properly connected to their respective line, neutral and ground terminal connections on the input and output terminal blocks to prevent accidental shock or electrocution.

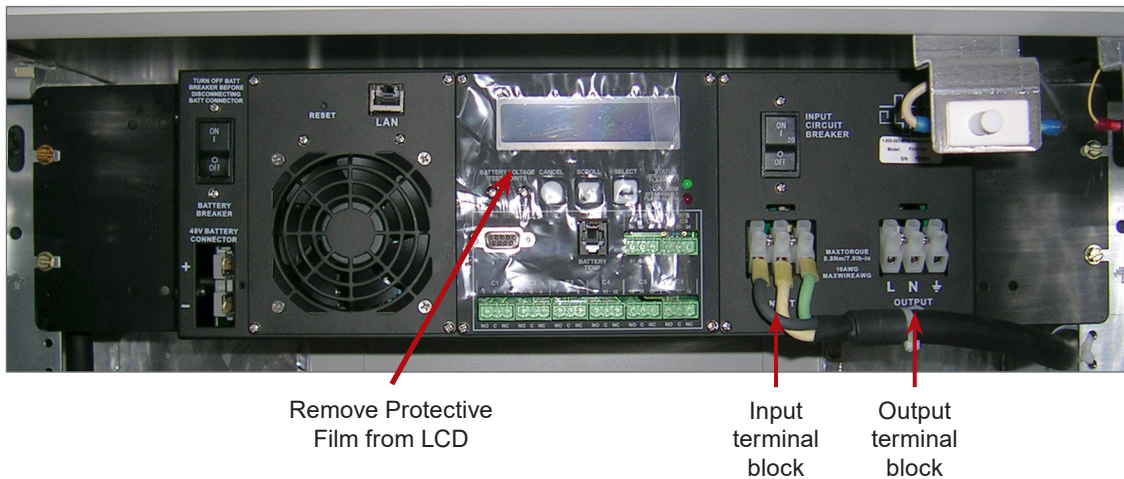


Figure 15 — Connecting AC Power Input and Output Load Cables

#### 7.4.4 Wiring the Alpha FXM with a UATS option

1. Connect the **TO UPS IN** power cable from the UATS to the FXM UPS AC Input terminal block, matching line, neutral and ground wires to their respective terminal labels.
2. Connect the **FROM UPS OUT** cable from the UATS to the FXM UPS AC Output terminal block, matching line, neutral and ground wires to their respective terminal labels.
3. Torque all connections to 1.4 N-m (12 lb-in).

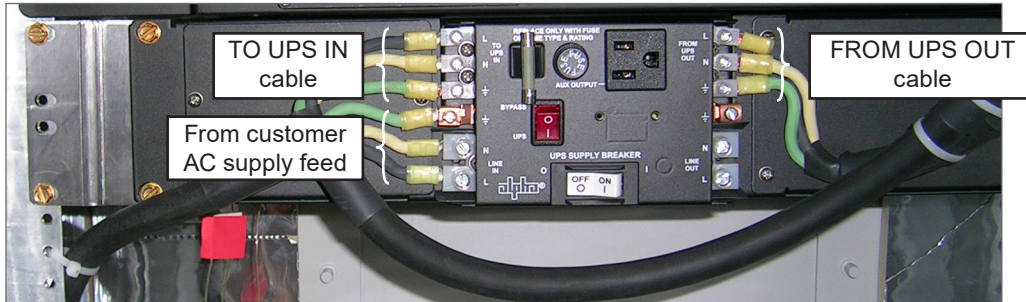


Figure 16 — UATS AC Power Connection Wiring

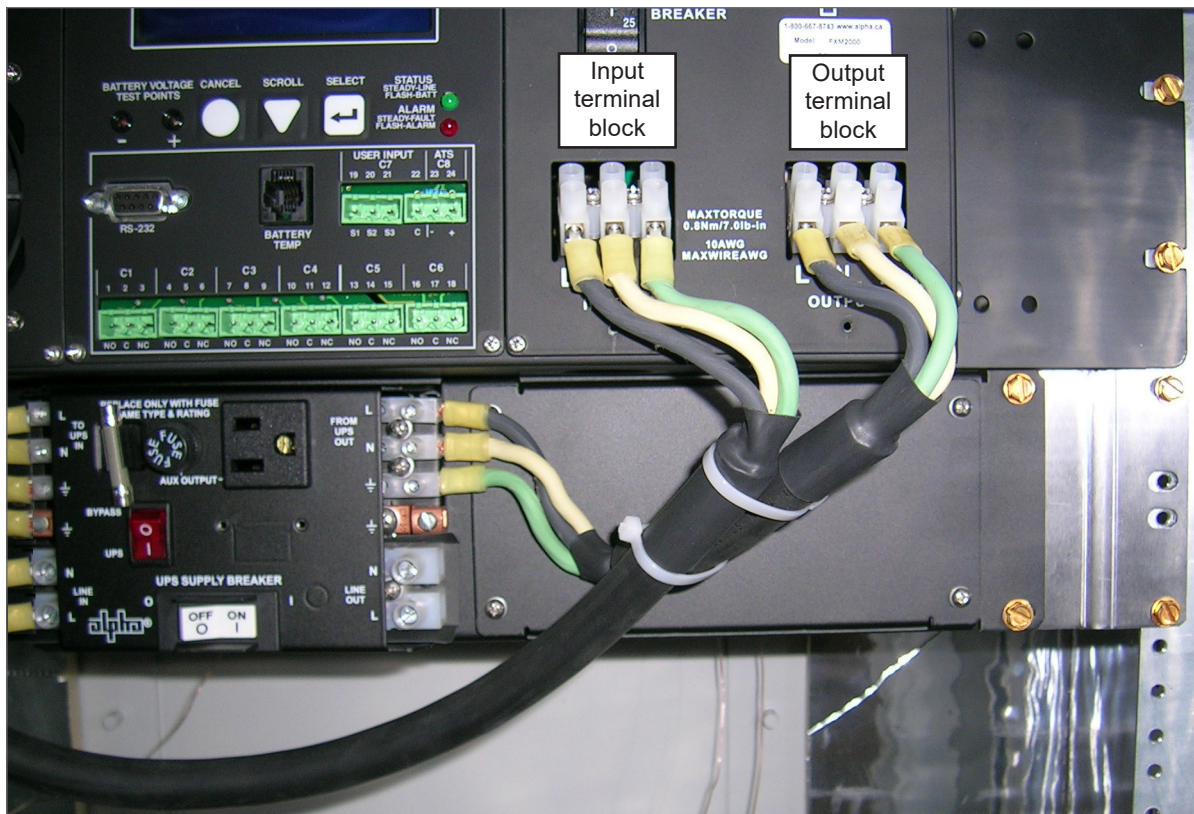


Figure 17 — FXM UPS AC Power Connection Wiring from UATS

## 7.4.5 Wiring the External Batteries

- Use new batteries when installing a new unit. Verify that all batteries are the same type with identical date codes.
- The battery return connection is to be treated as an Isolated DC return (DC-I) as defined in GR-1089-CORE.

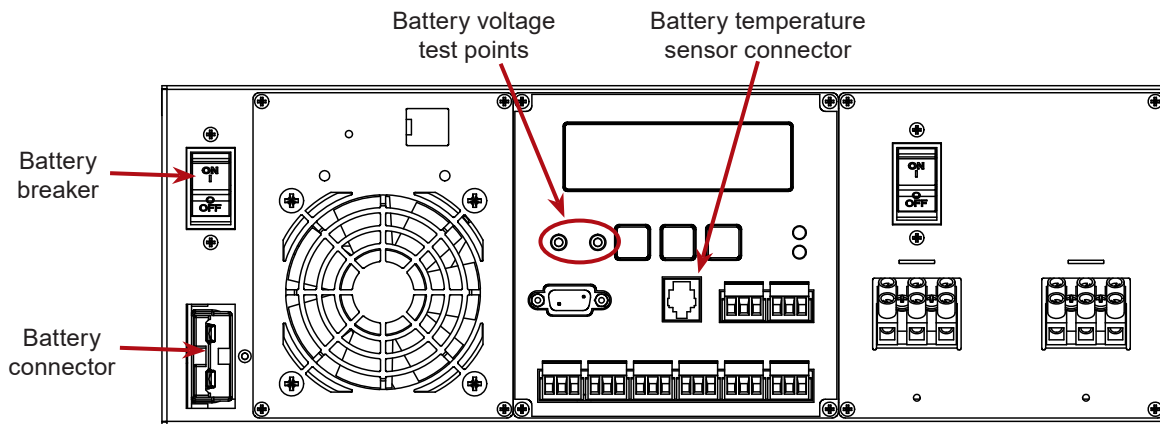


Figure 18 — FXM 1100 Front Panel

1. Number the batteries from 1 to 4 with labels or tape.
2. Coat the battery terminals with a corrosion inhibitor.
3. Connect the batteries as shown in Figure 19.
4. Connect the black battery cable to the negative terminal of the battery string, and the red battery cable to the positive terminal of the battery string.
5. When the batteries are wired together, measure the voltage at the battery connection terminals. It should read between 21 and 27V (FXM650 - 24) or 42 and 54V (FXM1100-48).
6. Note the polarity and ensure that it is correct.
7. Ensure that the Battery breaker on the FXM UPS is OFF.
8. Connect the external batteries to the Battery connector on the FXM UPS—see Figure 18.
9. Route the sensor end of the battery temperature cable to the batteries.
10. Attach the battery temperature sensor to the body of the battery, about 2 to 3" (5 to 7.5cm) from the base of the battery.
11. If multiple battery strings are used, repeat steps 1 to 4 as required.

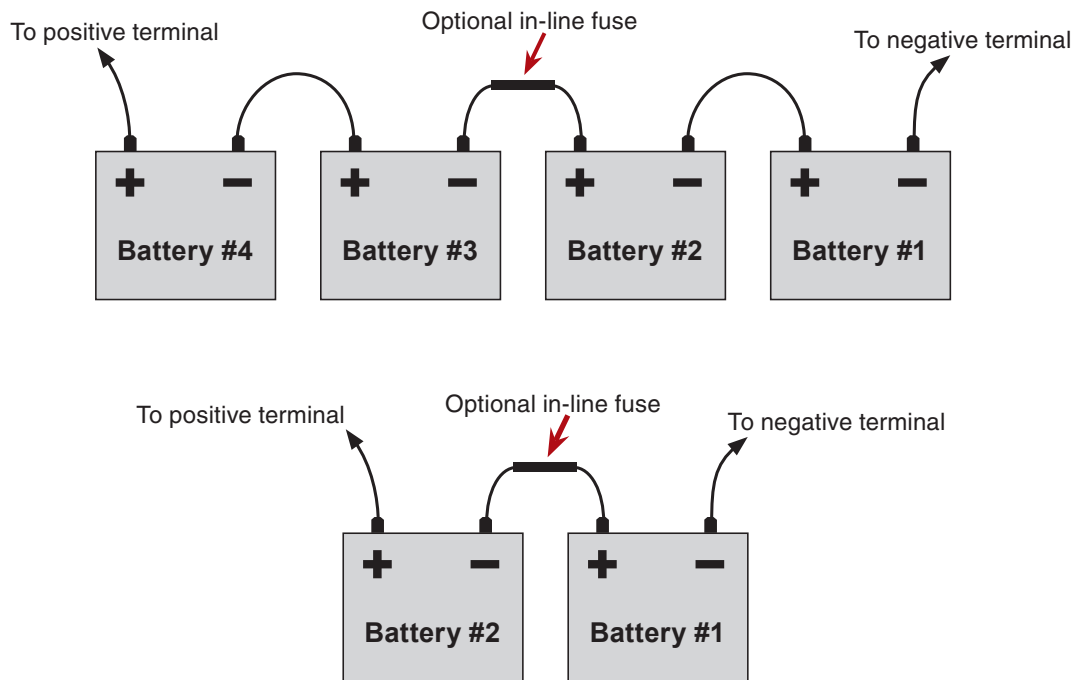


Figure 19 — FXM UPS External Battery Wiring for 48 VDC string (top) and 24 VDC String (bottom)



## CAUTION!

**Torque the battery terminals according to the manufacturer's specifications on the battery nameplate or datasheet.**

### 7.4.6 Start-up and Operation

Refer to the FXM650/1100 UPS Installation and Operation manual, (Alpha P/N 017-230-B4).

## 8. Maintenance

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

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



### WARNING!

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

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

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

**Table F — Sample maintenance log**

Procedure	Date Completed
Clean ventilation openings and rinse out the enclosure filters.	
Inspect all system connections. Re-torque if necessary.	
Verify alarm/control settings.	
Verify alarm relay operation.	



## 9. Warranty Statement and Service Information

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### 9.1 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.

### 9.2 Warranty Statement

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

### 9.3 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.

### 9.4 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.

### 9.5 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).

### 9.6 Service Information

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

## 10. Acronyms and Definitions

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



# 11. Certification

## About CSA and NRTL

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

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

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

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

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

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

## NRTLs capabilities

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

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

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

## Governance of NRTL

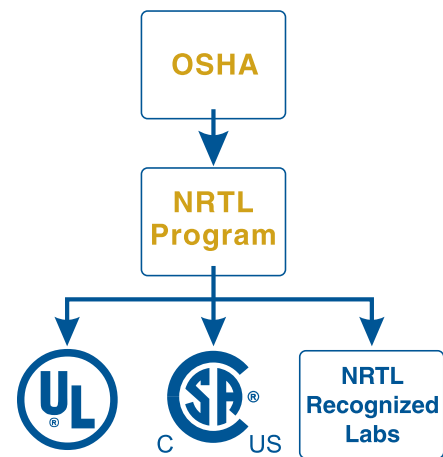
The NRTL Program is both national and international in scope with foreign labs permitted.

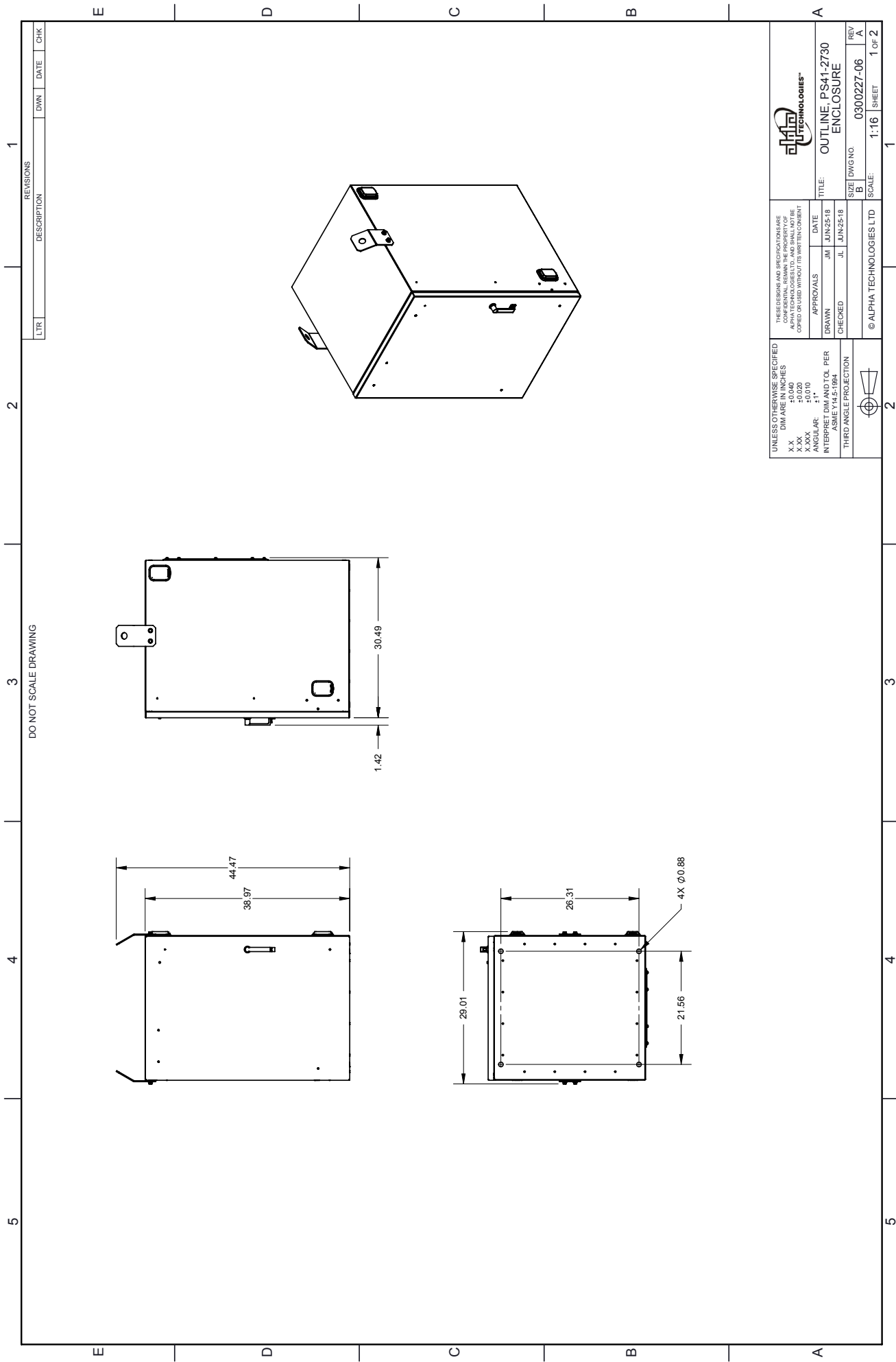
(1) [www.csagroup.org](http://www.csagroup.org)

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

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

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

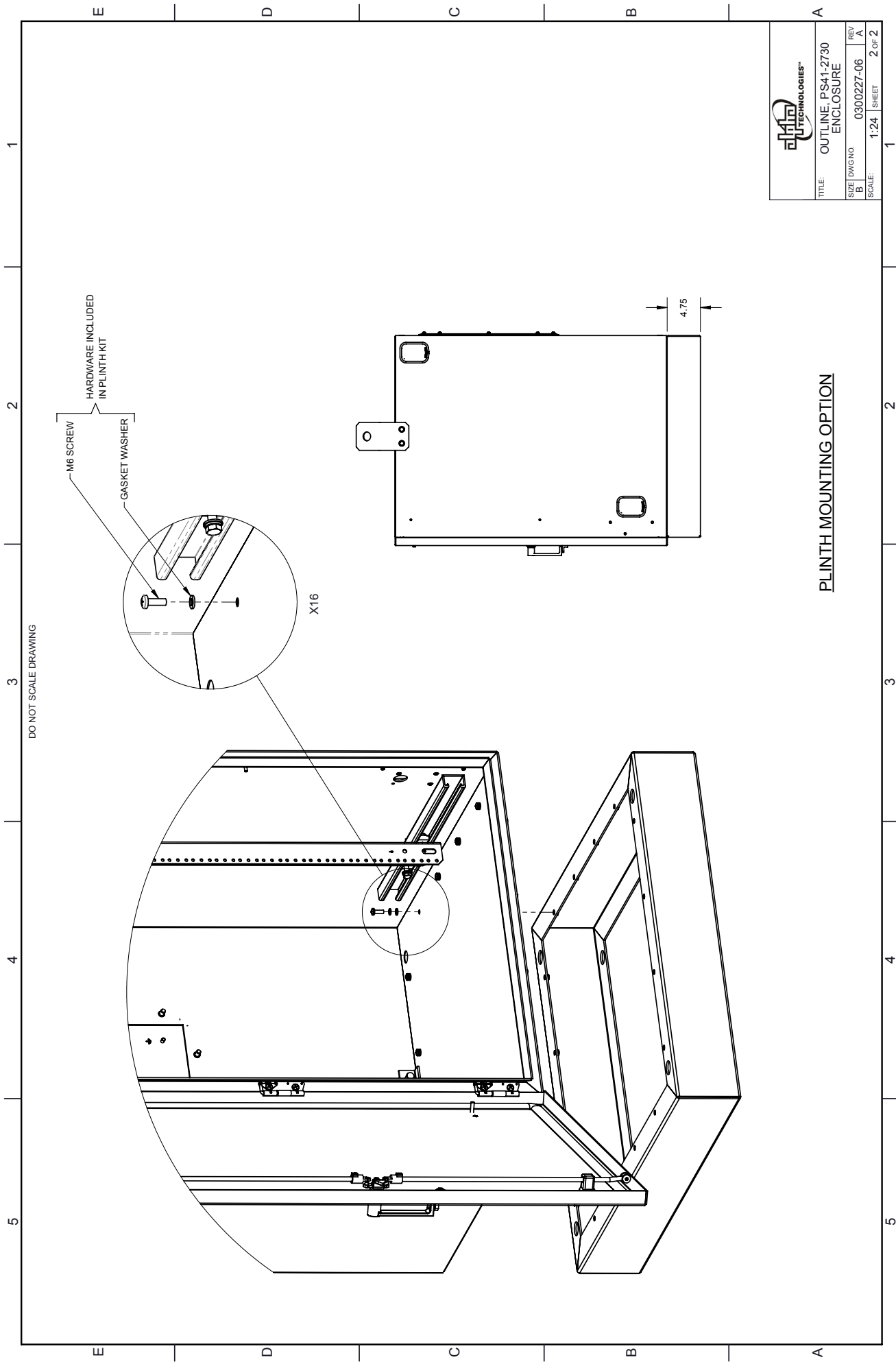




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CHECKED	JL	JUN-25-18	
SIZE DWG NO.		0300227-06	
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1		1 OF 2	




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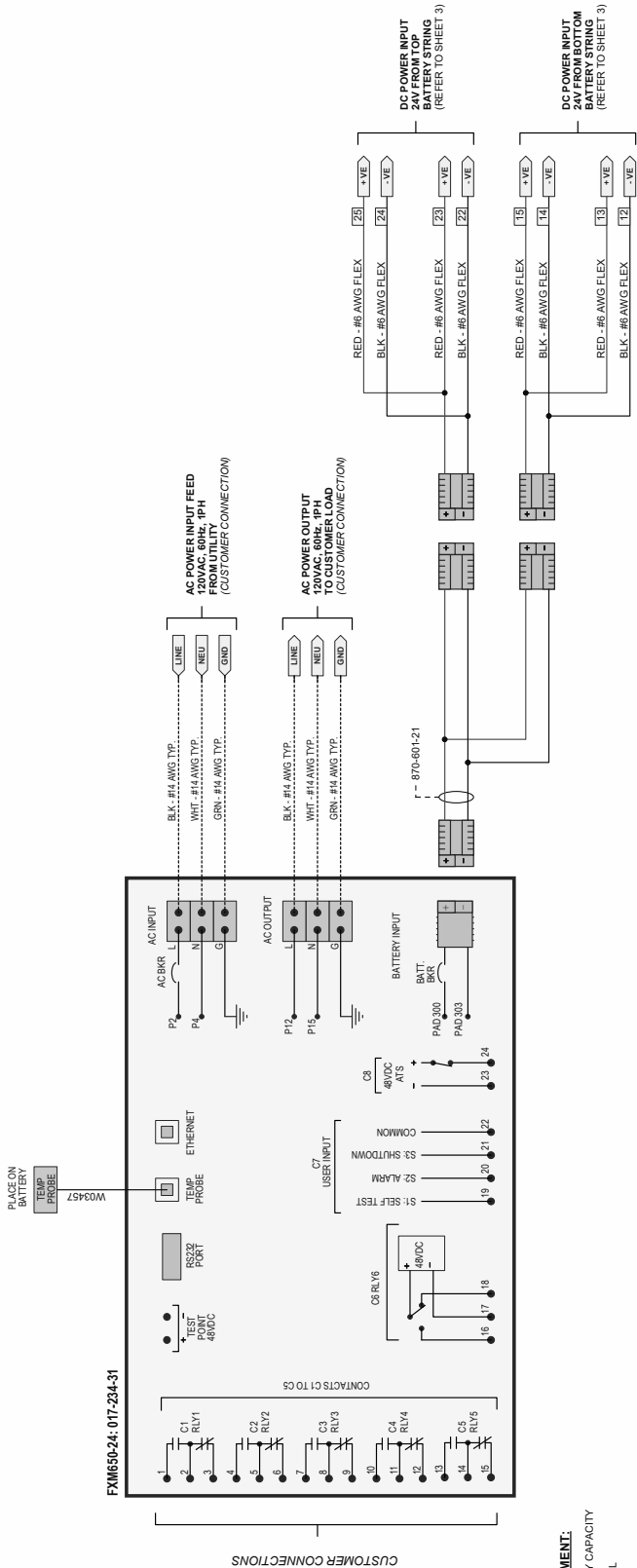
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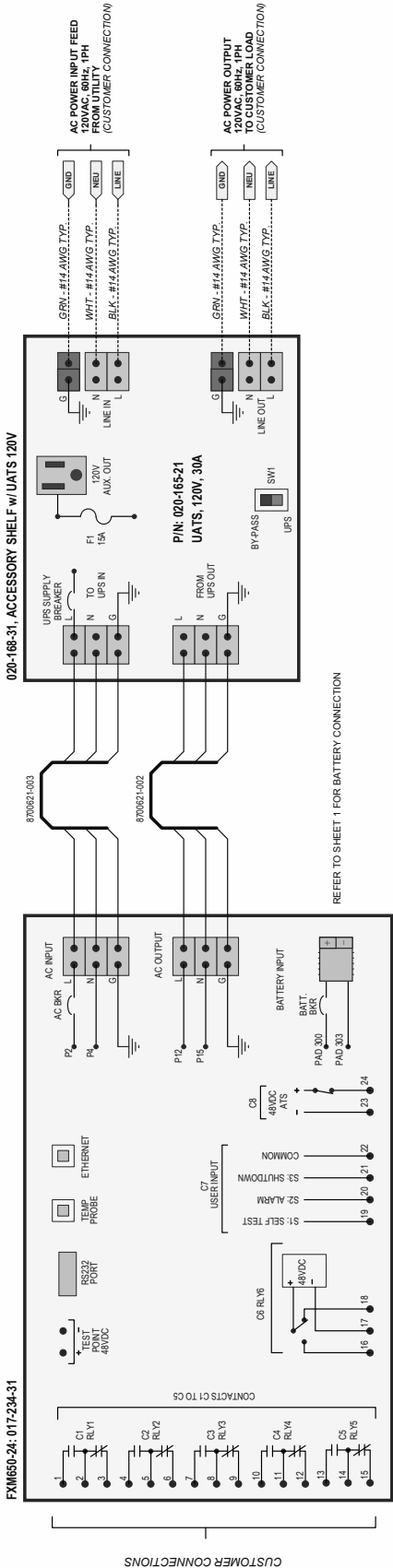
	
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SIZE DWG NO.	REV
B 0300227-06	A
SCALE: 1:24	SHEET 2 OF 2

FXM650 UPS MODULE AC POWER, BATTERY STRING & TEMPERATURE PROBE WIRING:

REVISIONS			
LTR	DESCRIPTION	DRW	DATE



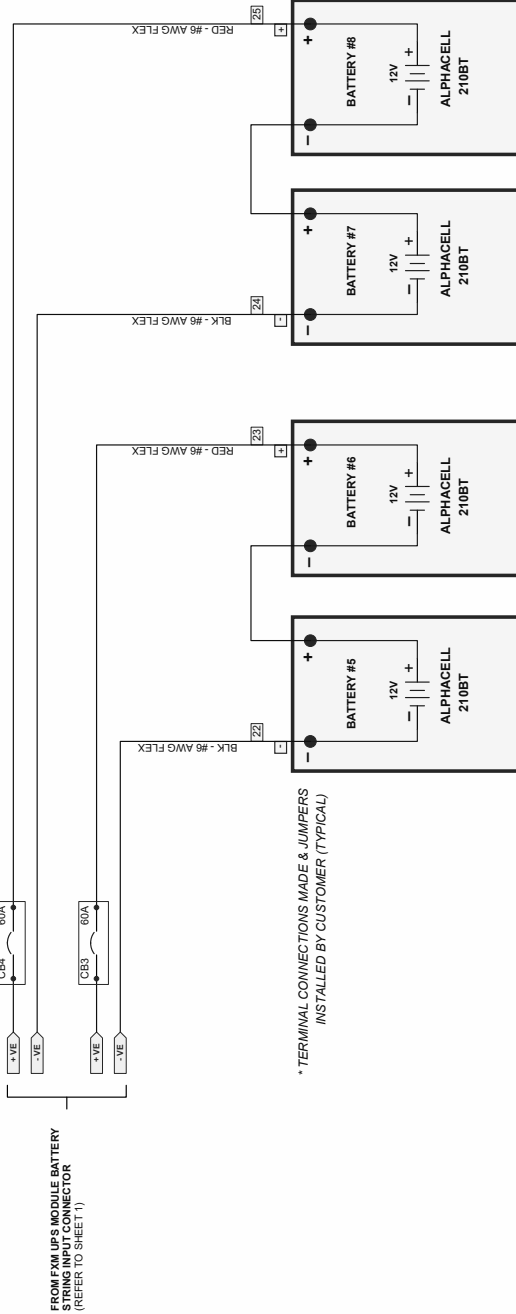
FXM650 UPS MODULE WITH UATS MODULE WIRING:



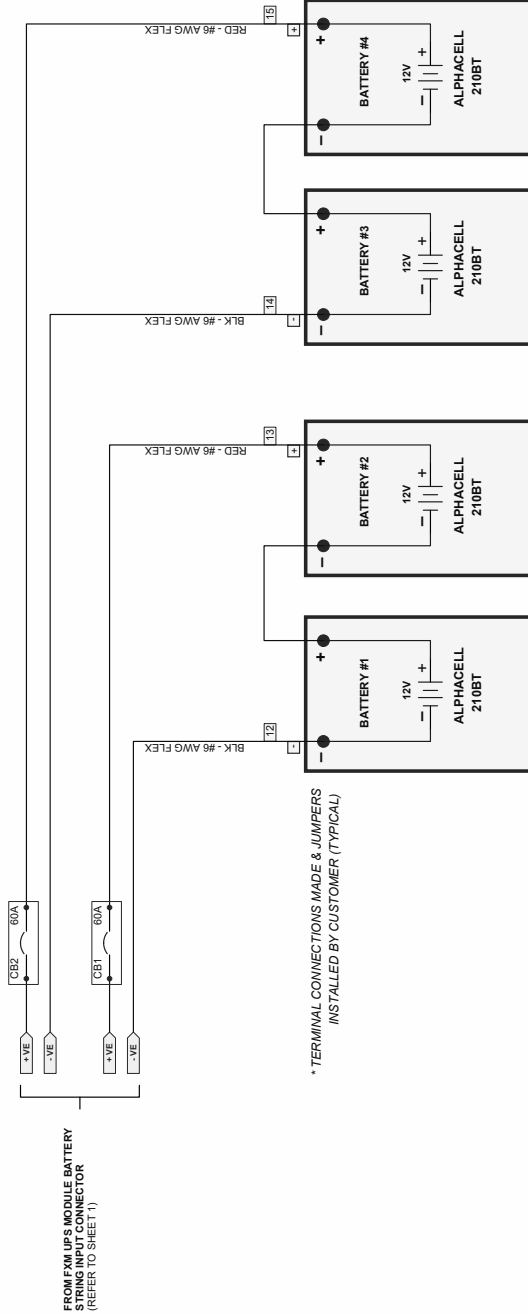
RELAY ASSIGNMENT:

- C3 = LOW BATTERY CAPACITY
- C4 = CHARGER FAIL
- C5 = AC FAIL
- C1, C2 = NOT USED

**SYSTEM 24V BATTERY STRINGS CABLING:**



TOP BATTERY STRINGS

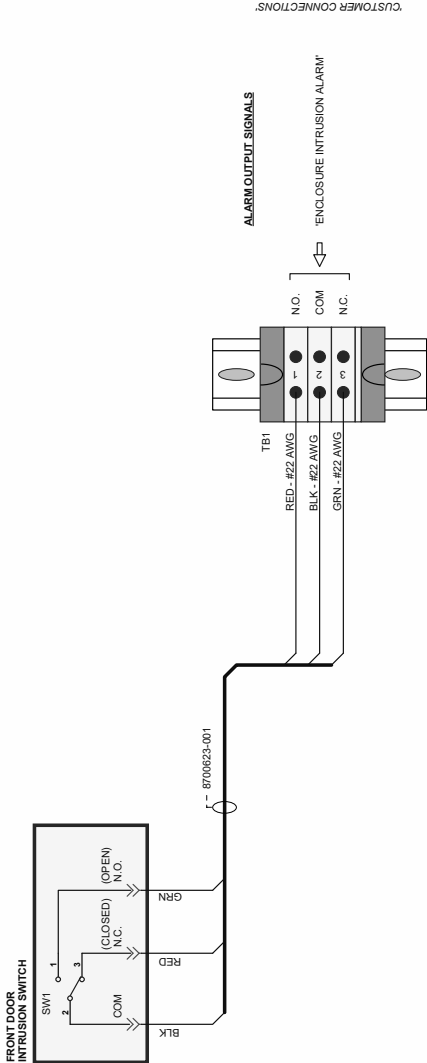


BOTTOM BATTERY STRINGS

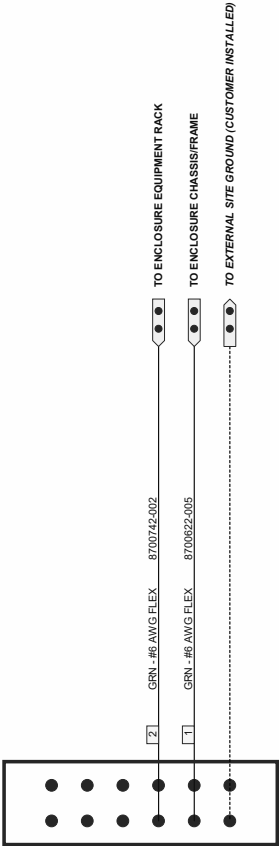


TITLE FXM5024 120V UPS POWERED BY BATTERY STRING WIRING SCHEMATIC, PS41-2730			
SIZE B	DWGNO 0570187-05	REV A	
SCALE	NTS	SHEET	3 of 4

ENCLOSURE INTRUSION ALARM WIRING:



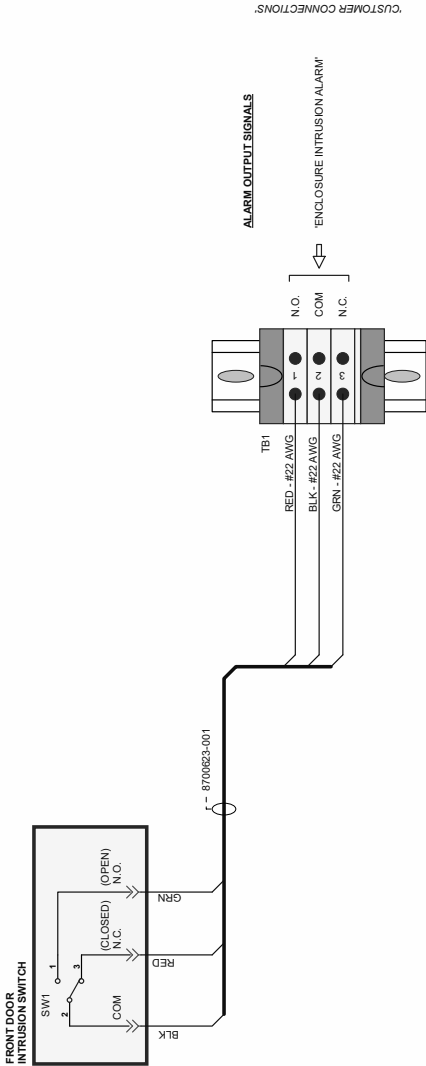
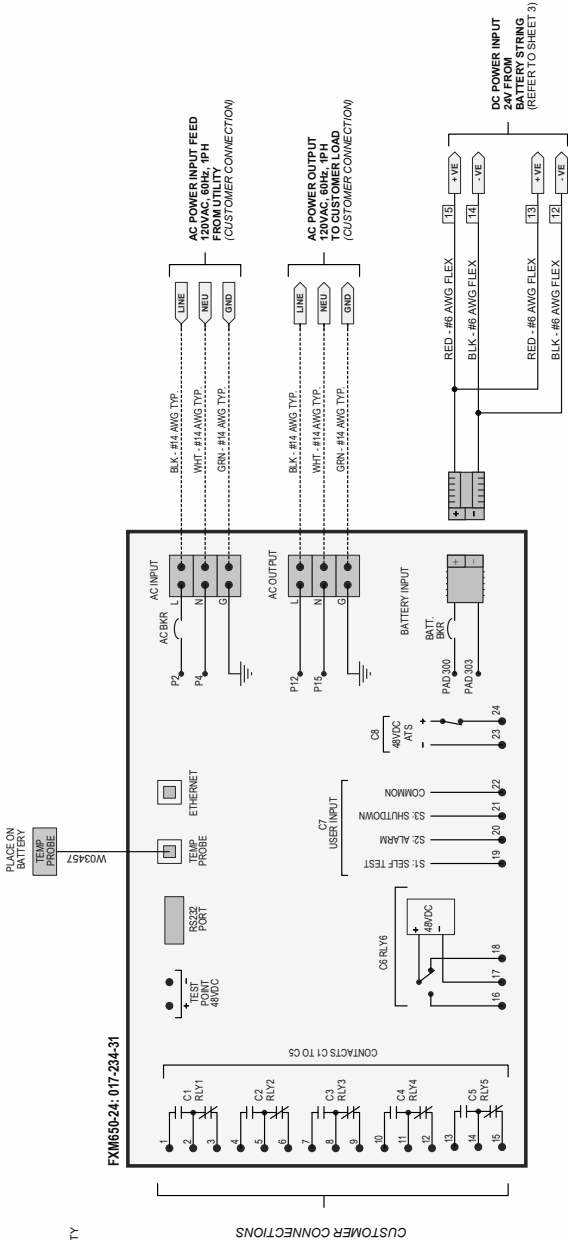
ENCLOSURE MASTER GROUND BAR TERMINATIONS:



REVISES			
LTR	DESCRIPTION	DRW	DATE
3	ADDED BATTERY BREAKERS	JL	2018-02-18

# FXM650 UPS MODULE AC POWER, BATTERY STRING, INTRUSION ALARM & TEMPERATURE PROBE WIRING:

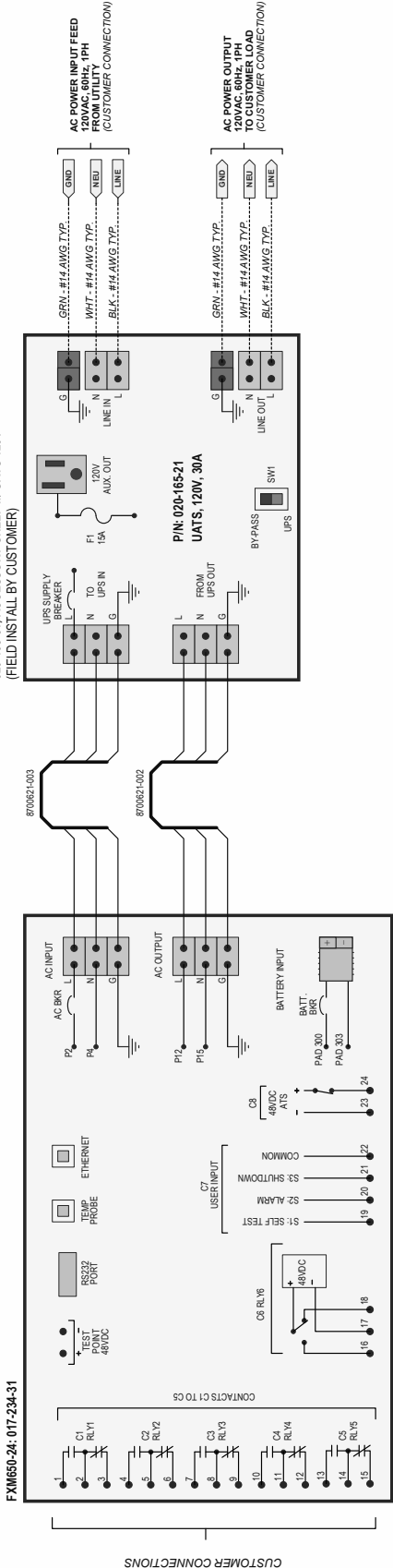
**RELAY ASSIGNMENT:**  
C3 = LOW BATTERY CAPACITY  
C4 = CHARGER FAIL  
C5 = AC FAIL  
C1, C2 = NOT USED



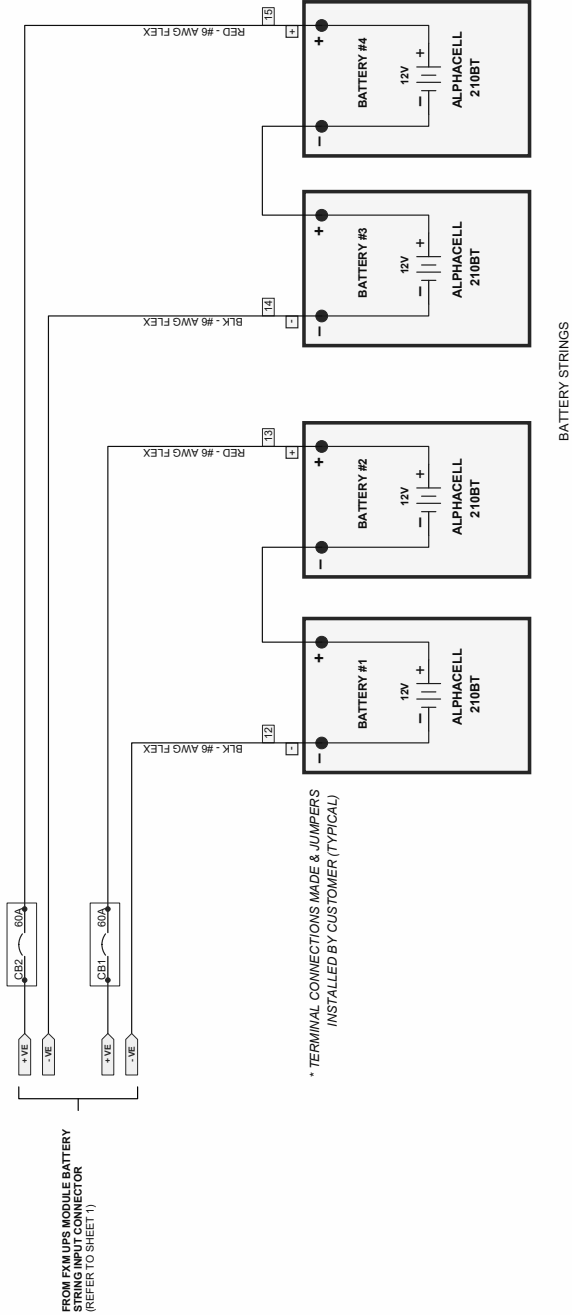
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APPROVALS	DATE	TITLE: FXM650-24, 120V, UPS, POWER ENCLOSURE SYSTEM WIRING SCHEMATIC, PS41-2730	
DRAWN	JL	2018-03	REV B
CHECKED	JJ	2018-03	REV B
SIZE: B		DWG NO. 0570188-05	SCALE: 1 of 3
© ALPHA TECHNOLOGIES LTD		NTS	SHEET



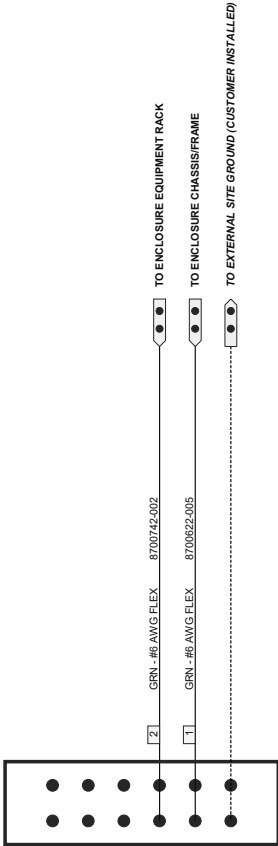
FXM650 UPS MODULE WITH FIELD INSTALLED UATS MODULE WIRING:



SYSTEM 24V BATTERY STRINGS CABLING:

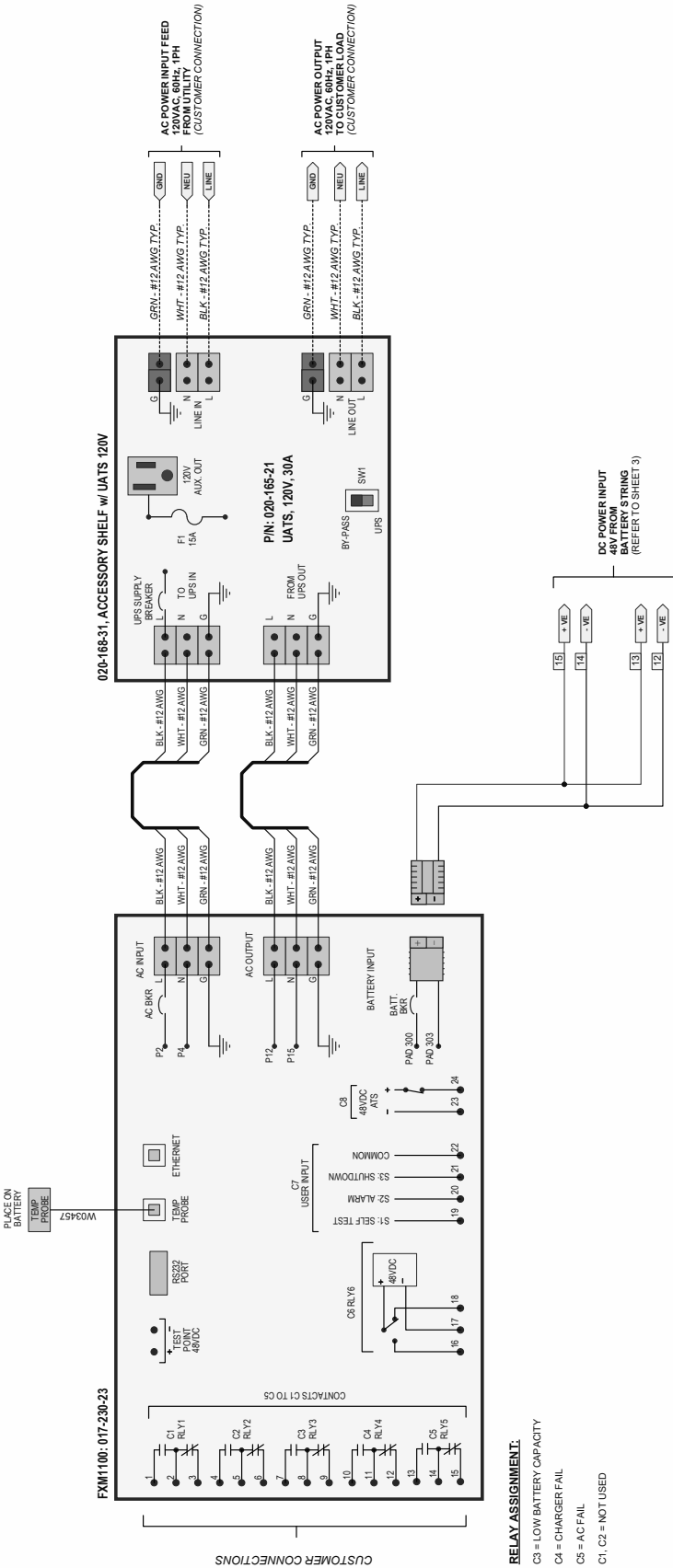


ENCLOSURE MASTER GROUND BAR TERMINATIONS:

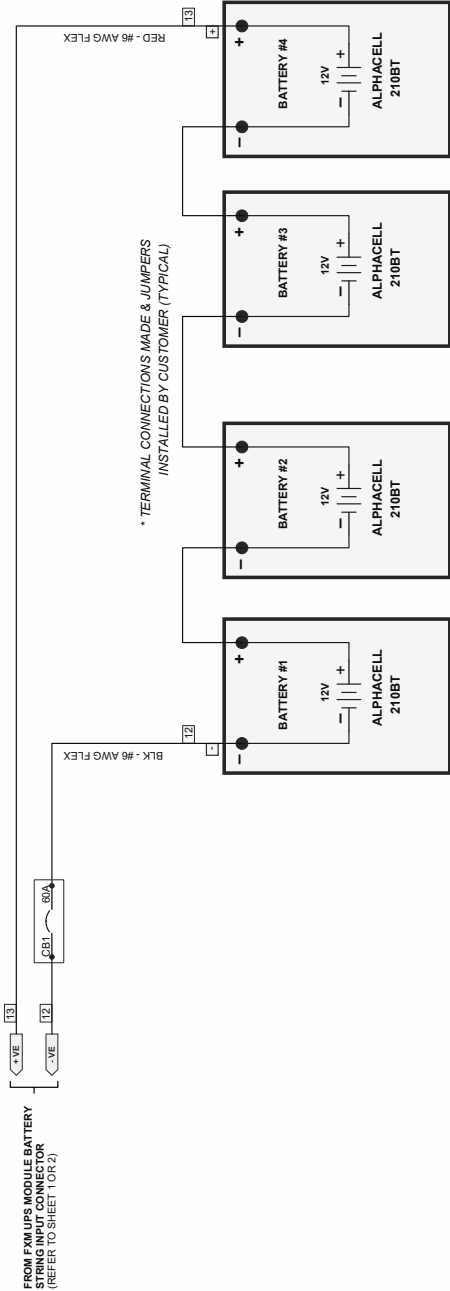
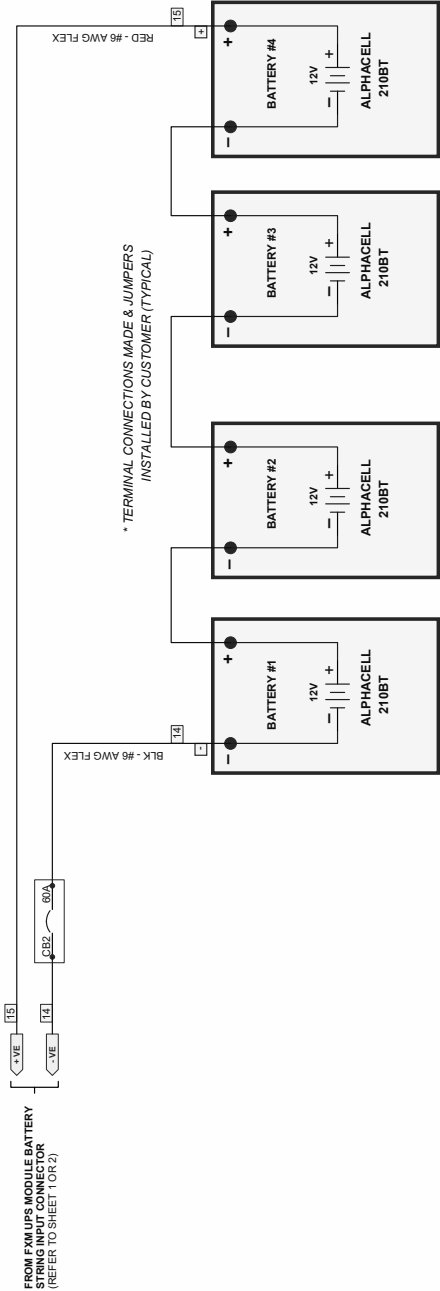




FXM1100 UPS MODULE WITH UATS MODULE. BATTERY STRING & TEMPERATURE PROBE WIRING:

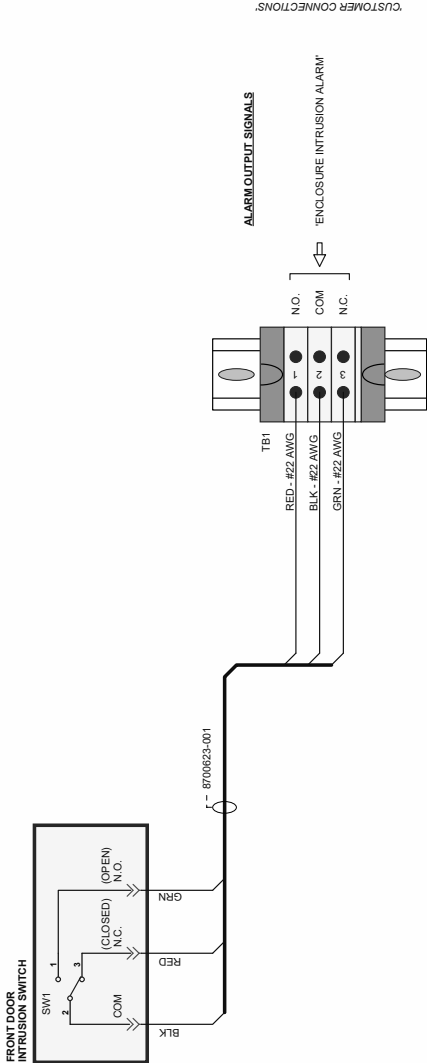


SYSTEM 48V BATTERY STRINGS CABLING:

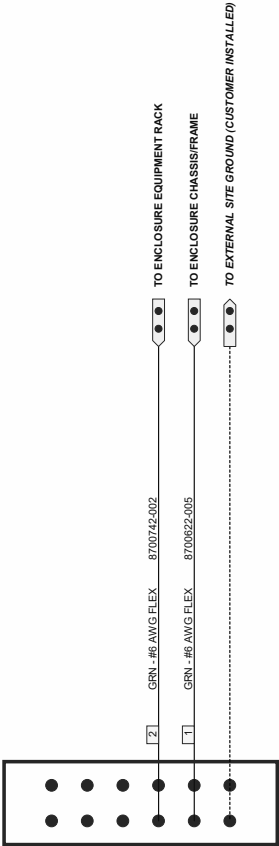


TITLE FXM100-48 120V UPS, POWER ENCLOSURE SYSTEM WIRING SCHEMATIC, PS41-Z130		
SIZE B	DRAWING 0570189-05	REV A
SCALE	NTS	SHEET 3 of 4

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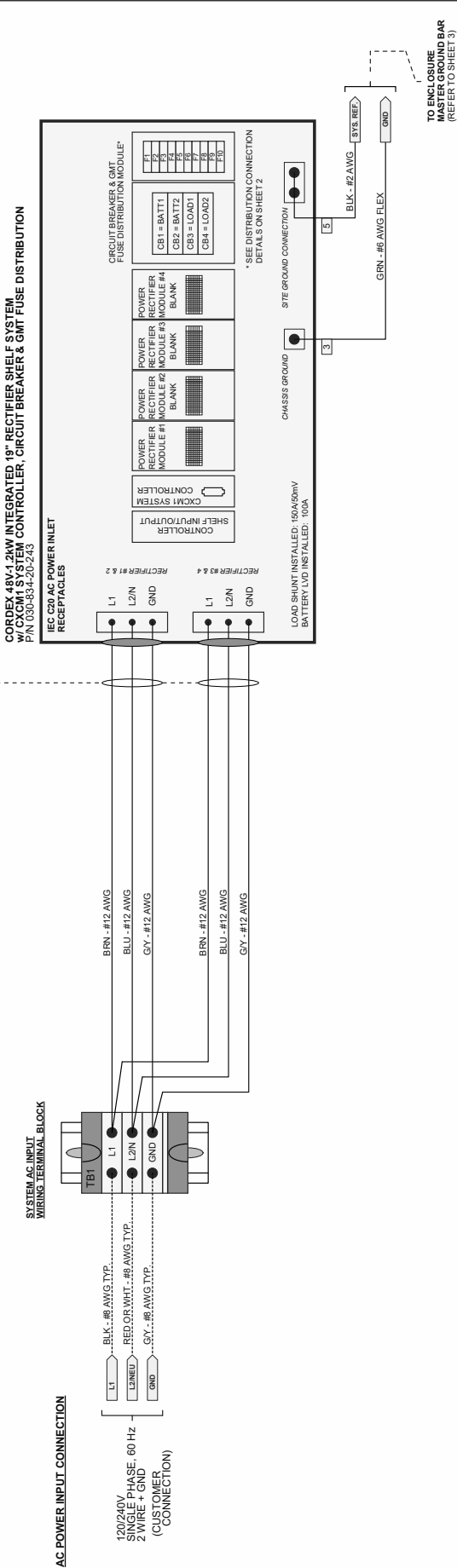
ENCLOSURE MASTER GROUND BAR TERMINATIONS:



CORDEX 48-1.2kW RECTIFIER SHELF w/ MAIN BREAKER LOADCENTRE AC POWER DISTRIBUTION WIRING:

REVISIONS		
LTR	DESCRIPTION	CHK
B	CHANGE BATTERY CB TO 60A	J.L

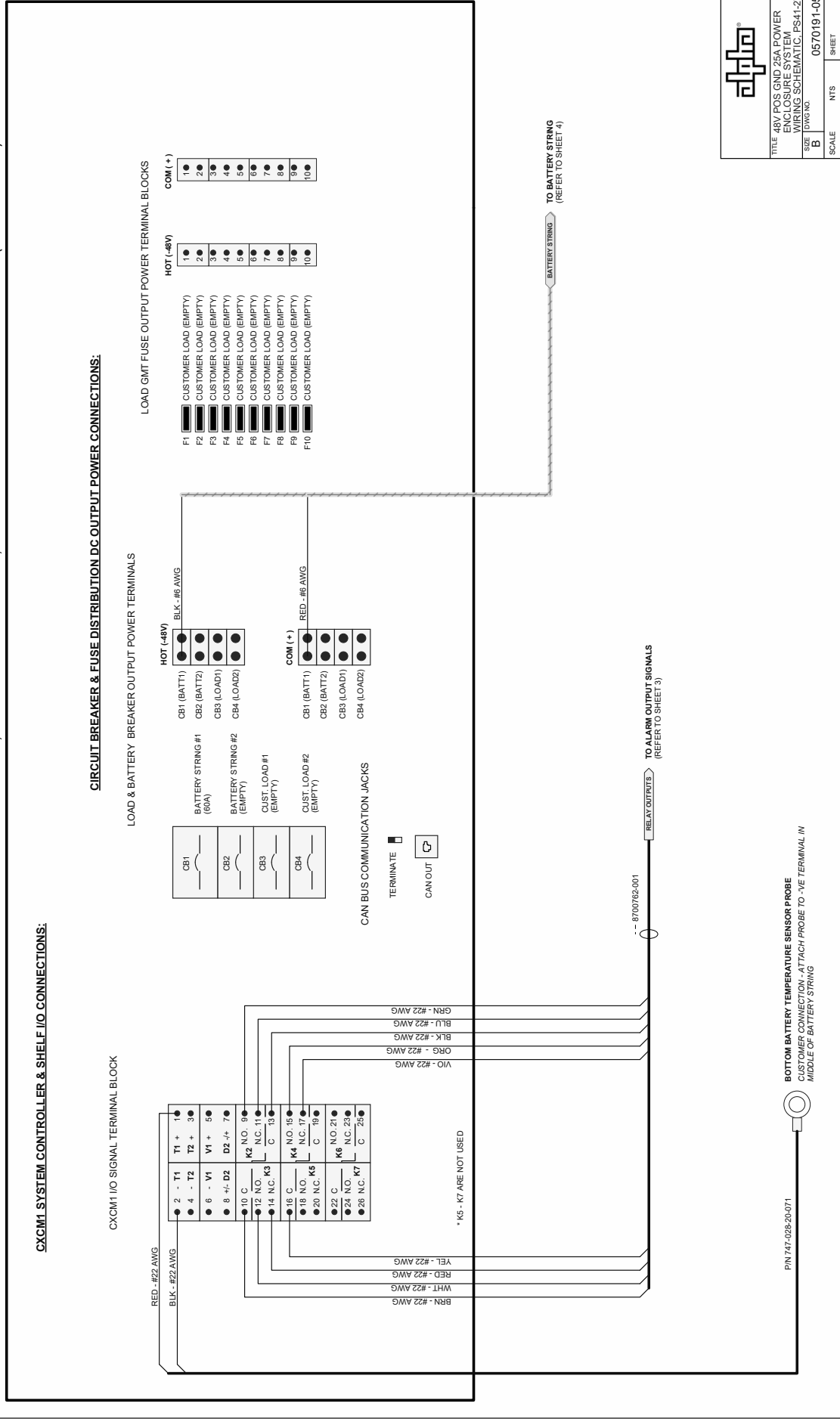
\* USE SUPPLIED 12/3 SJT POWER CORDSETS



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APPROVALS	DATE
DRAWN	J.L. 2018-03
CHECKED	J.L. 2018-03
DATE	2018-03-20
TITLE	48V POS GND 25A POWER ENCLOSURE SYSTEM WIRING SCHEMATIC, PS41-2730
SIZE	DWGNO
REV	B
0570191-05	
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NTS	SHEET
1 of 4	

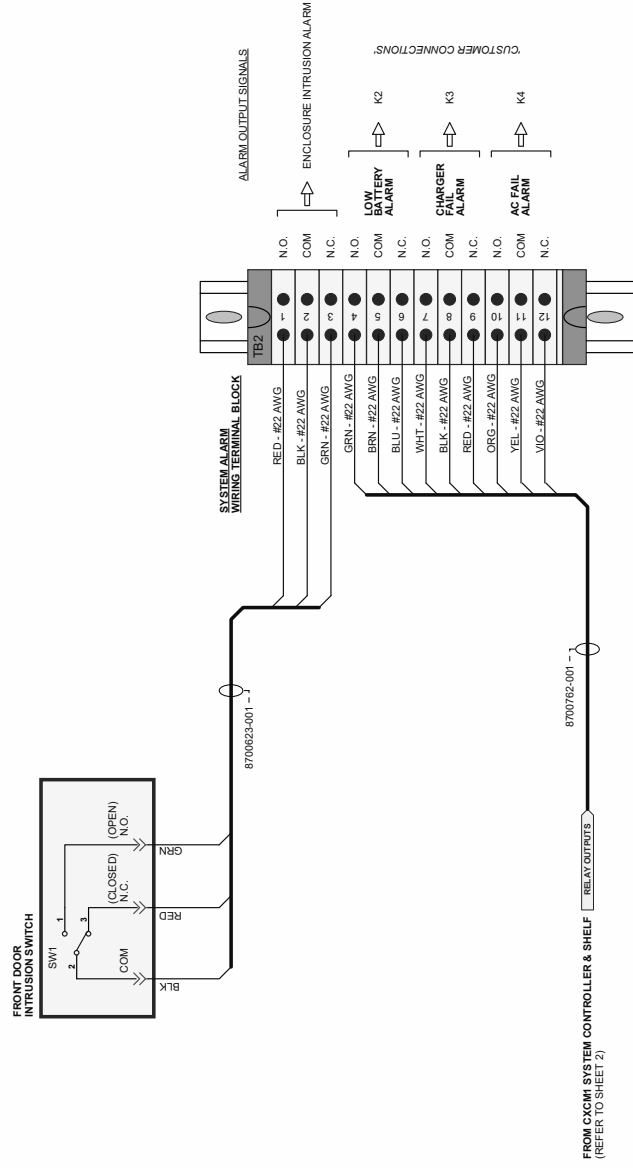
**CORDEX 48-1.2kW RECTIFIER SHELF BREAKER AND FUSE DISTRIBUTION & CXCM1 SYSTEM CONTROLLER INPUT/OUTPUT WIRING:**

CORDEX 48V-1.2kW INTEGRATED 19" POWER RECTIFIER MODULE SHELF SYSTEM w/ CXCM1 SYSTEM CONTROLLER, 2 LOAD &amp; 2 BATT BREAKER POS, BATTERY LVD AND 10 POS GMT FUSE DISTRIBUTION (P/N 030-834-20-243)

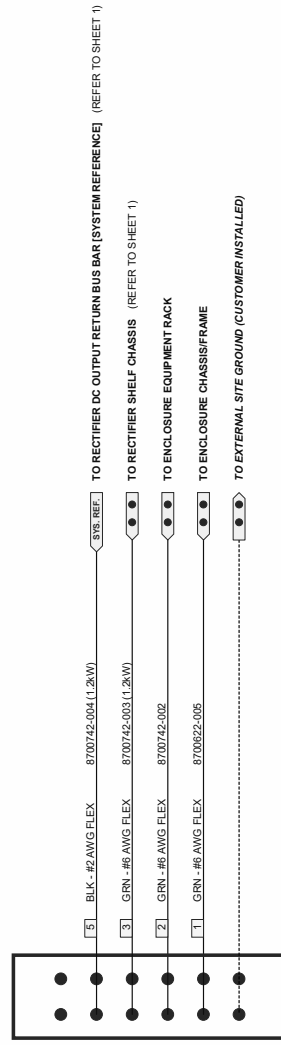




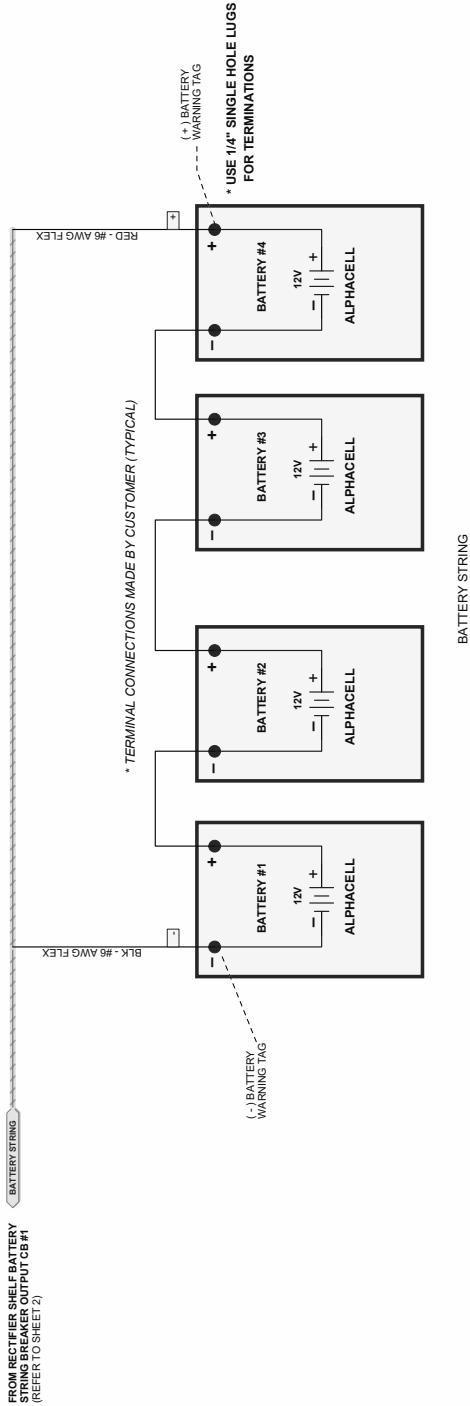
**ENCLOSURE ALARM OUTPUT WIRING:**



**ENCLOSURE MASTER GROUND BAR TERMINATIONS:**



SYSTEM 48V BATTERY STRING CABLING:



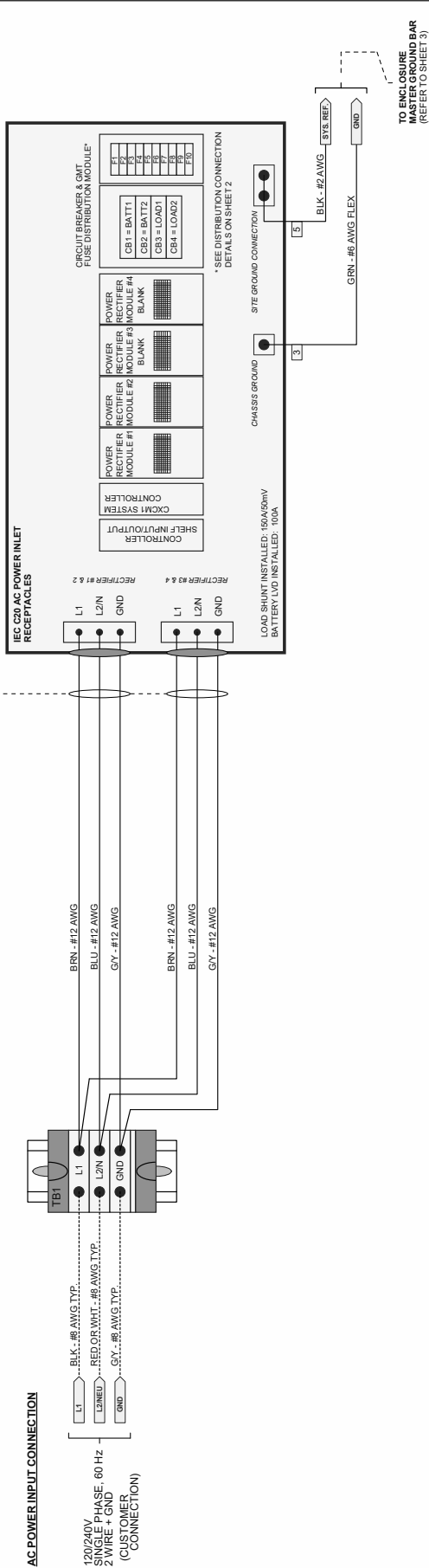
TITLE 48V POS GND 25A POWER ENCLOSURE SYSTEM WIRING SCHEMATIC, PS41-2730		
SIZE B	DWG NO. 0570191-05	REV B
SCALE	NTS	SHEET 4 of 4

CORDEX 48-1.2kW RECTIFIER SHELF AC POWER WIRING:

REVISIONS		
LTR	DESCRIPTION	CHK
B	CHANGE BATTERY CB TO B6A	J.L
		2018.10.12.U

\* USE SUPPLIED 12/3 SJT POWER CORDSETS

CORDEX 48V-1.2kW INTEGRATED 19" RECTIFIER SHELF SYSTEM  
AC/DC SYSTEM CONTROLLER, CIRCUIT BREAKER & GBT FUSE DISTRIBUTION  
P/N 030434-20-243



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APPROVALS	DATE	TITLE
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CHECKED J.L	2018-08-13	SIZE DWGNO
DESIGNED		
BY		
© ALPHA TECHNOLOGIES LTD	SCALE	SHEET
		1 of 4

## CORDEX 48V-1.2kW INTEGRATED 19" POWER RECTIFIER MODULE SHELF SYSTEM w/ CXCM1 SYSTEM CONTROLLER, 2 LOAD &amp; 2 BATT BREAKER POS, BATTERY LVD AND 10 POS GMT FUSE DISTRIBUTION (P/N 030-834-20-243)

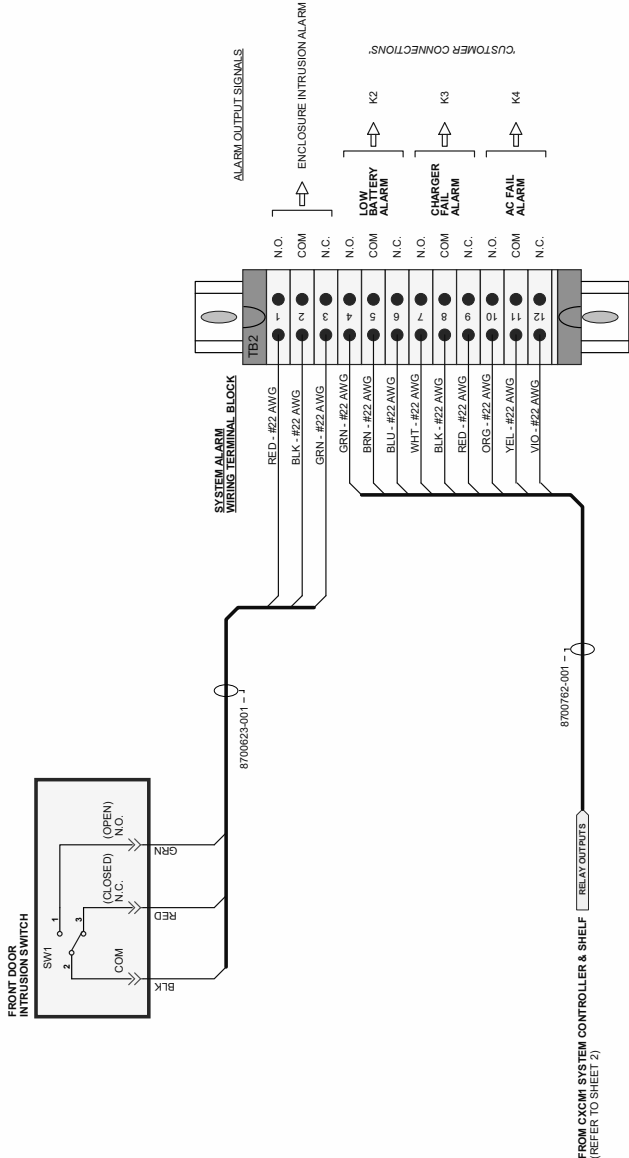
### CIRCUIT BREAKER & FUSE DISTRIBUTION DC OUTPUT POWER CONNECTIONS:



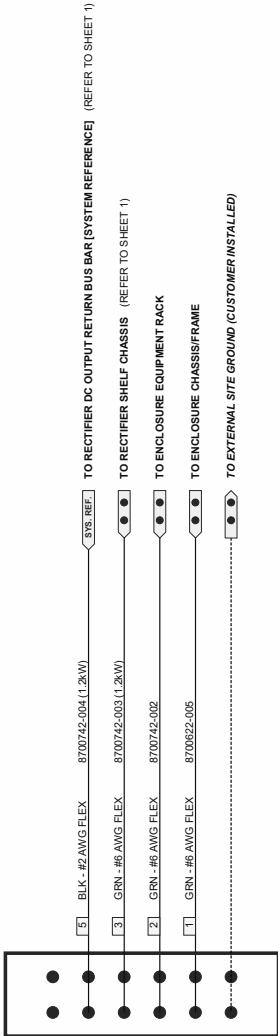
TOP BATTERY TEMPERATURE SENSOR PROBE  
CUSTOMER CONNECTION - ATTACH PROBE TO -  
MIDDLE OF BATTERY STRING

**BOTTOM BATTERY TEMPERATURE SENSOR PROBE**  
CUSTOMER CONNECTION - ATTACH PROBE TO -VE TERMINAL IN  
MIDDLE OF BATTERY STRING

ENCLOSURE ALARM OUTPUT WIRING:

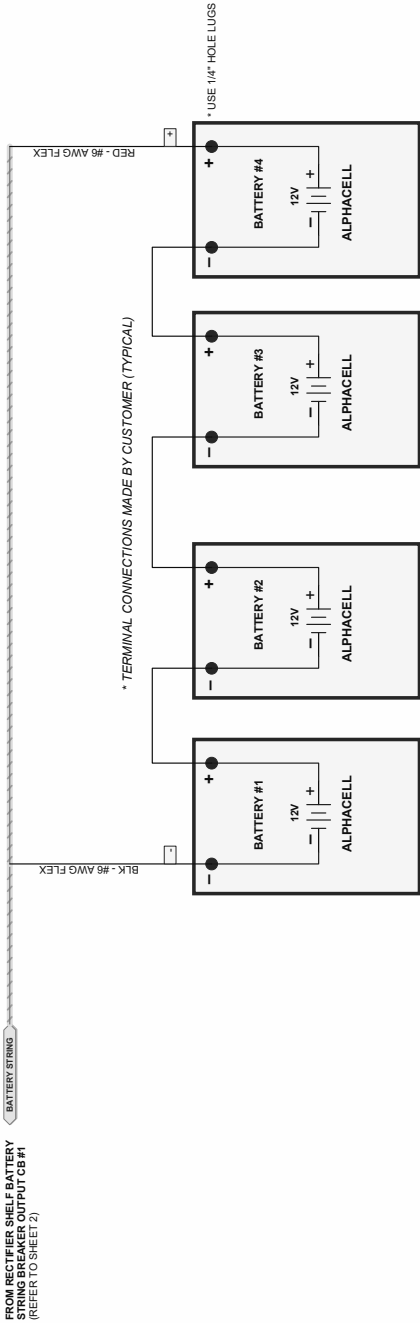
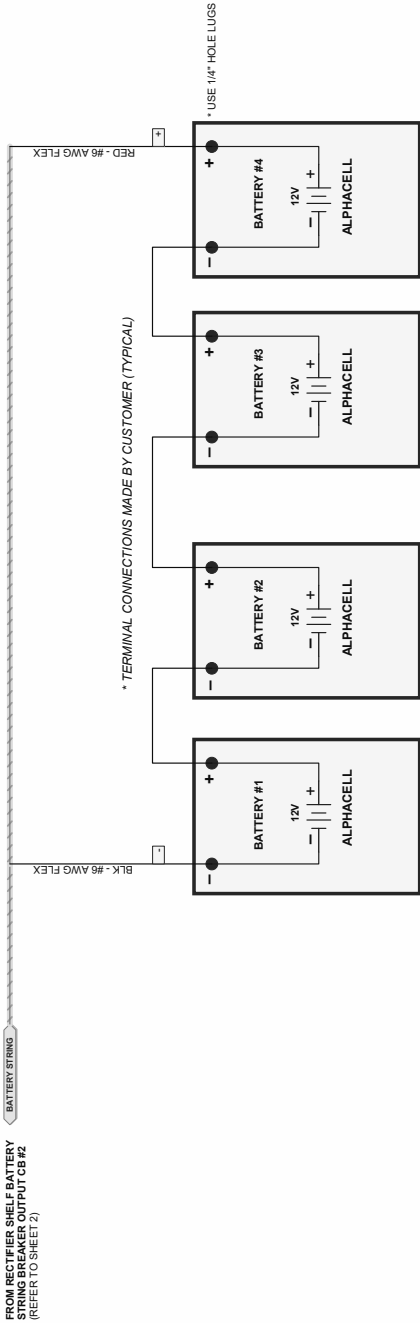


ENCLOSURE MASTER GROUND BAR TERMINATIONS:



TITLE 48V POS GND 50A POWER ENCLOSURE SYSTEM WIRING SCHEMATIC, PS41-2730			
SIZE B	DRAWING 0570192-05	SHEET 3 of 4	REV B
SCALE	NTS	SHEET	

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