



Public Safety Solutions

PS41-2730-FXM HP

User Guide ID: 9400032-J0

Effective: 03/2022



Read this document carefully.

Learn how to protect your equipment from damage and fully understand its functions.

Public Safety Solutions

Alpha[®] PS41-2730-FXM HP

UL 2524 Certified Backup Power System



NOTICE

For the latest version of software, firmware, and product documentation, visit the Alpha[®] website, www.alpha.com or www.alpha.ca.



NOTICE

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



NOTICE

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



NOTICE

EnerSys shall not be held liable for any damage or injury involving its enclosures, power supplies, generators, batteries, or other hardware if used or operated in any manner or subject to any condition inconsistent with its intended purpose, or if installed or operated in an unapproved manner, or improperly maintained.

Copyright notice

© 2022 EnerSys. All rights reserved. Trademarks and logos are the property of EnerSys and its affiliates unless otherwise noted. Subject to revisions without prior notice. E. & O.E.

No part of this documentation shall be reproduced, stored in a retrieval system, translated, transcribed, or transmitted in any form or by any means manual, electric, electronic, electromechanical, chemical, optical, or otherwise without prior explicit written permission from EnerSys.

This document, the software it describes, and the information and know-how they contain constitute the proprietary, confidential and valuable trade secret information of EnerSys, and may not be used for any unauthorized purpose, or disclosed to others without the prior written permission of EnerSys.

The material contained in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, EnerSys assumes no liability resulting from errors or omissions in this document, or from the use of the information contained herein. EnerSys reserves the right to make changes in the product design without reservation and without notification to its users.

Contents

1. Safety.....	6
1.1 Safety symbols.....	6
1.2 General warning and cautions.....	6
1.3 Electrical safety.....	7
1.4 Battery safety.....	7
2. Introduction.....	8
2.1 Product overview.....	8
3. Specifications	9
4. Features.....	11
4.1 Alpha® FXM HP 650 and FXM HP 1100 rugged UPS modules.....	11
4.2 Universal automatic transfer switch (optional)	11
4.3 Alarms, controls, and communications.....	12
4.4 Battery storage and retainer.....	13
4.5 Enclosure security.....	13
4.6 Power enclosure system – options, components, and parts.....	13
5. Inspection	14
5.1 Packing materials.....	14
5.2 Returns for service	14
5.3 Check for damage	14
5.4 General receipt of shipment	14
5.5 Miscellaneous small parts.....	14
6. Site evaluation and pre-installation.....	15
6.1 Site selection	15
6.2 Tools required.....	15
7. Installation.....	16
7.1 Safety precautions	16
7.2 Plinth mounting for concrete floor	16
8. Wiring.....	20
8.1 Grounding the enclosure.....	20

- 8.2 I/O wiring into power enclosure system..... 20
- 8.3 Installation of the Alpha® FXM HP UPS..... 23
- 9. Maintenance..... 29
 - 9.1 Battery maintenance report 30
- 10. Battery calculations..... 31
 - 10.1 Battery calculation for the Alpha® FXM HP 1100 UPS 31
 - 10.2 Battery calculation for the Alpha® FXM HP 650 UPS 32
- 11. Acronyms and definitions 33

Figures

Figure 1: Alpha® PS41-2730-FXM HP interior view	8
Figure 2: Alpha® FXM HP 650 UPS (top) and FXM HP 1100 UPS (bottom)	11
Figure 3: Universal automatic transfer switch.....	11
Figure 4: Attaching an EOLR to the dry contacts of the public safety system.....	12
Figure 5: Alpha® PS41-2730-FXM HP enclosure with two battery trays and front retainer.....	13
Figure 6: Plinth template for mounting bolts	16
Figure 7: Battery tray screws	18
Figure 8: Mounting the enclosure to the plinth	18
Figure 9: Securing the enclosure to the plinth.....	19
Figure 10: Enclosure MGB and chassis ground.....	20
Figure 11: Rear cable entry locations.....	21
Figure 12: Assembling brackets from the rack mount kit	24
Figure 13: Connecting AC power input and output load cables	25
Figure 14: UATS AC power connection wiring.....	26
Figure 15: Alpha® FXM HP UPS AC power connection wiring from UATS	26
Figure 16: Alpha® FXM HP 1100 UPS front panel	27
Figure 17: Alpha® FXM HP UPS external battery wiring for a 48 Vdc string.....	28
Figure 18: Alpha® FXM HP UPS external battery wiring for a 24 Vdc string.....	28

1. Safety

Save these instructions

This document 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 document before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies Ltd. 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 document. Where these symbols appear, use extra care and attention.



WARNING

Risk of serious injury or death

Equipment in operation poses a potential electrical hazard which could result in serious injury or death to personnel. This hazard may continue even when power is disconnected.



CAUTION

Cautions indicate the potential for injury to personnel.



CAUTION

Risk of burns

A device in operation can reach temperature levels which could cause burns.



ATTENTION

The use of attention indicates specific regulatory or code requirements that may affect the placement of equipment or installation procedures. Follow the prescribed procedures to avoid equipment damage or service interruption.



GROUNDING

This symbol indicates the location or terminal intended for the connection to protective earth. An enclosure that is not properly connected to protective earth presents an electrical hazard. Only a licensed electrician can connect AC power and protective earth to the enclosure.



NOTICE

A notice provides additional information to help complete a specific task or procedure or general information about the product.

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 document.
- Only trained personnel are qualified to install or replace this equipment and its components.
- Use proper lifting techniques whenever handling equipment, parts, or batteries.

1.3 Electrical safety



WARNING

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

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

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



WARNING

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

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

1.4 Battery safety

- Servicing and connection of batteries must be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Always wear eye protection, rubber gloves, and a protective vest when working near batteries. Remove all metallic objects from your hands and neck.
- Use OSHA approved insulated hand tools. Do not rest tools on top of batteries.
- Batteries contain or emit chemicals known to cause cancer and birth defects or other reproductive harm. Battery post terminals and related accessories contain lead and lead compounds. Wash your hands after handling batteries.



WARNING

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

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

2. Introduction

2.1 Product overview

The Alpha® PS41-2730-FXM HP is a charger and battery backup system ideal for sites with BDA systems installed to improve emergency radio communication per UL 2524.

This enclosure is designed to protect its internal backup power system in accordance with NFPA 1221 and UL 2524 standard requirements.



Figure 1: Alpha® PS41-2730-FXM HP interior view

3. Specifications

Table A — Alpha® PS41-2730-FXM HP specifications		
Electrical		
Alpha® PS41-2730-FXM HP 650		
AC input	<ul style="list-style-type: none"> 120 V, 8.0 A maximum, 60 Hz, 1PH 120 V, 30 A maximum, 60 Hz, (UATS) - optional 	
AC output	120 V, 3.8 A / 456 W maximum, 60 Hz, 1PH	
Trouble relay outputs (three total)		
Dry contact voltage, Vdc	24 Vdc	
Dry contact current, A resistive	1 A	
Recommended AC input breaker	15 A	
Alpha® PS41-2730-FXM HP 1100		
AC input	<ul style="list-style-type: none"> 120 V, 16.4 A maximum, 60 Hz, 1PH 120 V, 30 A maximum, 60 Hz, (UATS) - optional 	
AC output	120 V, 8.3 A / 1000 W maximum, 60 Hz, 1PH	
Trouble relay outputs (three total)		
Dry contact voltage, Vdc	48 Vdc	
Dry contact current, A resistive	1 A	
Recommended AC input breaker	20 A	
Battery back-up operation		
Alpha® PS41-2730-FXM HP 650		
Charge current	10 A	Run time: <ul style="list-style-type: none"> 12 hours at 494 watts 24 hours at 246 watts
Maximum battery configuration	Two 208 Ah in series, up to four strings in parallel	
Alpha® PS41-2730-FXM HP 1100		
Charge current	15 A	Run time: <ul style="list-style-type: none"> 12 hours at 1000 watts 24 hours at 500 watts
Maximum battery configuration	Four 208 Ah in series, up to two strings in parallel	
Mechanical		
Dimensions (H x W x D)	1051 x 701 x 775 mm (41.4 x 27.6 x 30.5 in.)	
System weight (without battery)	52 kg (115 lb)	
Mounting	Ground with plinth (option)	
Construction	High strength corrosion resistant aluminum	
Finish	Powder coat, red	
Door latch	Three point latch with L-handle for padlock	

Environmental	
Operating temperature	0 to 40°C (32 to 104°F) for indoor installations
Storage temperature	-40 to 85°C (-40 to 185°F)
Cabinet rating	UL 508A Enclosure Type 4
Agency Compliance	
System rating	UL 2524



ATTENTION

Only use accessories (such as grommets or fittings) with the proper Type 4 rating or better during field installation.

4. Features

4.1 Alpha® FXM HP 650 and FXM HP 1100 rugged UPS modules

Alpha® FXM HP 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.

Multiple communication ports including two Ethernet connections permits simultaneous local craft access as well as permanent LAN/WAN connectivity. A USB drive may also be used to quickly backup and restore site configuration settings and data logs. Enhanced security using modern encryption technology ensures proper authentication and privacy for remote connection with the UPS.

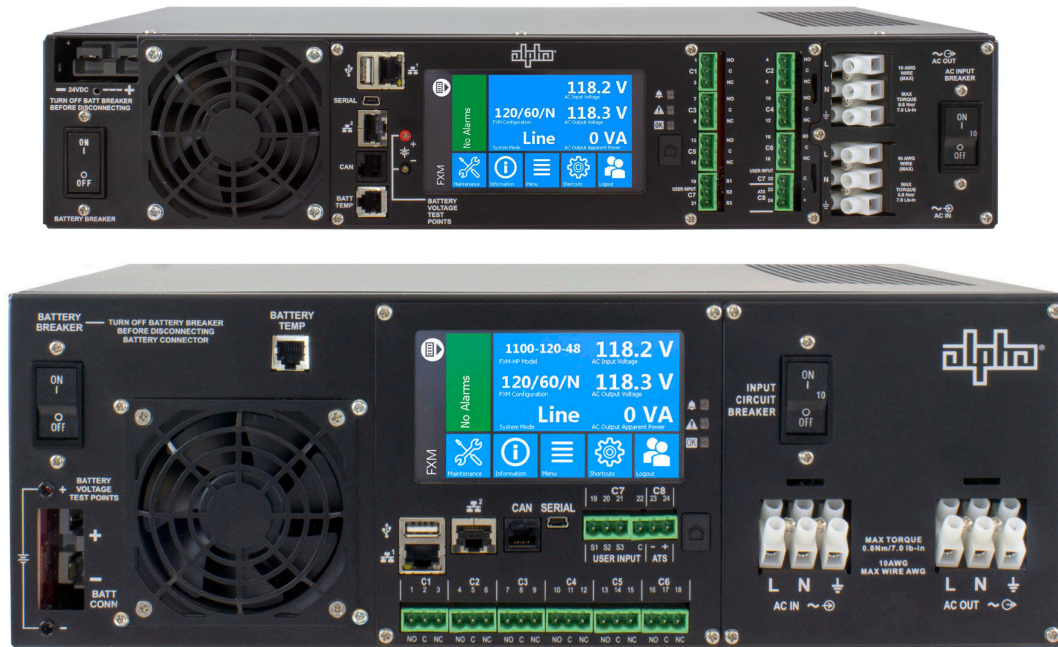


Figure 2: Alpha® FXM HP 650 UPS (top) and FXM HP 1100 UPS (bottom)

4.2 Universal automatic transfer switch (optional)

The universal automatic transfer switch (UATS) is an optional add-on switching unit. These switching units provide power 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 or the other, the UATS allows the use of up to three different back-up sources (line, batteries, and generator).



Figure 3: Universal automatic transfer switch

4.3 Alarms, controls, and communications

4.3.1 Standard alarm function description

Dry contacts are available for standard annunciation of the following conditions:

- Low battery alarm
- Charger fail alarm
- AC fail alarm
- AC normal.

Connections to these alarms are shown in and [Table C](#) for the Alpha® FXM HP UPS modules.

These alarms must be taken to and monitored by a dedicated alarm or annunciator panel in accordance with UL 2524, NFPA 1221, or local regulations.



NOTICE

Ensure that the alarm panel or the annunciator panel is terminated with an end of line resistor (EOLR) of proper resistance to be monitored by the control panel.

When attaching an EOLR to the dry contacts of the public safety system, ensure that the UL listed resistor is connected to the dry contacts via pigtail connections using UL listed marrettes.

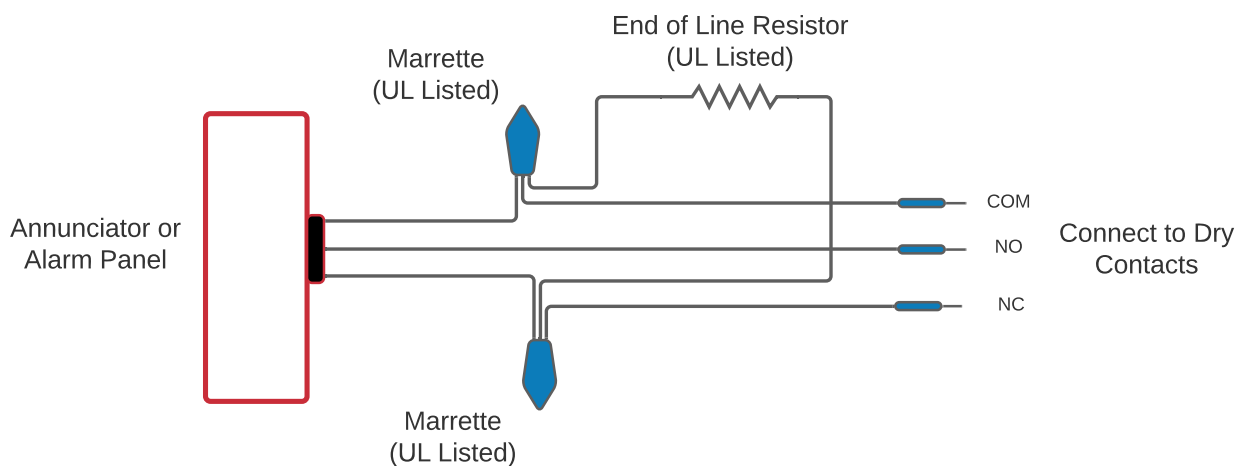


Figure 4: Attaching an EOLR to the dry contacts of the public safety system

4.3.2 Temperature compensation



NOTICE

Do not splice the temperature probe leads to a conductor larger than 0.75 mm² (18 AWG).

The temperature compensation feature will adjust the output float or 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 at time of commissioning.

4.3.3 Communication

- Ethernet: 10/100 BASE-T Ethernet connection on the front of the controller for local communication.
- Web based user interface for local or remote via a 10/100 BASE-T Ethernet connection.
- Email notification.
- SNMP communications protocol

4.4 Battery storage and retainer

The Alpha® PS41-2730-FXM HP enclosure can support up to two strings (48 V) or up to four strings (24 V) of VRLA batteries on two battery trays. One or two trays are supplied, and are equipped with a battery wiring harness and a front retainer.

Battery tray dimensions W × D: 52.1 cm × 59.4 cm (20.5 in. × 23.4 in.)

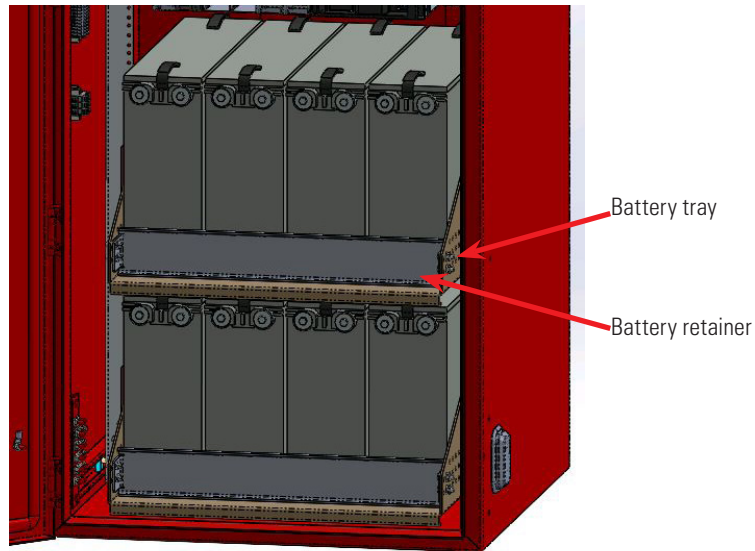


Figure 5: Alpha® PS41-2730-FXM HP enclosure with two battery trays and front retainer

4.5 Enclosure security

The front door can be secured with a separate padlock installed on the door handle. Install a padlock on the enclosure door after installation to prevent unauthorized access to the system.

4.6 Power enclosure system – options, components, and parts

Table B — Part numbers

AC power system option	
Alpha® FXM HP 650 UPS, 24 V, 1 battery tray	0570188-101
Alpha® FXM HP 650 UPS, 24 V, 2 battery trays	0570187-101
Alpha® FXM HP 1100 UPS, 48 V, 2 battery trays	0570189-101
Accessories	
Universal automatic transfer switch (UATS) accessory kit Allows the Alpha® FXM HP UPS module to be removed without turning off the power to the load.	0370498-001
Plinth mounting kit (height: 12.1 cm; 4.75 in.)	0370231-002

5. Inspection

5.1 Packing materials

EnerSys 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 EnerSys 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 EnerSys packaging material is from sustainable resources and or is recyclable.

5.2 Returns for service



NOTICE

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

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.

5.3 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 EnerSys for advice on the impact of any damage.

5.4 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.

5.5 Miscellaneous small parts

Review the packing slip and bill of materials to determine the part number of the "configuration kits" included with your system. Review the bill of materials to verify that all the small parts are included. Contact Alpha Technologies Ltd. if you have any questions before you proceed.

6. Site evaluation and pre-installation

6.1 Site selection

Consider the following before selecting a mounting location:

- The Alpha® PS41-2730-FXM HP 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 Alpha® PS41-2730-FXM HP indoor power enclosure has been designed for the following mounting options: Plinth, mounted on a concrete slab, floor, or similar surface. (PN: 0370231-002)



NOTICE

The Alpha® PS41-2730-FXM HP backup power system is designed for indoor use only.

6.2 Tools required

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

- Battery lifting apparatus (if required)
- Electric drill with hammer action, 1/2 inch 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 2.5 to 0.34 mm² (14 to 22 AWG)
- Torque wrench: 1/4 inch drive, 0 to 17 Nm (0 to 150 in-lb)
- Torque wrench: 3/8 inch drive, 0 to 136 Nm (0 to 100 ft-lb)
- Insulating canvases as required
- Various insulated hand tools including:
 - Combination wrenches
 - Ratchet and socket set
 - Various screwdrivers
 - Electricians knife
- Battery safety spill kit (required for wet cells only)

7. 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 documentation.

7.1 Safety precautions

Refer to the "[Safety](#)" section near the beginning of this document.

7.2 Plinth mounting for concrete floor

7.2.1 Mounting the plinth to the concrete floor

A fully equipped power enclosure with two shelves of batteries weighs approximately 344 kg (760 lb). 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, for example, civil or structural. Cast-in-place or pre-cast concrete slabs can be used.

Use the template in [Figure 6](#) to place the anchor bolts. Follow the specific recommendations from the fastener manufacturer to ensure that the securing device achieves its full structural capacity.

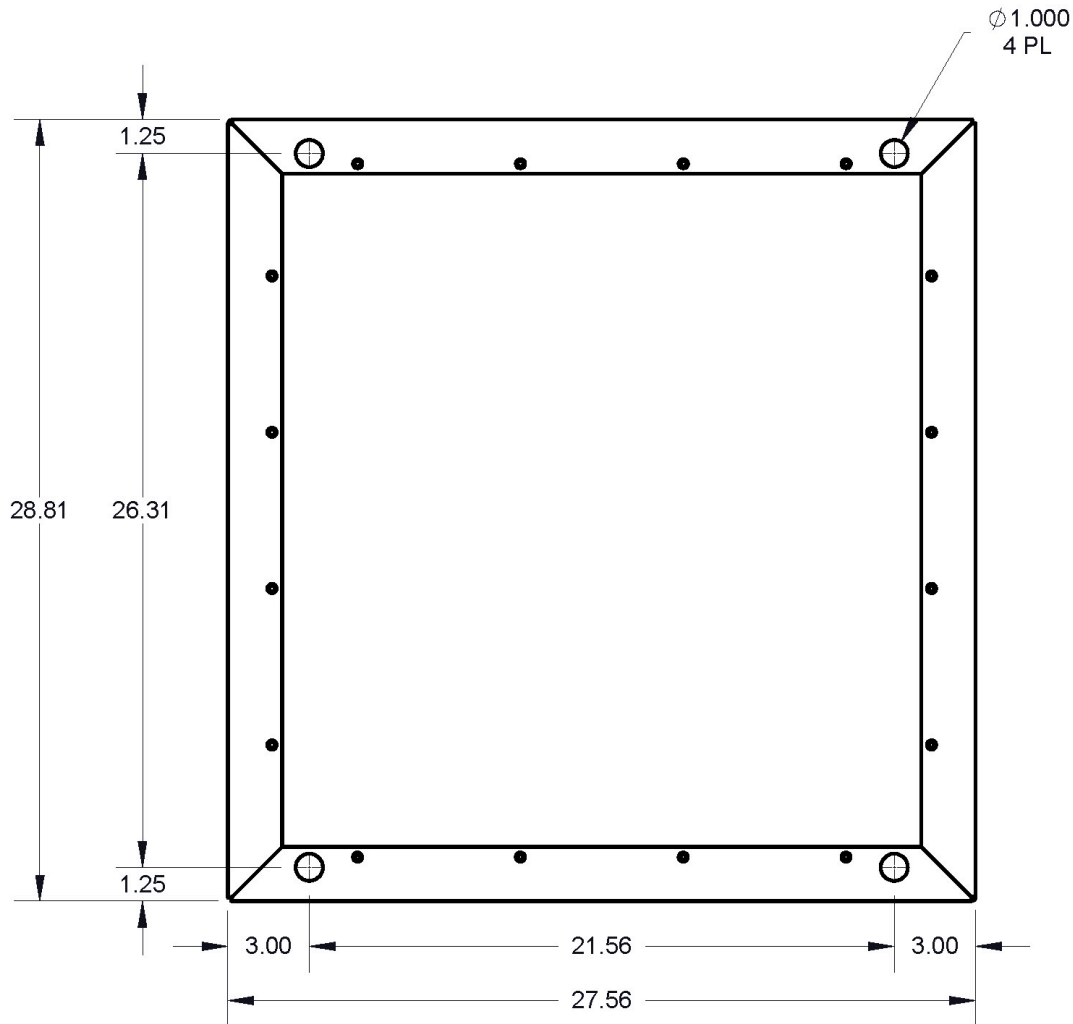


Figure 6: Plinth template for mounting bolts

1. Place the plinth in position over the anchor holes.
2. If used, place the vapor barrier material on the mounting surface.
3. Mount the plinth box onto the four installed mounting bolts on the concrete floor.
4. Secure the plinth with four 3/8 inch hex nuts, flat and lock washers (to be supplied by the installer).
5. Check that the plinth is level from front-to-back and from side-to-side.
6. Add shims as needed under one or two of the corners of the plinth, placing the shims as close as possible to the bolts.
7. Once the plinth is level, tighten all bolts to the appropriate torque.

Recommended bolt torque values	
¼ inch	11.93 Nm (8.8 ft-lb)
⅜ inch	44.1 Nm (32.5 ft-lb)
½ inch	98.9 Nm (73 ft-lb)

7.2.2 Unpacking the power system



CAUTION

Do not hoist or 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 Ltd..

7.2.3 Mounting the 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 7](#).
3. Use a mallet or hammer and slotted screwdriver to remove the 16 mounting hole knockouts at the base of the enclosure. [Figure 8](#) shows the location of four of the 16 mounting holes.
4. Lift the enclosure onto the plinth.
5. Secure the enclosure to the plinth with the 16 M6 × 16 screws and rubber washers included with the plinth.
6. Replace the battery tray.



Figure 7: Battery tray screws



Four of the 16 mounting holes around the base of the enclosure

Figure 8: Mounting the enclosure to the plinth

7.2.4 Securing the enclosure to the plinth

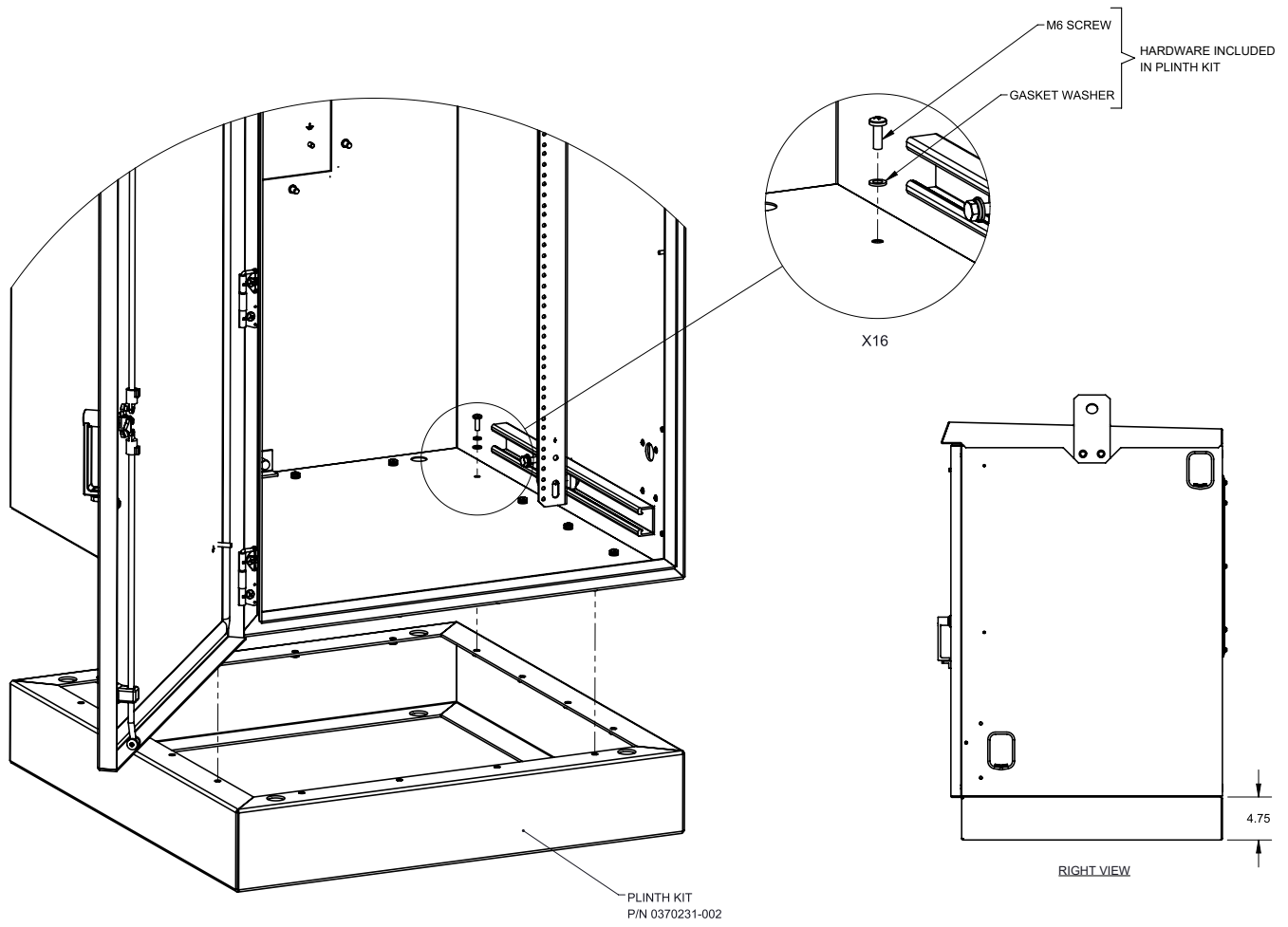


Figure 9: Securing the enclosure to the plinth

8. 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 documentation.

8.1 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.

1. Locate the enclosure master ground bar (MGB) at the left front sidewall of the enclosure.



GROUNDING

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



Figure 10: Enclosure MGB and chassis ground

8.2 I/O wiring into power enclosure system



NOTICE

Power limited and non-power limited wiring must enter the enclosure through separate conduit entrances. All power limited conductors must be separated by a minimum of 1.3 cm (0.25 in.) from all non-power limited conductors. The maximum length of the I/O wiring shall be no longer than 30 meters (98.5 feet).

With the enclosure securely mounted, drill holes as needed for cord grips or conduit fittings (installer supplied). Avoid drill shavings from contacting any power components inside the system. You will require a minimum of the following cables entering and exiting the enclosure:

- AC input power cable (non-power limited)
- AC output cable (non-power limited)
- Alarm/network cable (power limited)
 - Ethernet port (power limited)

Wiring must be routed and secured away from sharp projections, corners, and internal components. Use fittings rated UL Type 4 or better to maintain enclosure integrity. Refer to outline drawing for recommended drilling locations.

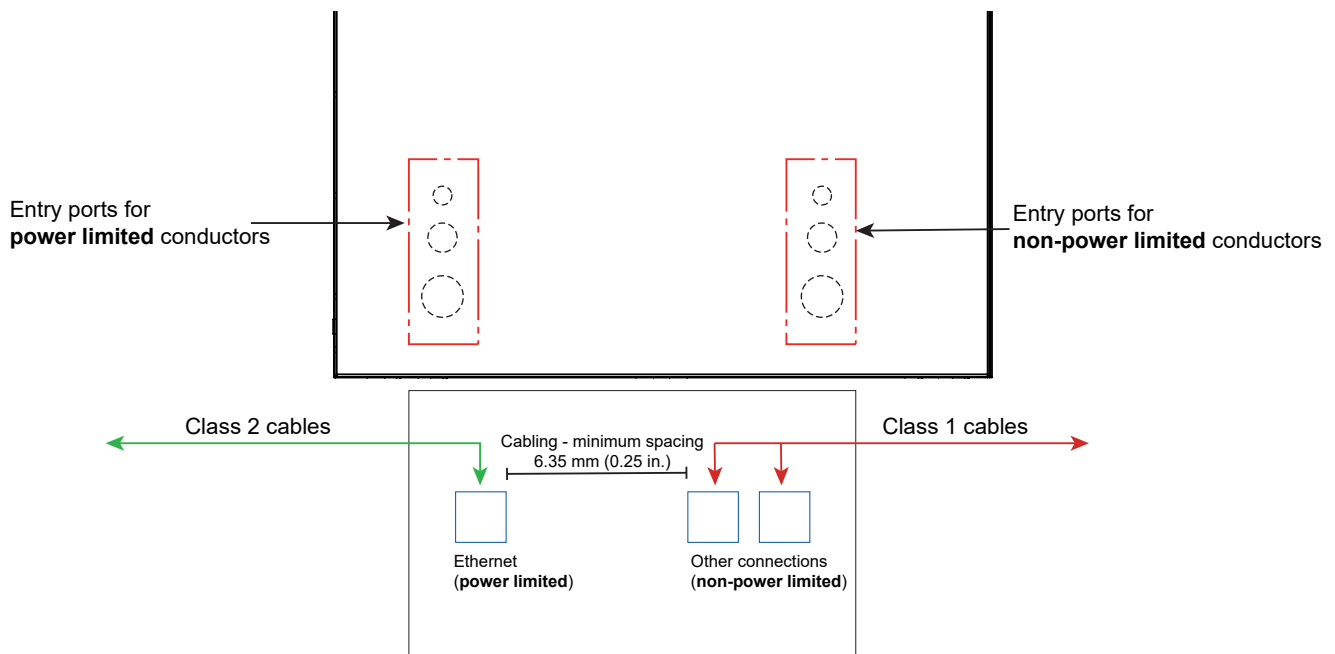


Figure 11: Rear cable entry locations



ATTENTION

Only use accessories (such as grommets or fittings) with the proper Type 4 rating or better during field installation.

8.2.1 Power enclosure alarm wiring block

The intrusion alarm wiring block, located on the left side wall of the enclosure, uses screw-in DIN-rail mounted terminal blocks. All other alarms are located on the Alpha® FXM HP UPS front panel. Use mating plugs included with the FXM HP UPS packaging. Connect designated alarm outputs to the local alarm-sending unit or device using appropriate wire with gauge sizes from 0.2 to 2.5 mm² (22 to 12 AWG). Strip the wires 7 to 8 mm (0.28 to 0.32 in.) before connecting to the terminal block.

Systems are shipped programmed with the appropriate settings. If a replacement power unit is installed in the field, the settings will need to be programmed to the following values.



ATTENTION

This product incorporates field-programmable software. In order for the product to comply with the requirements in the Standard UL 2524, certain programming features or options must be limited to specific values or not used at all as indicated.

Table C — FXM HP UPS system alarms

FXM HP front terminal	Description	Programming (replacement units)
C1	Do not use	Disabled
C2	Do not use	Disabled
C3	Low battery	C3 = Low Battery Warning 1, Low Battery Warning 2, Low Battery and No Line 1, Low Battery and No Line 2
C4	Charger fail alarm	Set C4 = Missing FXM HP UPS, AC Output Overloaded, AC Output Short Circuit, Battery Over Voltage, Battery Under Voltage, Battery Fail Fault, AC Input Backfeed Failure, Frequency Unknown
C5 (NO – COM)	AC fail alarm	C5 = On Battery
C5 (NC – COM)	AC normal operation	Technician to wire to annunciator panel to indicate AC on.
C6	Do not use	
C7	Do not use	
C8	Do not use	
USB A/USB Mini-B	Do not use	
CAN	Do not use	
LAN	TCP/IP Ethernet port	

8.3 Installation of the Alpha® FXM HP UPS



GROUNDING

The Alpha® FXM HP UPS is intended for permanent AC connection only.

The Alpha® FXM HP UPS 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 FXM HP UPS input **MUST** be protected by a circuit breaker certified for this use in accordance with the local electrical code. The FXM HP 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 FXM HP UPS must have disconnect devices attached.

The Alpha® PS41-2730-FXM HP is suitable both for installation as part of a common bonding network (CBN) and an isolated bonding network.

For installations above 1400 meters (4500 feet) elevation, additional cooling may be needed to reduce the operating temperature of the PS41-2730-FXM HP. The maximum allowable operating temperature must be reduced by 2°C (3.5 °F) for every 300 meters (1000 feet) above 1400 meters (4500 feet).

Observe the following EMC requirements when setting up the Alpha® PS41-2730-FXM HP 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, or other applicable government codes and regulations.
- The customer facilities must provide suitable surge protection.

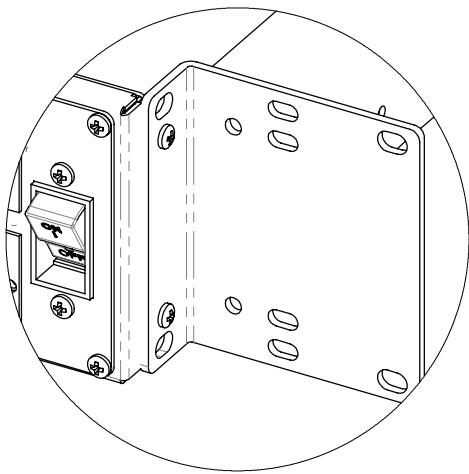
8.3.1 Mounting the FXM HP UPS in the Alpha® PS41-2730-FXM HP enclosure



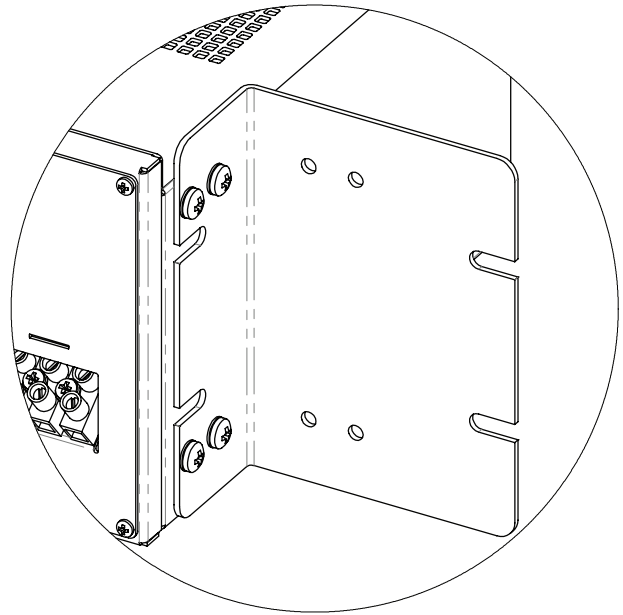
CAUTION

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

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



Mount the brackets from the FXM HP 650 UPS rack mount kit in an offset position with the M5 screws provided in the kit (two per bracket).



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

Figure 12: Assembling brackets from the rack mount kit

8.3.2 Wiring the Alpha® FXM HP UPS module



CAUTION

Make sure the AC line power is off. Switch off all circuit breakers on the Alpha® FXM HP 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

- If used, connect the following ports:
 - Ethernet port
 - Dry contacts
- Connect the load cable to the FXM UPS output terminal block (see [Figure 13](#)). Torque to 1.4 Nm (12 in-lb).
- Connect the line power to the FXM UPS AC input terminal block (see [Figure 13](#)). Torque to 1.4 Nm (12 in-lb).



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.

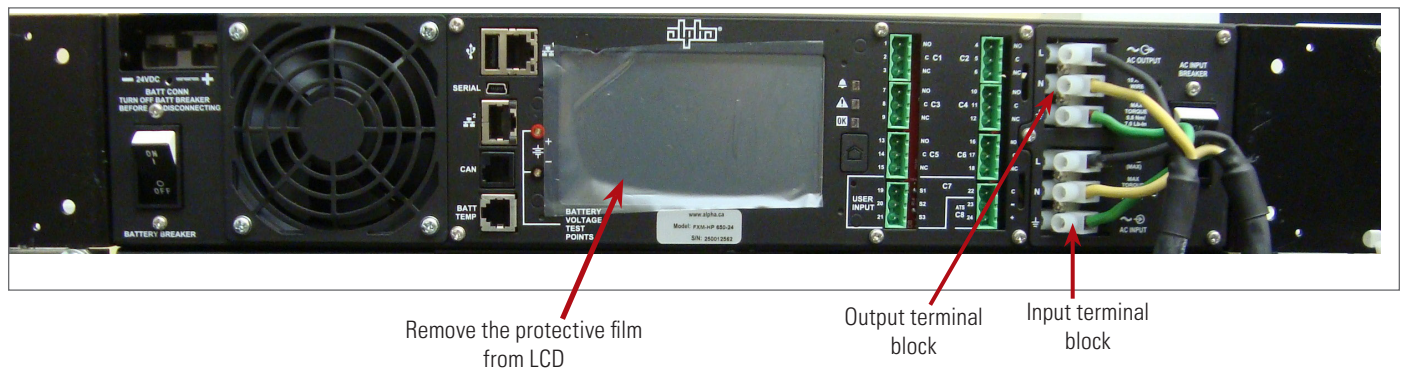


Figure 13: Connecting AC power input and output load cables

8.3.3 Wiring the Alpha® PS41-2730-FXM HP with a UATS option

1. Connect the TO UPS IN power cable from the UATS to the Alpha® FXM HP 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 Alpha® FXM HP UPS AC output terminal block, matching line, neutral, and ground wires to their respective terminal labels.
3. Torque all connections to 1.4 Nm (12 in-lb).

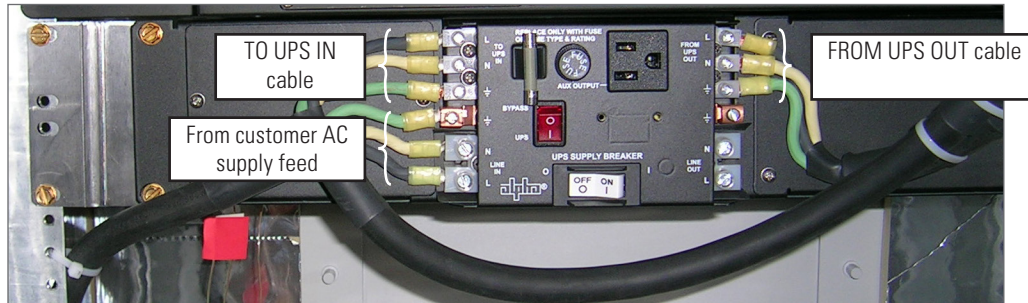


Figure 14: UATS AC power connection wiring

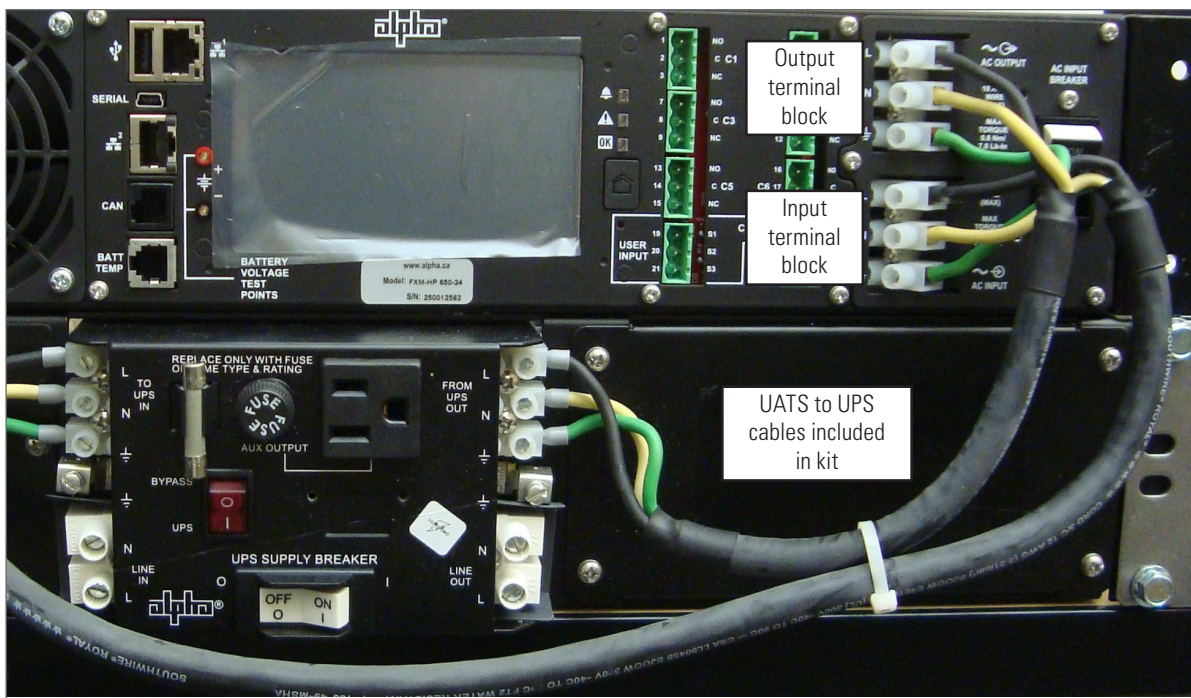


Figure 15: Alpha® FXM HP UPS AC power connection wiring from UATS

8.3.4 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.

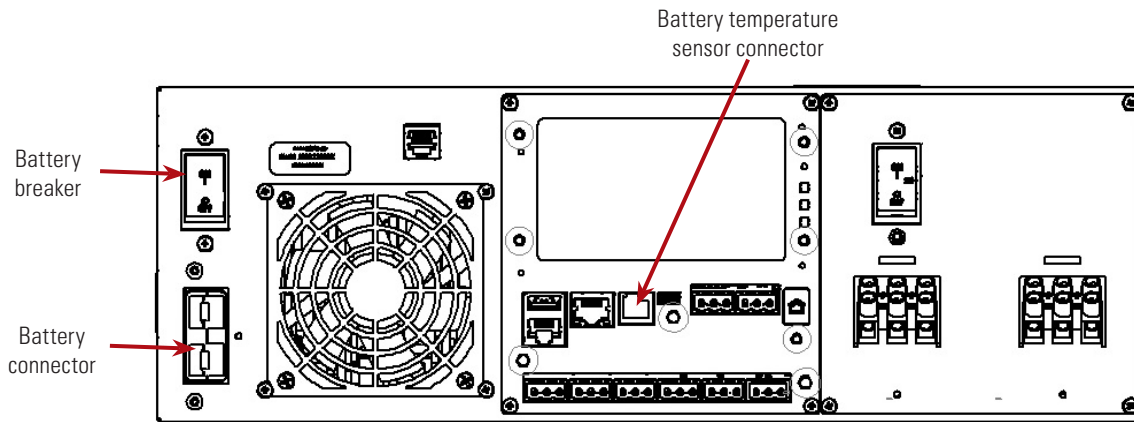


Figure 16: Alpha® FXM HP 1100 UPS front panel

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 17](#) and [Figure 18](#).
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 to 27 V (Alpha® FXM HP 650-24) or between 42 to 54 V (Alpha® FXM HP 1100-48).
6. Note the polarity and ensure that it is correct.
7. Ensure that the battery breaker on the FXM HP UPS is OFF.
8. Connect the external batteries to the battery connector on the FXM HP UPS—see [Figure 16](#).
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 5 to 7.5 cm (2 to 3 in.) from the base of the battery.
11. If multiple battery strings are used, repeat steps 1 to 4 as required.

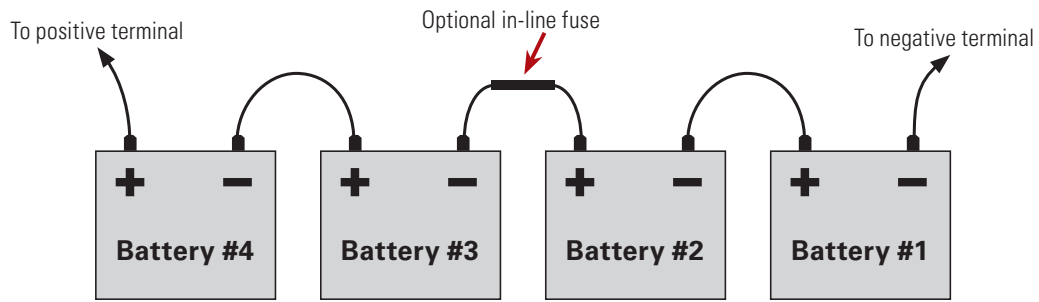


Figure 17: Alpha® FXM HP UPS external battery wiring for a 48 Vdc string

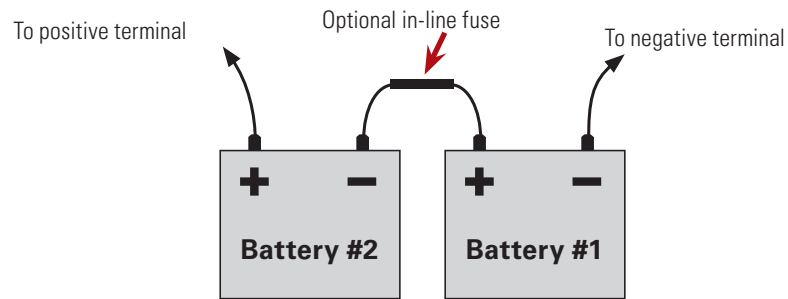


Figure 18: Alpha® FXM HP UPS external battery wiring for a 24 Vdc string

ATTENTION

Torque the battery terminals according to the manufacturer's specifications on the battery nameplate or data sheet.

9. Maintenance

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

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



WARNING

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



ATTENTION

Circuit cards, including semi-conductor devices, can be damaged by static electricity. Always wear a grounded wrist strap when handling or installing circuit cards.



ATTENTION

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 D — 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.	

9.1 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 documentation for guidelines. See the following table for typical maintenance report:

Company:	Date:	
Address:		
Battery location and number:		
Number of cells:	Type:	Date new:
Date installed:	Float voltage:	Ambient temperature:

Table E — Typical VRLA battery maintenance report

Cell number	Serial number	Voltage	Specific	Ohms	Mhos	Observations

Remarks and recommendations:
Readings taken by:

10. Battery calculations

The maximum battery and electrical specifications are provided for the systems. The following calculations provide an example of a maximum configuration.

To increase the capacity of a battery bank, additional battery strings may be connected in parallel. Each additional string will increase the overall capacity of the battery bank. Two battery strings in parallel of 210 Ah will provide 420 Ah at the C10 rate or 42 amps for 10 hours. Each battery is still providing 21 amps at the 10-hour rate, and therefore the discharge rating of the battery is maintained.

This calculation may be used to select applicable equivalent or smaller battery products as needed for specific site requirements.

Iac	System load at 120 Vac
Eff	Efficiency of the inverter
T	Run time requirement
1.2	Design life factor required by UL 2524
Vdc	Battery bus voltage
Vpc	End voltage per cell (use for reference on data sheet)

10.1 Battery calculation for the Alpha® FXM HP 1100 UPS

The following example shows how to calculate and select a battery to support the maximum load on the Alpha® FXM HP 1100 UPS.

10.1.1 Calculate the load on the battery

A system with a system load of 8.3 amps at 120 Vac needs to support 12 hours of run time. Alpha® FXM HP 1100 UPS efficiency = 85%. Battery bus voltage is 48 Vdc.

$$\begin{aligned} \text{Battery discharge current} &= ((I_{ac} \times 120) / \text{Eff}) / V_{dc} \\ \text{Battery discharge current} &= (8.3 \times 120) / 0.85 / 48 \\ \text{Battery discharge current} &= 24.4 \text{ A} \end{aligned}$$

10.1.2 Calculate the required battery size

Multiply the battery discharge current of 24.4 amps by 12 hours and by the design life factor of 1.2.

$$\begin{aligned} \text{Amp hours} &= I \times T \times 1.2 \\ \text{Amp hours} &= 24.4 \times 12 \times 1.2 \\ \text{Amp hours} &= 351.5 \text{ Ah} \end{aligned}$$

To achieve the maximum capacity out of the system, eight 12 volt batteries with a minimum of 182 Ah (C12) each configured in two parallel strings are required.

10.1.3 Battery selection

Refer to the manufacturer's data sheet and select a battery. The battery must use the nominal capacity (Ah) on the data sheet for the 10-hour or 12-hour rate for a 12-hour run time calculation at an End Cell voltage of 1.75 volts per cell. For 24-hour applications you can use a 20-hour or the 12-hour rate.

10.2 Battery calculation for the Alpha® FXM HP 650 UPS

The following example shows how to calculate and select a battery to support the maximum load on the Alpha® FXM HP 650 UPS.

10.2.1 Calculate the load on the battery

A system with a system load of 3.79 amps at 120 Vac needs to support 12 hours of run time. Alpha® FXM HP 650 UPS efficiency = 75%. Battery bus voltage is 24 Vdc.

$$\text{Battery discharge current} = ((I_{ac} \times 120) / \text{Eff}) / V_{dc}$$

$$\text{Battery discharge current} = (3.79 \times 120) / 0.75 / 24$$

$$\text{Battery discharge current} = 25.3 \text{ A}$$

10.2.2 Calculate the required battery size

Multiply the battery discharge current of 25.3 amps by 12 hours and by the design life factor of 1.2.

$$\text{Amp hours} = I \times T \times 1.2$$

$$\text{Amp hours} = 25.3 \times 12 \times 1.2$$

$$\text{Amp hours} = 364 \text{ Ah}$$

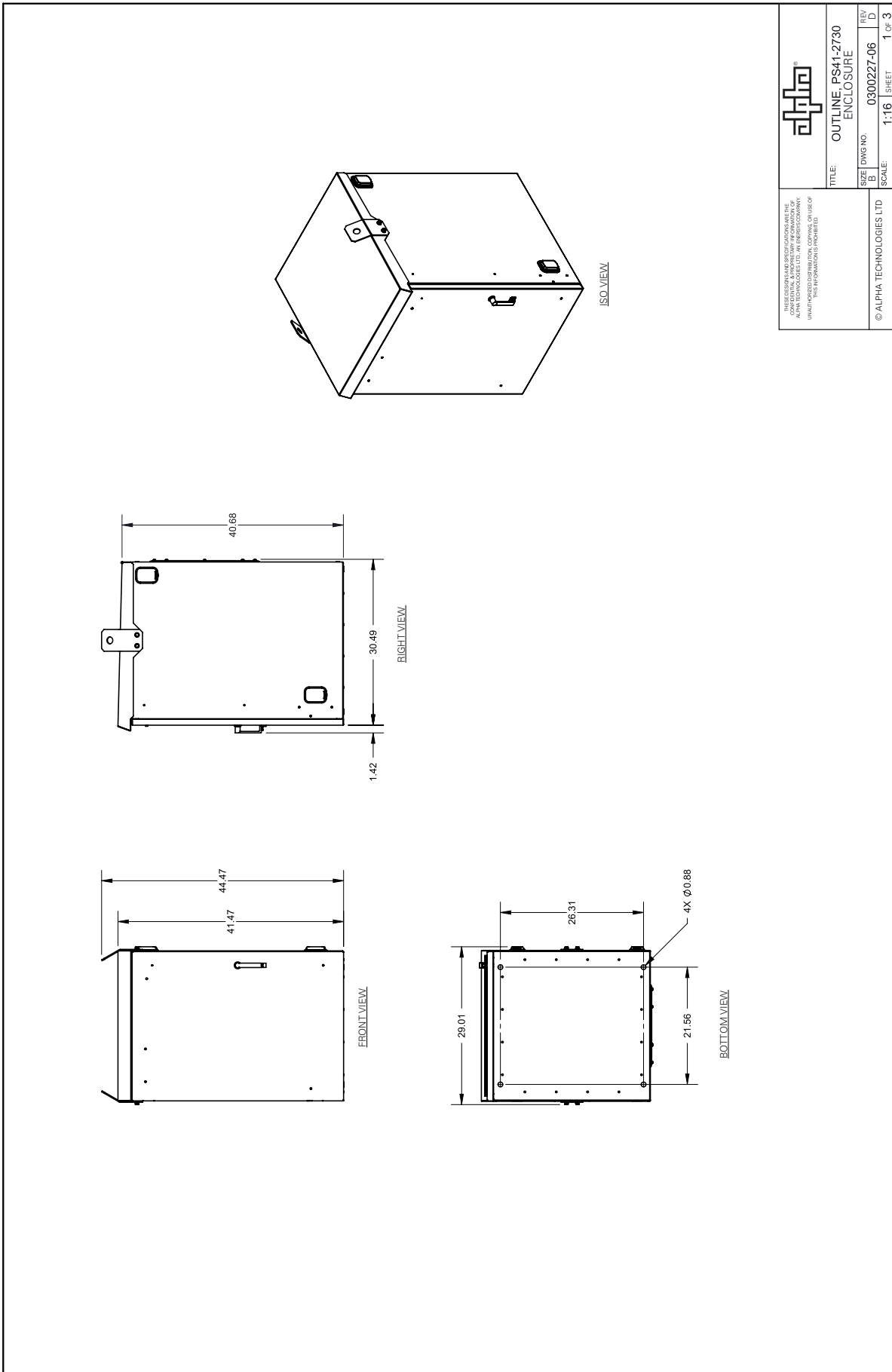
To achieve the maximum capacity out of the system, eight 12 volt batteries with a minimum of 182 Ah (C12) each configured in four parallel strings are required.

10.2.3 Battery selection

Refer to the manufacturer's data sheet and select a battery. The battery must use the nominal capacity (Ah) on the data sheet for the 10-hour or 12-hour rate for a 12-hour run time calculation at an End Cell voltage of 1.75 volts per cell. For 24-hour applications you can use a 20-hour or the 12-hour rate.

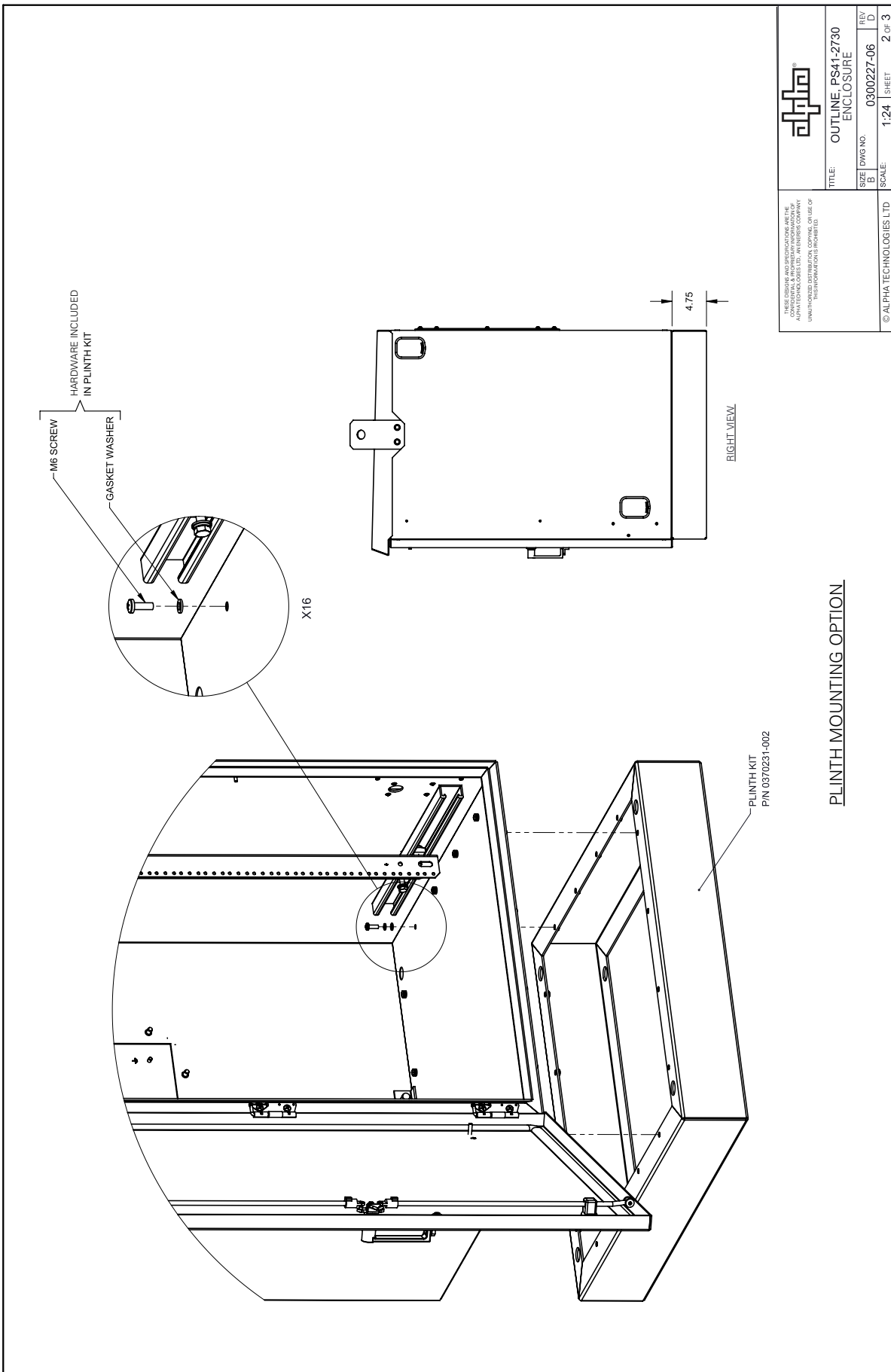
11. Acronyms and definitions

AC	Alternating current
ANSI®	American National Standards Institute
AWG	American Wire Gauge
BTU	British thermal unit
CAN	Controller area network
CEC	Canadian Electrical Code
CPH	Central power hub
CSA®	Canadian Standards Association
CX	Cordex® series; 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 US)
GFCI	Ground fault circuit interrupter
HVSD	High voltage shutdown
IEC	International Electrotechnical Commission
IEEE®	The Institute of Electrical and Electronics Engineers, Inc.
IP	Internet Protocol
LED	Light emitting diode
LVD	Low voltage disconnect
LVBD	Low voltage battery 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 US)
NFPA®	National Fire Protection Association, Inc.
NO	Normally open
OSHA	Occupational Safety & Health Administration
OSP	Outside Plant
OVP	Over voltage protection
RU	Rack unit (44.45 mm; 1.75 in.)
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



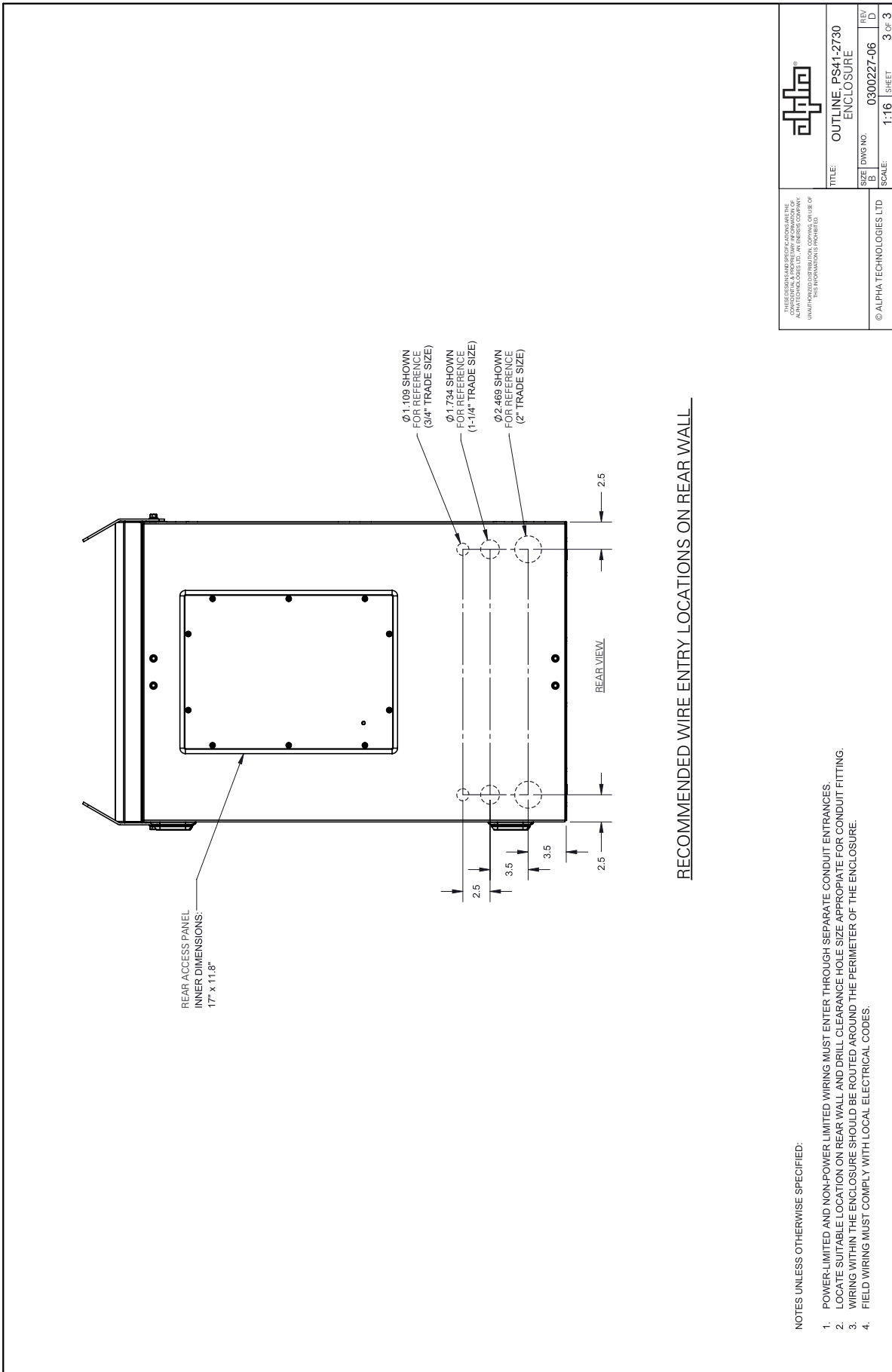
THIS DRAWING AND SPECIFICATION ARE THE
 CONFIDENTIAL, UNPUBLISHED INFORMATION OF
 ALPHA TECHNOLOGIES LTD. REPRODUCTION OR USE OF
 THIS INFORMATION IS PROHIBITED.

		TITLE: OUTLINE, PS41-2730 ENCLOSURE	
		SIZE: DWG NO. 0300227-06	REV: D
© ALPHA TECHNOLOGIES LTD		SCALE: 1:16	SHEET 1 OF 3

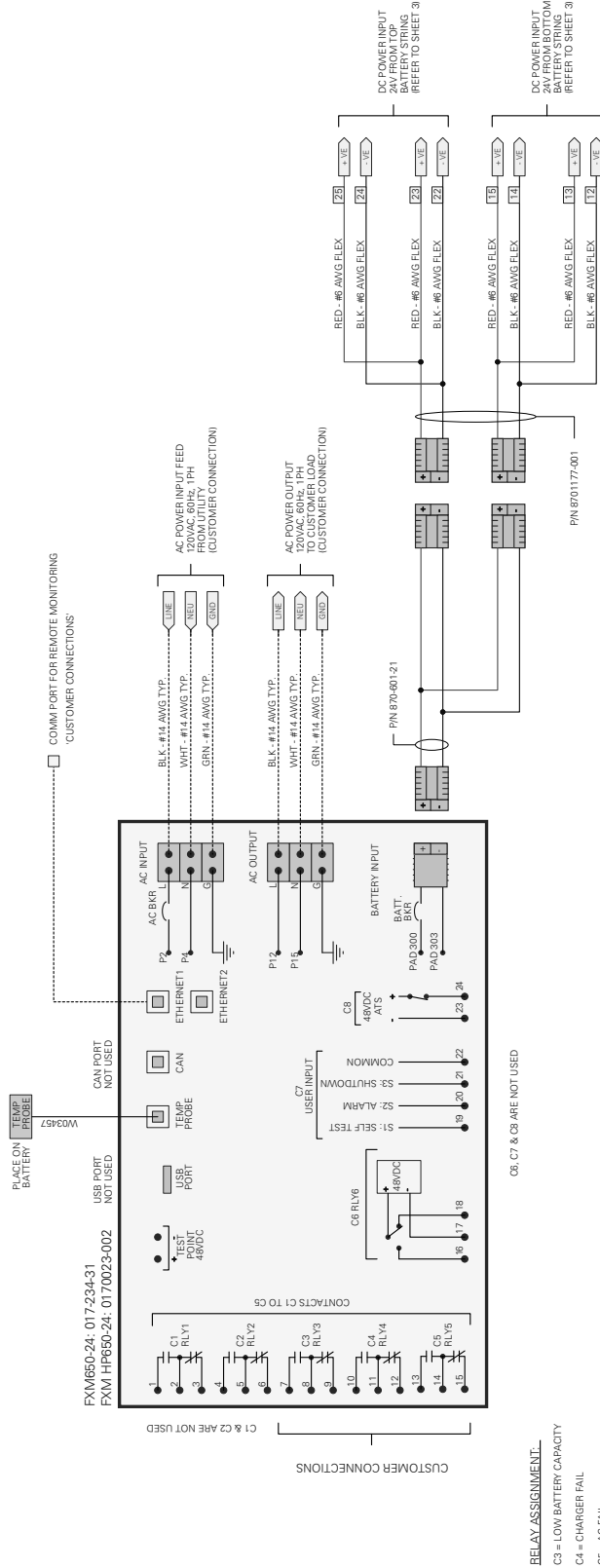


THIS DRAWING AND SPECIFICATION ARE THE
CONFIDENTIAL & PROPRIETARY INFORMATION OF
ALPHA TECHNOLOGIES LTD. UNAUTHORIZED REPRODUCTION,
DISSEMINATION, COPIES, OR USE OF
THIS INFORMATION IS PROHIBITED.

	
TITLE: OUTLINE, PS41-2730 ENCLOSURE	
SIZE	DWG NO.
B	0300227-06
D	
REV	
D	
SCALE: 1:24 SHEET 2 of 3	
© ALPHA TECHNOLOGIES LTD	



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



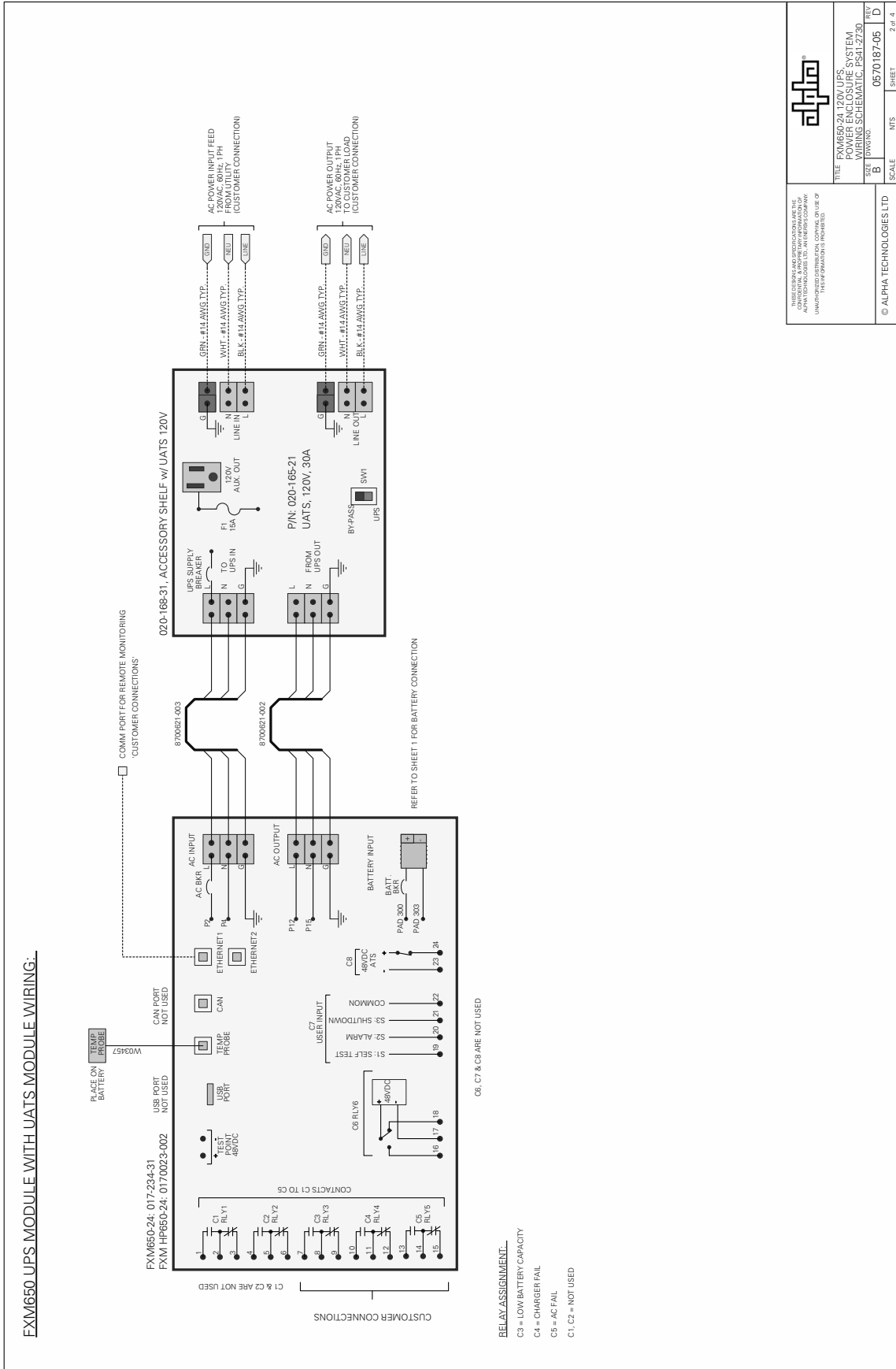
BATTERY ASSIGNMENT:
 C3 = LOW BATTERY CAPACITY
 C4 = CHARGER FAIL
 C5 = AC FAIL
 C1, C2 = NOT USED

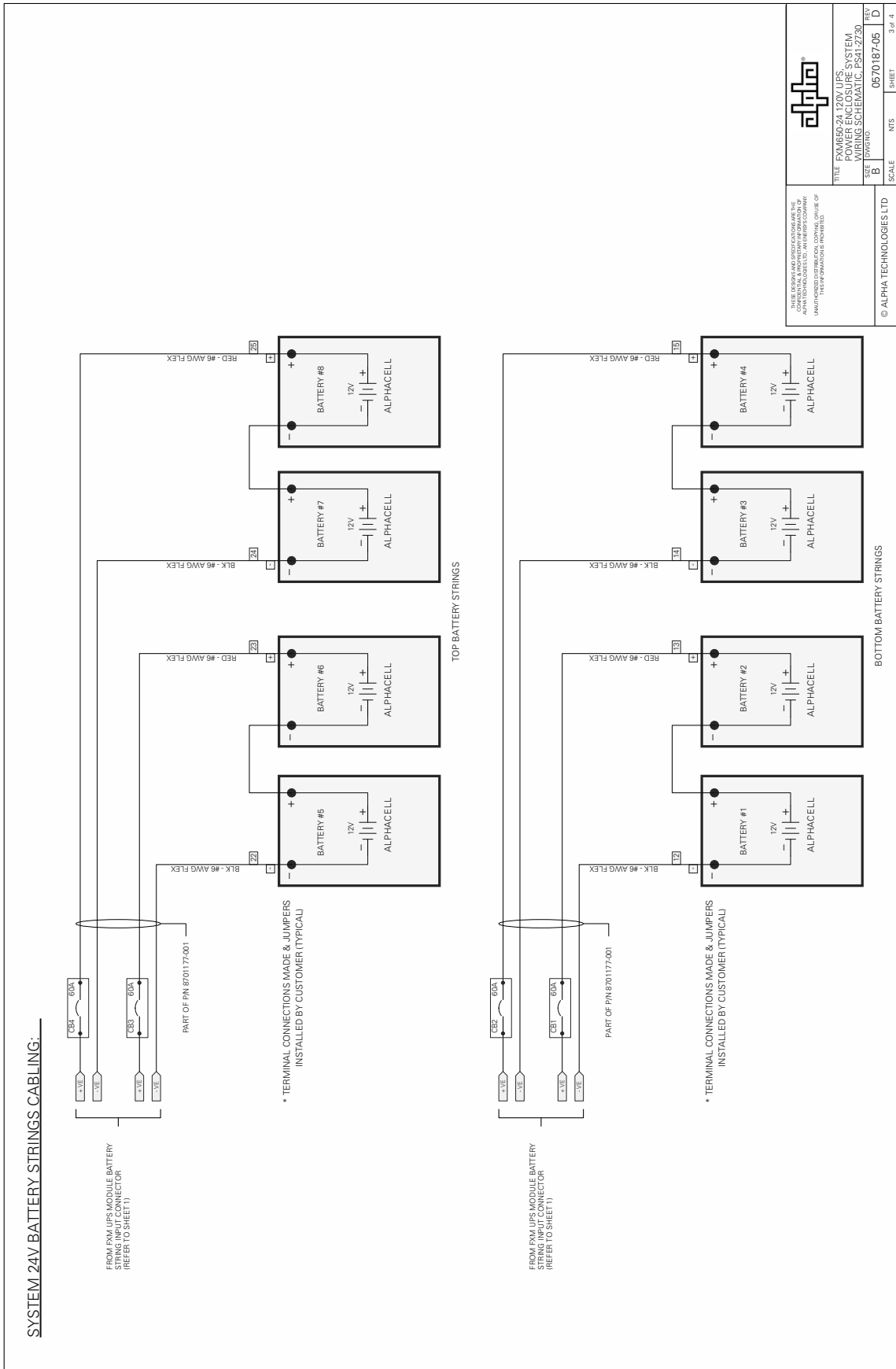
C6, C7 & C8 ARE NOT USED

TITLE: FXM650-24 120V UPS, POWER ENCLOSURE SYSTEM DRAWING SCHEDULE: PS41-2730	
SCALE	0570187-05
SHEET	1 of 4

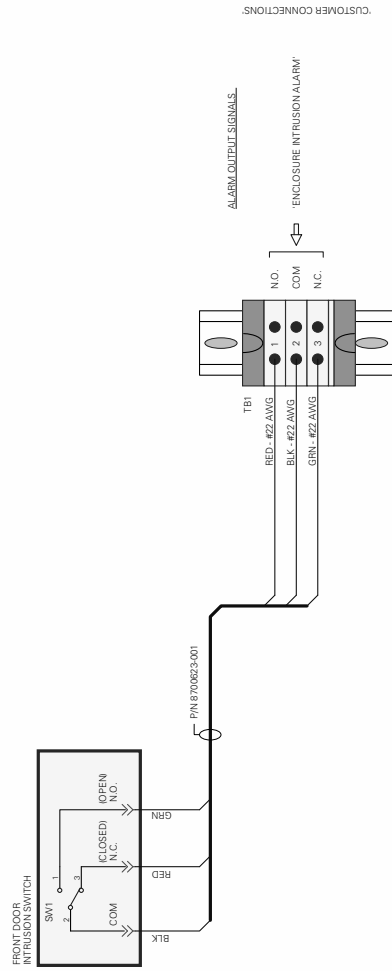
© ALPHA TECHNOLOGIES LTD
 THESE DESIGNS AND SPECIFICATIONS ARE THE PROPERTY OF ALPHA TECHNOLOGIES LTD. AN INDEPENDENT COMPANY. UNAUTHORIZED DISTRIBUTION, COPYING OR USE OF THIS INFORMATION IS PROHIBITED.

- NOTES UNLESS OTHERWISE SPECIFIED:
1. POWER LIMITED AND NON-POWER LIMITED WIRING MUST ENTER THROUGH SEPARATE CONDUIT ENTRANCES. USE THE SUITABLE LOCATION ON REAR WALL AND DRILL CLEARANCE HO LE SIZE APPROPRIATE FOR CONDUIT FITTING.
 2. WIRING WITHIN THE ENCLOSURE SHOULD BE ROUTED AROUND THE PERIMETER OF THE ENCLOSURE.
 3. WIRING WITHIN THE ENCLOSURE SHOULD BE ROUTED AROUND THE PERIMETER OF THE ENCLOSURE.
 4. FIELD WIRING MUST COMPLY WITH LOCAL ELECTRICAL CODES.

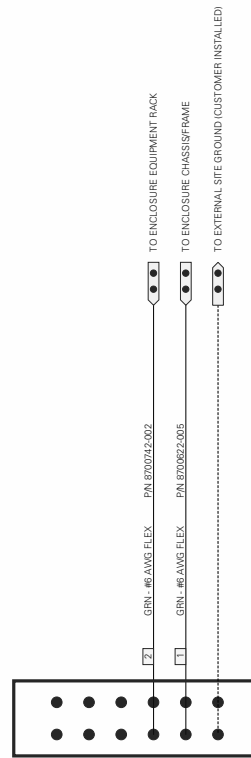





ENCLOSURE INTRUSION ALARM WIRING:



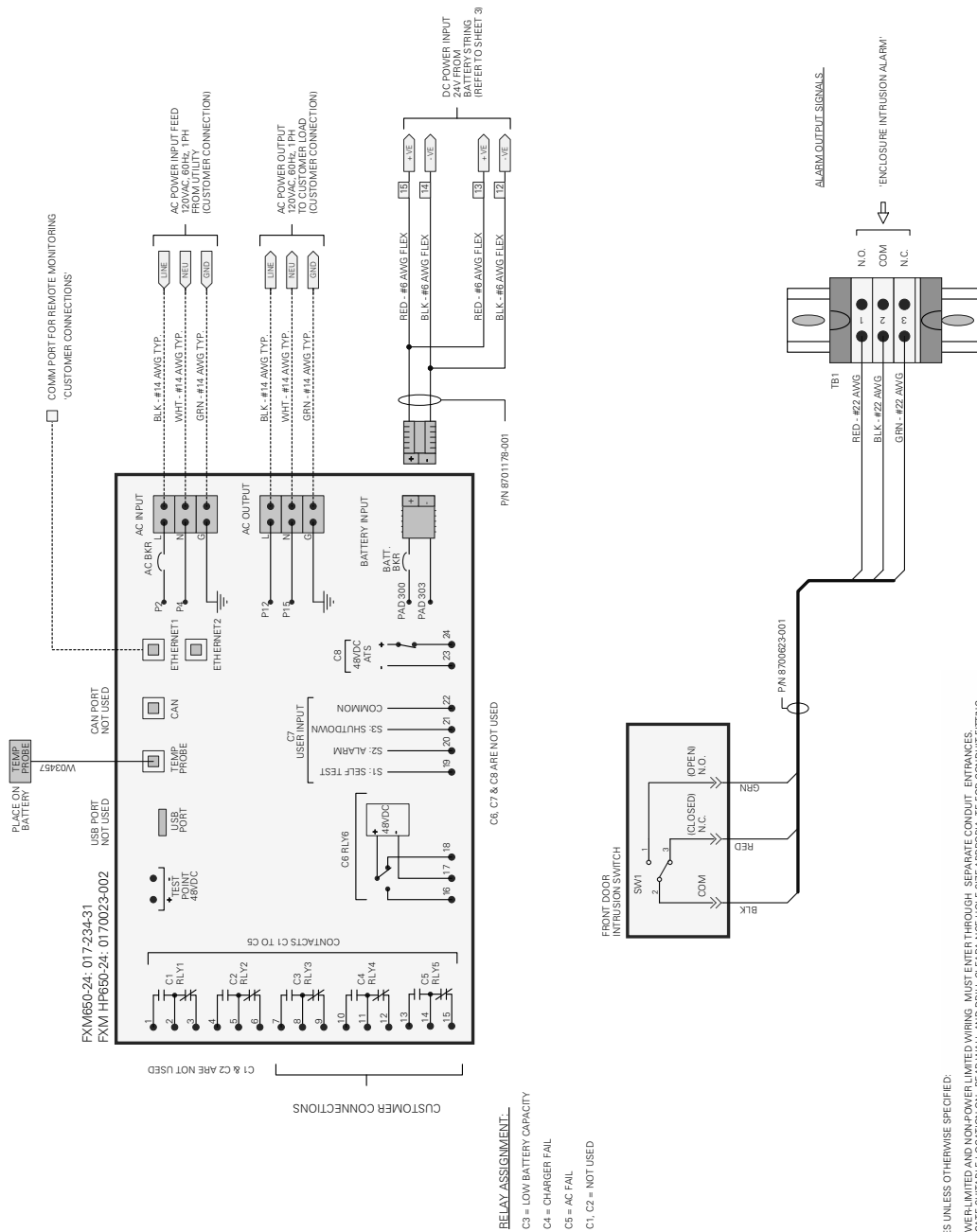
ENCLOSURE MASTER GROUND BAR TERMINATIONS:



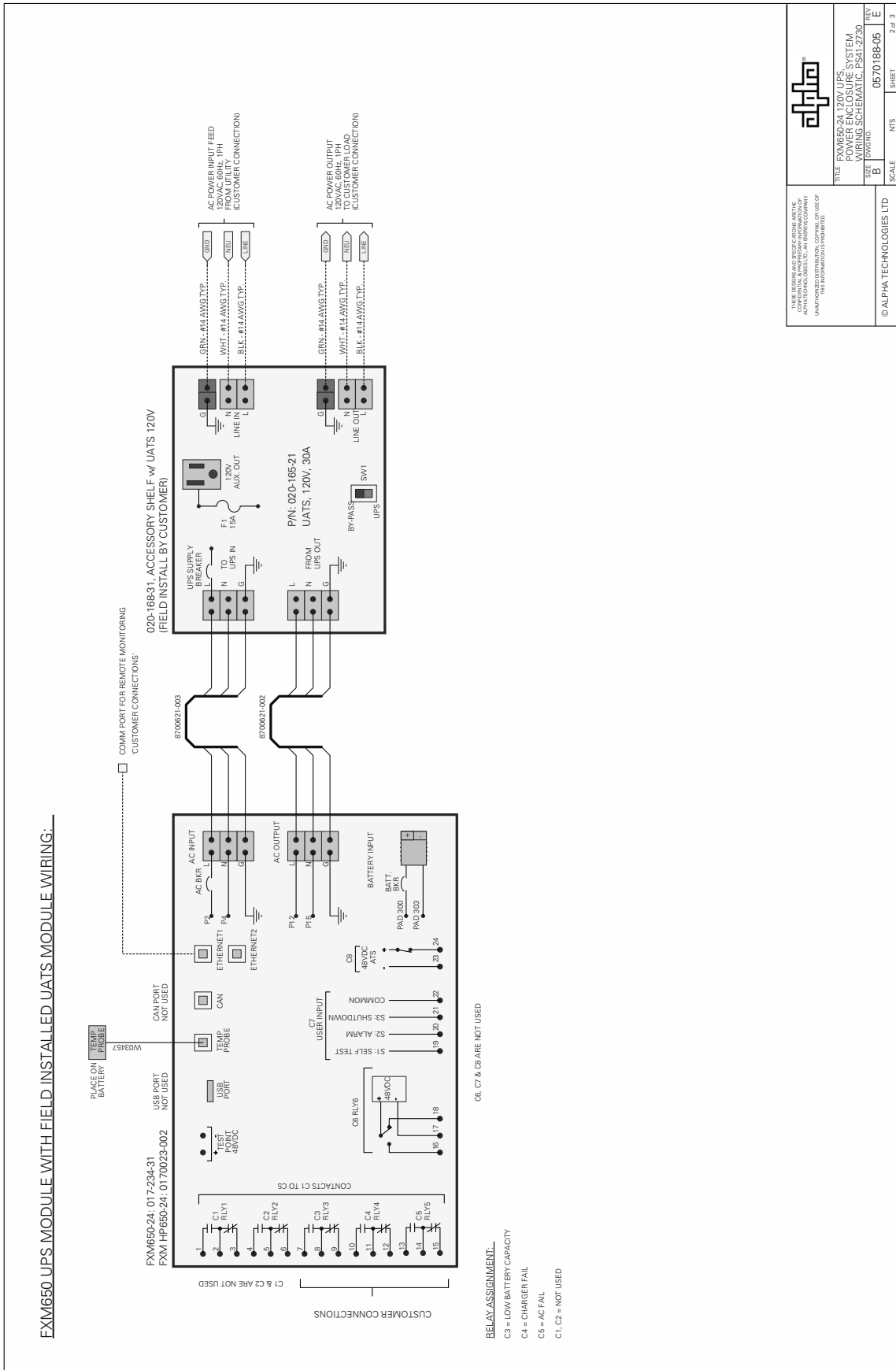
THIS DOCUMENT IS UNCLASSIFIED AND IS NOT CONTROLLED. A LIMITED INFORMATION SECURITY CLASSIFICATION POLICY APPLIES TO THIS DOCUMENT. UNAUTHORIZED DISSEMINATION OR USE OF THIS INFORMATION IS PROHIBITED.

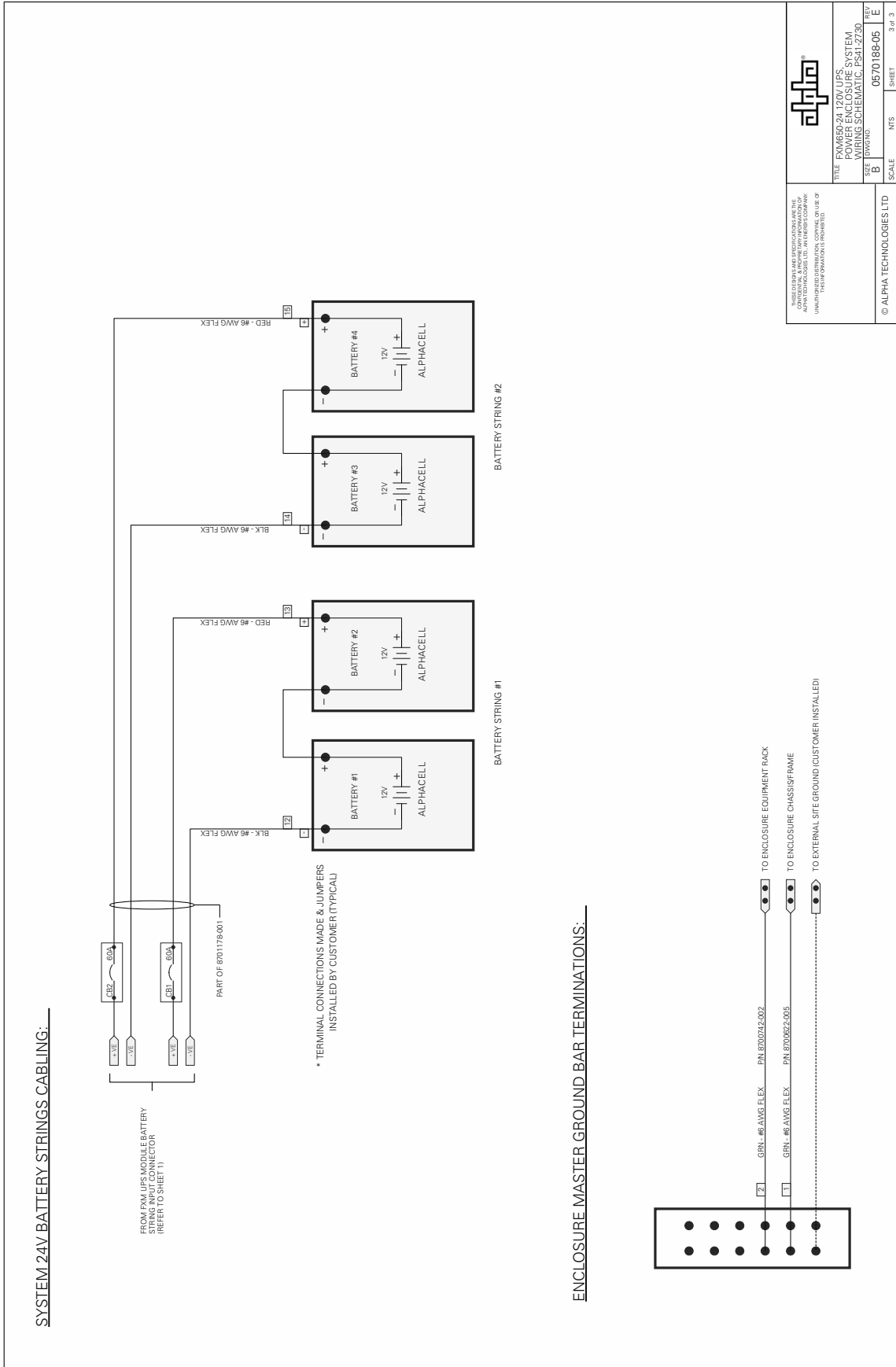
		TITLE	FXM85024 120V UPS POWER ENCLOSURE SYSTEM WIRING SCHEMATIC PS41-2730
		REV	0570187-05
SCALE	NTS	SHEET	4 of 4
© ALPHA TECHNOLOGIES LTD			

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



		TITLE FXM650-24 120V UPS POWER ENCLOSURE SYSTEM WIRING SCHEMATIC, PS41-2730	
		SIZE DRAWING B	SCALE NTS
THESE DESIGNS AND SPECIFICATIONS ARE THE PROPERTY OF ALPHA TECHNOLOGIES LTD. AN IRVING COMPANY. UNAUTHORIZED DISTRIBUTION OR USE OF THIS INFORMATION IS PROHIBITED.		SHEET 0570188-05	REV E
© ALPHA TECHNOLOGIES LTD		SCALE NTS	SHEET 1 of 3



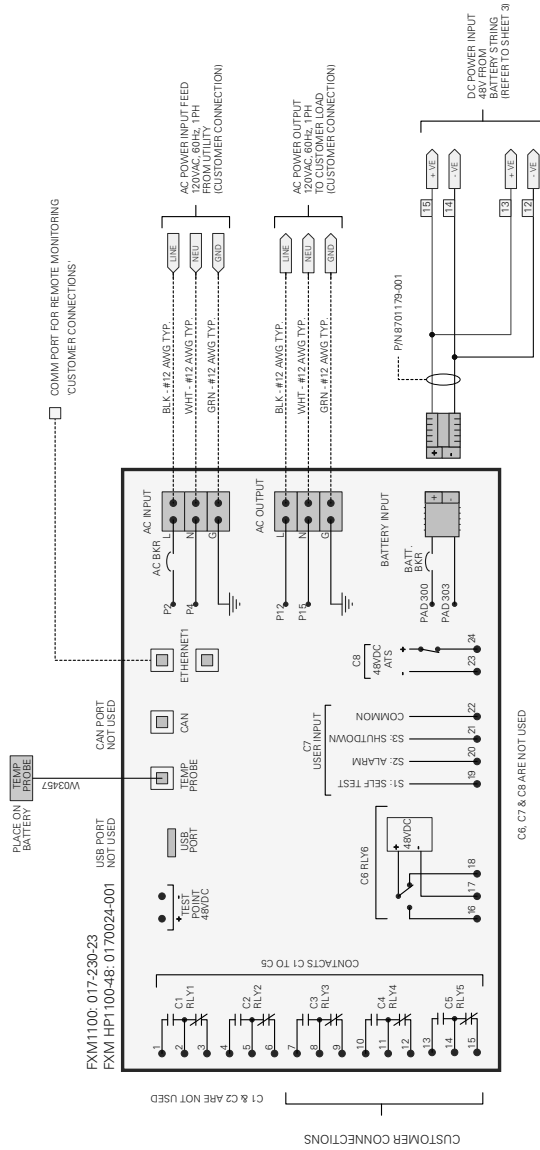


THIS DRAWING IS THE PROPERTY OF ALPHA TECHNOLOGIES LTD. IT IS CONFIDENTIAL AND NOT BE LOANED, REPRODUCED, COPIED, REPRODUCED, OR DISCLOSED TO ANY OTHER PARTY WITHOUT THE WRITTEN PERMISSION OF ALPHA TECHNOLOGIES LTD.

TITLE	FXM650-24 120V UPS POWER ENCLOSURE SYSTEM WIRING SCHEMATIC PS41-2730
SIZE	B
SCALE	NTS
SHEET	3 of 3

© ALPHA TECHNOLOGIES LTD

FXM1100 UPS MODULE AC POWER, BATTERY STRING & TEMPERATURE PROBE WIRING:



RELAY ASSIGNMENT:

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

NOTES UNLESS OTHERWISE SPECIFIED:

1. POWER LIMITED AND NON-POWER LIMITED WIRING, MUST ENTER THROUGH SEPARATE CONDUIT ENTRANCES.
2. LOCATE SUITABLE LOCATION ON REAR WALL AND DRILL CLEARANCE HOLE SIZE APPROPRIATE FOR CONDUIT FITTING.
3. WIRING WITHIN THE ENCLOSURE SHOULD BE ROUTED AROUND THE PERIMETER OF THE ENCLOSURE.
4. FIELD WIRING MUST COMPLY WITH LOCAL ELECTRICAL CODES.

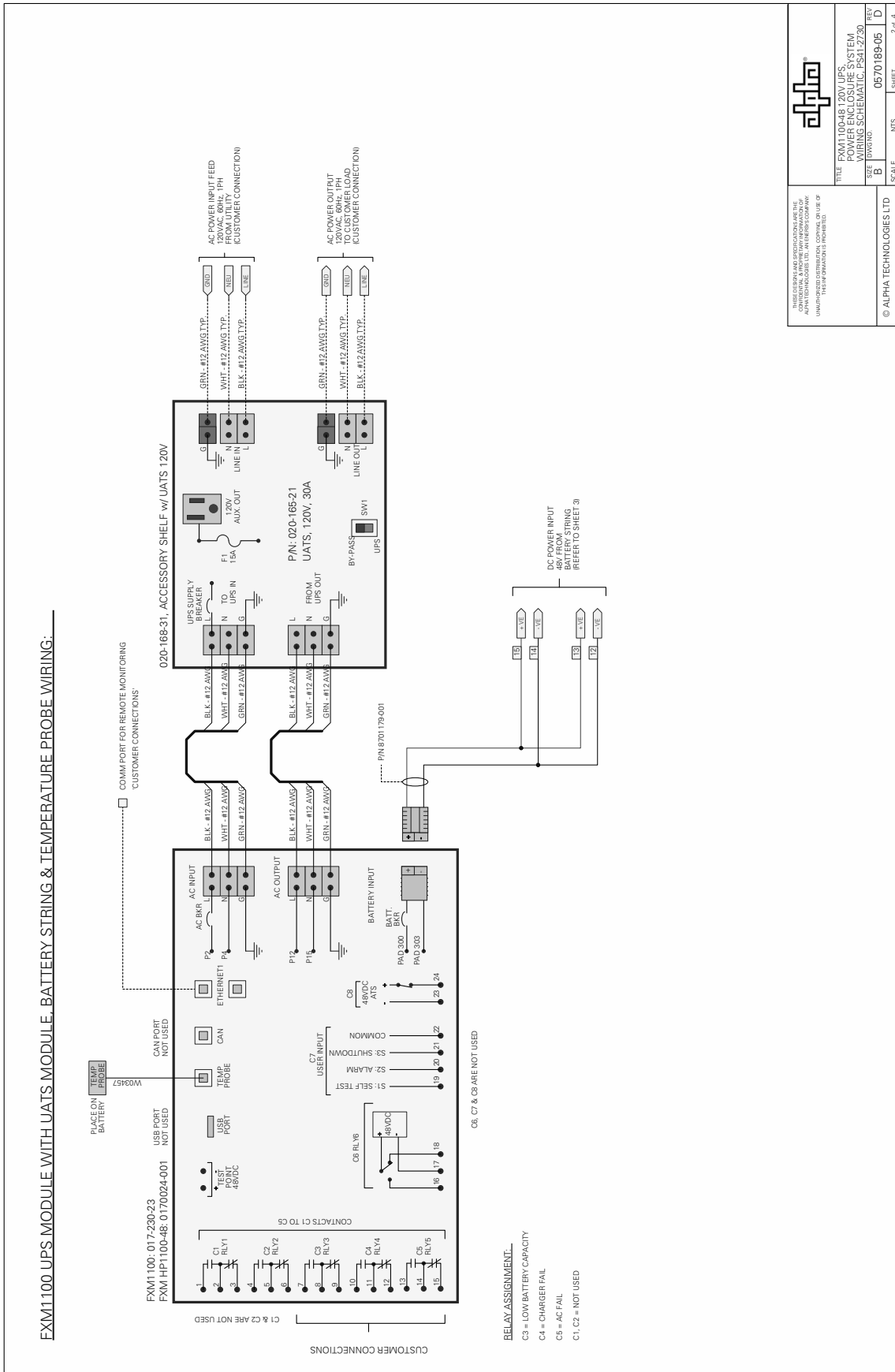
THESE DESIGNS AND SPECIFICATIONS ARE THE PROPERTY OF ALPHA TECHNOLOGIES LTD. ALL RIGHTS RESERVED. UNAUTHORIZED DISTRIBUTION, COPYING OR USE OF THIS INFORMATION IS PROHIBITED.

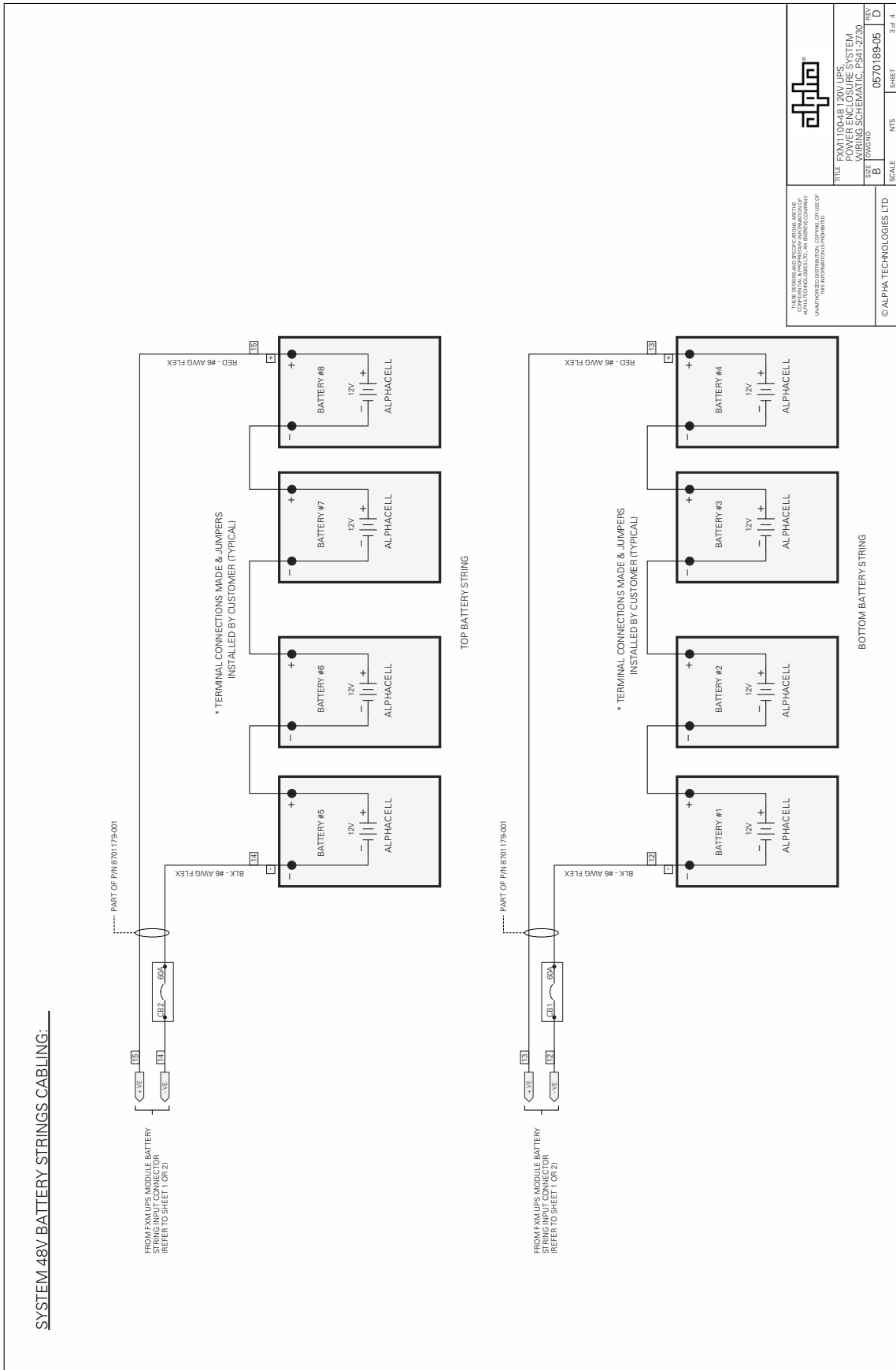


TITLE: FXM1100-48 120V UPS,
POWER ENCLOSURE SYSTEM
DRAWING SCHEDULE: PS41-2730

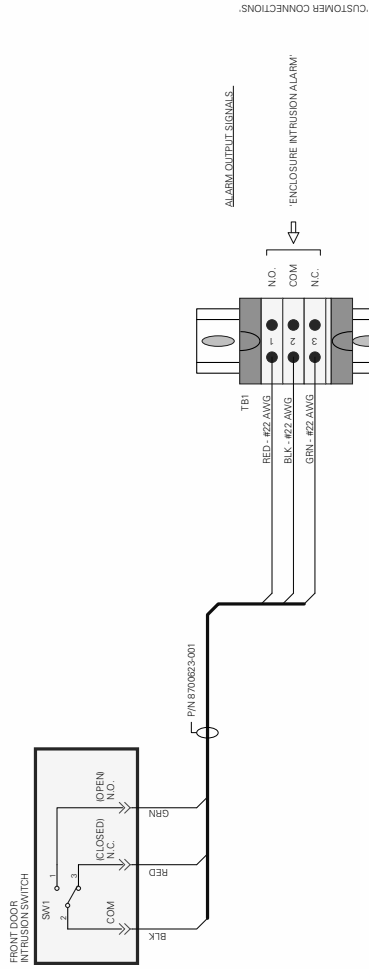
SIZE	SCALE	SHEET	REV
B	NTS	0570189-05	D
			1 of 4

© ALPHA TECHNOLOGIES LTD

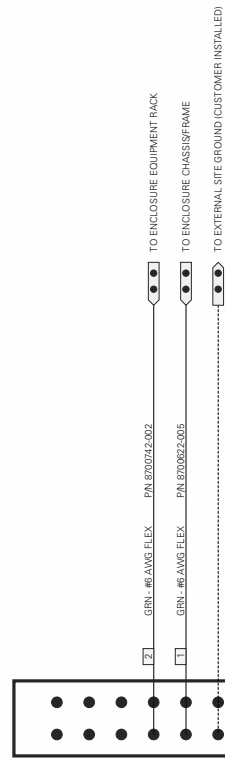





ENCLOSURE INTRUSION ALARM WIRING:



ENCLOSURE MASTER GROUND BAR TERMINATIONS:



NOTE: REVISIONS TO THIS SCHEMATIC ARE THE PROPERTY OF ALPHA TECHNOLOGIES LTD. ANY CHANGES TO THIS SCHEMATIC WILL BE THE PROPERTY OF ALPHA TECHNOLOGIES LTD. THE INFORMATION IS PROVIDED AS IS.

	
TITLE: FXM1 100-481 120V UPS POWER ENCLOSURE SYSTEM WIRING SCHEMATIC: PS41-2730	
SCALE: B	NTS: 05701899-05
SHEET: 4 of 4	REV: D

© ALPHA TECHNOLOGIES LTD



Alpha Technologies Ltd. | 7700 Riverfront Gate, Burnaby, BC V5J 5M4 Canada
Toll Free North America: +1 800 667 8743 | Outside North America +1 604 436 5547 | Technical Support +1 888 462 7487
For more information visit our website at: www.alpha.com or www.alpha.ca
© 2022 EnerSys. All rights reserved. Trademarks and logos are the property of EnerSys and its affiliates unless otherwise noted.
Subject to revisions without prior notice. E. & O.E.

9400032-J0 REV B (03/2022)