



Public Safety Solutions

PS27-2220-PSU

User Guide ID: 9400033-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[®] PS27-2220-PSU

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

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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® PS27-2220-PSU is a charger and battery backup system idea for sites with BDA systems installed to improve emergency radio communication per UL 2524. The Alpha® PS27-2220-PSU is an integrated, fully featured power system in a compact form factor. The Alpha® PS27-2220-PSU enclosure is integrated with either the Cordex® 24V-400W or 48V-650W PSU.

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



Figure 1: Alpha® PS27-2220-PSU interior view

3. Specifications

Table A — Alpha® PS27-2220-PSU specifications	
Electrical	
PS27-2220-PSU (Cordex® 24V-400W PSU)	
AC input	120 V / 240 V, 4.0 A maximum, 60 Hz, 1 PH
DC output	24 V nominal, 14 A / 400 W maximum
PS27-2220-PSU (Cordex® 48V-650W PSU)	
AC input	120 V / 240 V, 4.7 A maximum, 60 Hz, 1 PH
DC output	48 V nominal, 13.5 A / 650 W maximum
Trouble relay outputs (three total)	
Dry contact voltage, Vdc	24 Vdc
Dry contact current, A resistive	1 A
Recommended AC input breaker	15 A
Mechanical	
Dimensions (H x W x D)	636 mm x 559 mm x 448 mm (25.03 in. x 22 in. x 19.23 in.)
System weight (without battery)	43.5 kg (96 lb)
Mounting	Ground with plinth
Construction	High strength corrosion resistant aluminum
Finish	Powder coat, red
Door prop	6.34 mm (0.25 in.) aluminum rod, two positions
Door latch	Compression latches, padlockable
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 50E/CSA C22.2 No.94.2 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 Cordex® 24V-400W or 48V-650W PSU

The Cordex® PSU is an integrated, fully-featured DC power system in a compact form factor. It provides power to critical loads while enabling remote site monitoring and delivering critical information on demand. The Cordex® PSU supplies reliable and low output ripple current along with short circuit, over voltage, over temperature, and over load protection. It also features advanced battery charging, monitoring and testing functionality. Two temperature, two digital inputs, and one analog input can be used for monitoring system alarms such as intrusion detection or equipment malfunction.

For more information, see the [Cordex® 24V-400W and 48V-650W PSU User Guide](#): 0100011-J0



Figure 2: Cordex® PSU (24V-400W or 48V-650W)

4.2 Cordex® CXCi HP system controller (integrated)

The integrated Cordex® CXCi+ HP system controller offers comprehensive local and remote control and monitoring, including a web server, providing easy set up using a standard web browser. SMTP features 'enable alarm' condition settings and multiple automatic notification options by email to a computer, server, or smartphone. Sites without internet access can use the integrated controller as an advanced standalone data logging system, allowing the capture of data from multiple inputs such as AC/DC voltages, load/battery current, and cell voltage/temperature. The controller captures and retains 90 days' statistical data and 500 alarm events, ready for download to a laptop for site history file and analysis of system performance, power system details, and thermal performance of outdoor enclosures and failure conditions.

For more information, see the [Cordex® CXC HP Controller Software manual](#): 0350058-J0



Figure 3: Cordex® CXCi HP system controller (integrated)

4.3 Alarms, controls, and communications

4.3.1 Standard alarm function description

Form C dry contacts are available for standard annunciation of the following conditions:

- Low battery alarm
- Charger fail alarm
- AC fail alarm

Connections to these alarms are shown in [Table C](#) for the Cordex® PSU 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 Alpha® Public Safety System, ensure that the UL listed resistor is connected to the dry contacts via pigtail connections using UL listed marrettes.

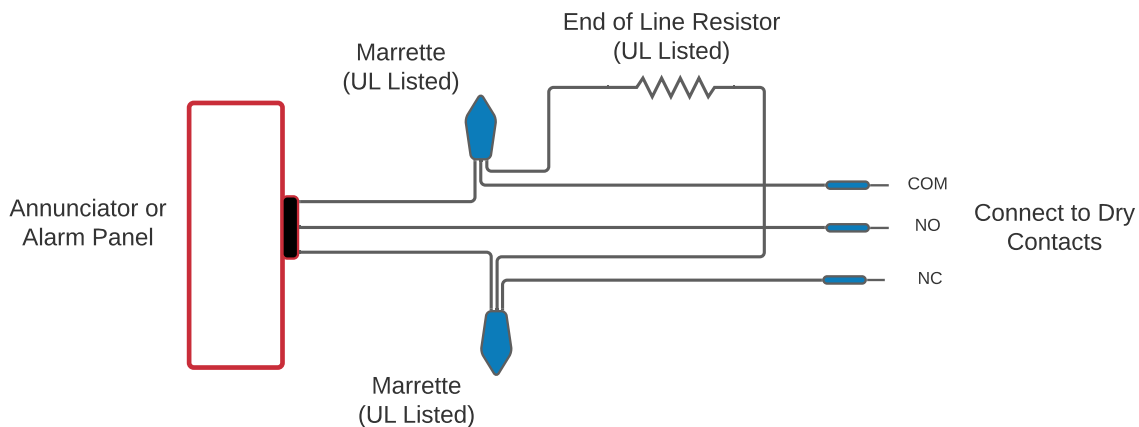


Figure 4: Attaching an EOLR to the dry contacts of the public safety system

4.3.2 Battery test and estimated state of health

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 the battery. The controller will monitor both the batteries and the rectifiers to ensure the load is not put at risk by the test procedure.

4.3.3 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/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.

4.3.4 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® PS27-2220-PSU enclosure can support one or two strings of VRLA batteries on the battery tray. A single tray is provided to support batteries and are equipped with a wiring harness.

Battery tray dimensions W × D: 483 mm × 406 mm (19 in. × 16 in.)

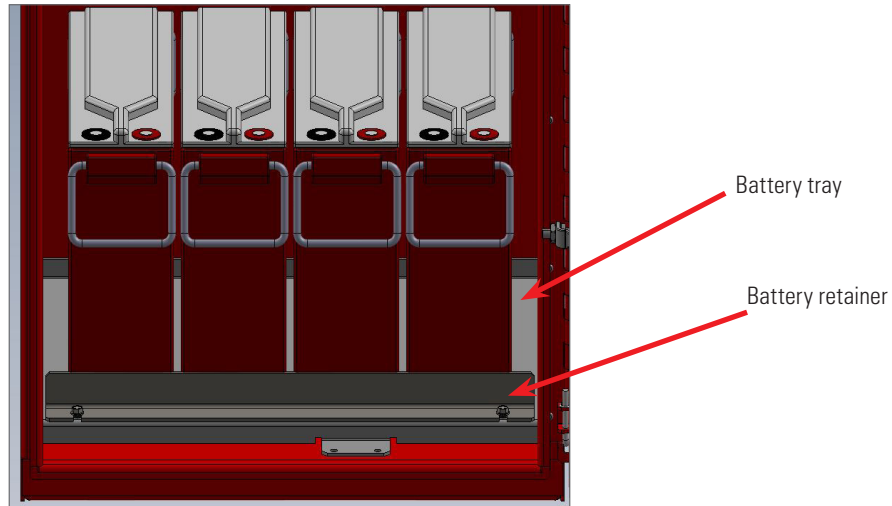


Figure 5: Battery tray and retainer

4.5 Enclosure security

The front door can be secured with a separate padlock installed on each latch collar. 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	
DC power system option	
Cordex® 24V-400W PSU, 1 battery tray	0570196-101
Cordex® 48V-650W PSU, 1 battery tray	0570190-101
Accessories	
Plinth mount kit (height: 20.3 cm; 8 in.)	740-760-23
Spare parts	
Battery fuse, 20 A, 1/4 in. × 1-1/4 in.	4600003
Fuse, 2 A, GMT	460-083-10
Fuse, 5 A, GMT	460-084-10
Power module, Cordex® 48V-650W PSU	010-570-20-041
Power module, Cordex® 24V-400W PSU	010-582-20-040

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.



NOTICE

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

5.2 Returns for service

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

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® PS27-2220-PSU enclosure is designed for front access only.
- 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® PS27-2220-PSU indoor power enclosure has been designed for the following mounting options:
Plinth, mounted on a concrete slab, floor, or similar surface.

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, 0.5 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

This mounting option assumes that a concrete floor is available at the installation site. [Figure 6](#) provides the location of the four bottom plinth mounting holes.

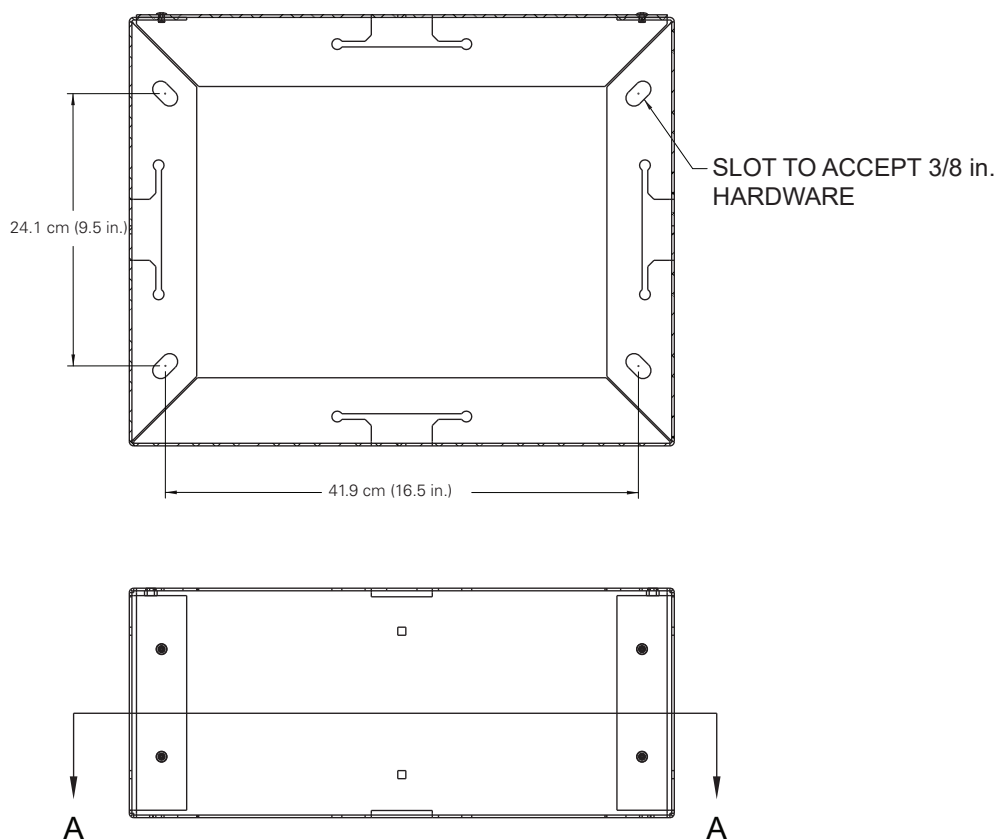


Figure 6: Plinth template for mounting bolts

1. Remove the plinth from the inside of the Alpha® PS27-2220-PSU enclosure or from its shipping container.
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.

- Once the plinth is level, tighten all bolts to the appropriate torque.

Recommended bolt torque values	
1/4 inch	11.93 Nm (8.8 ft-lb)
3/8 inch	44.1 Nm (32.5 ft-lb)
1/2 inch	98.9 Nm (73 ft-lb)

7.2.2 Mounting the enclosure to the plinth

- Unstrap and unbox the Alpha® PS27-2220-PSU enclosure from the shipping pallet.
- Remove the battery tray to access the bottom of the enclosure. There are two retaining screws per side as shown in [Figure 7](#).



Figure 7: Battery tray retaining screw locations

- With at least two installation personnel, lift and position the enclosure on its rear side. Use cardboard or similar material to protect the enclosure surface from any damage.
- On the bottom of the enclosure, locate the four outer mounting hole locations denoted by centerpunch marks as shown in [Figure 8](#). Drill out 7.14 mm (0.281 in.) diameter holes in each location for the 1/4 inch bolts installed in the next step.

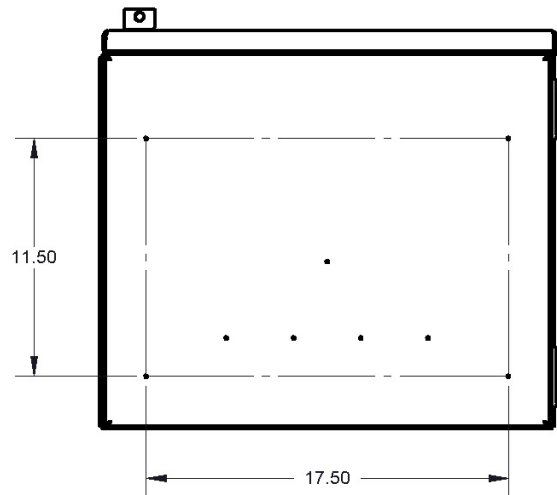


Figure 8: Enclosure/plinth mounting hole locations

- With at least two installation personnel, lift and position the enclosure onto the plinth.

6. Secure the enclosure to the plinth with the supplied 0.25 inch hardware. Torque bolts to 7 Nm (65 in-lb). See [Figure 9](#).
7. Reinstall the battery tray.

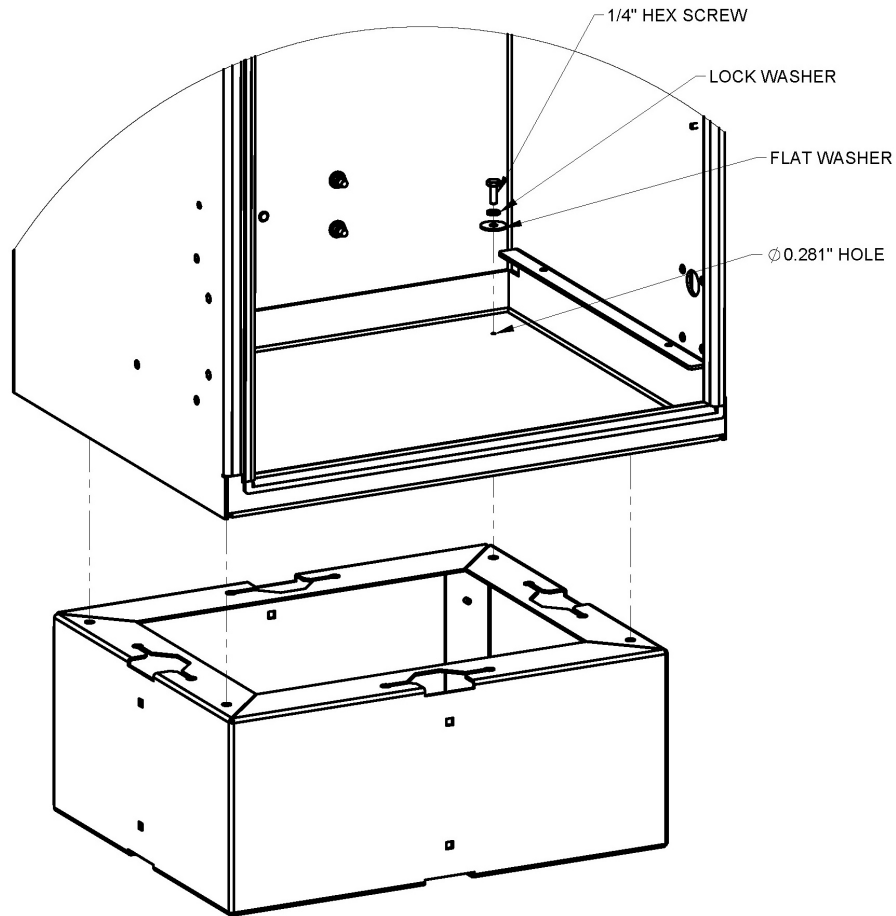


Figure 9: Securing enclosure to the plinth

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 or 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 UL Type 4 or better to maintain enclosure integrity rating.
3. Connect the site ground wire to any unused position 4 to 25 mm² (12 to 4 AWG) on the enclosure MGB.

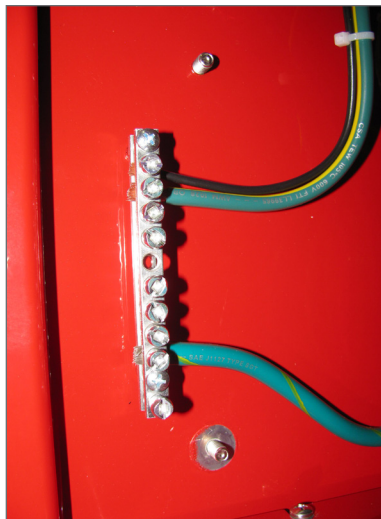


Figure 10: Enclosure MGB and chassis ground

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 6.35 mm (0.25 in.) from all non-power limited conductors. The maximum length of the input/output 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)
- DC 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.

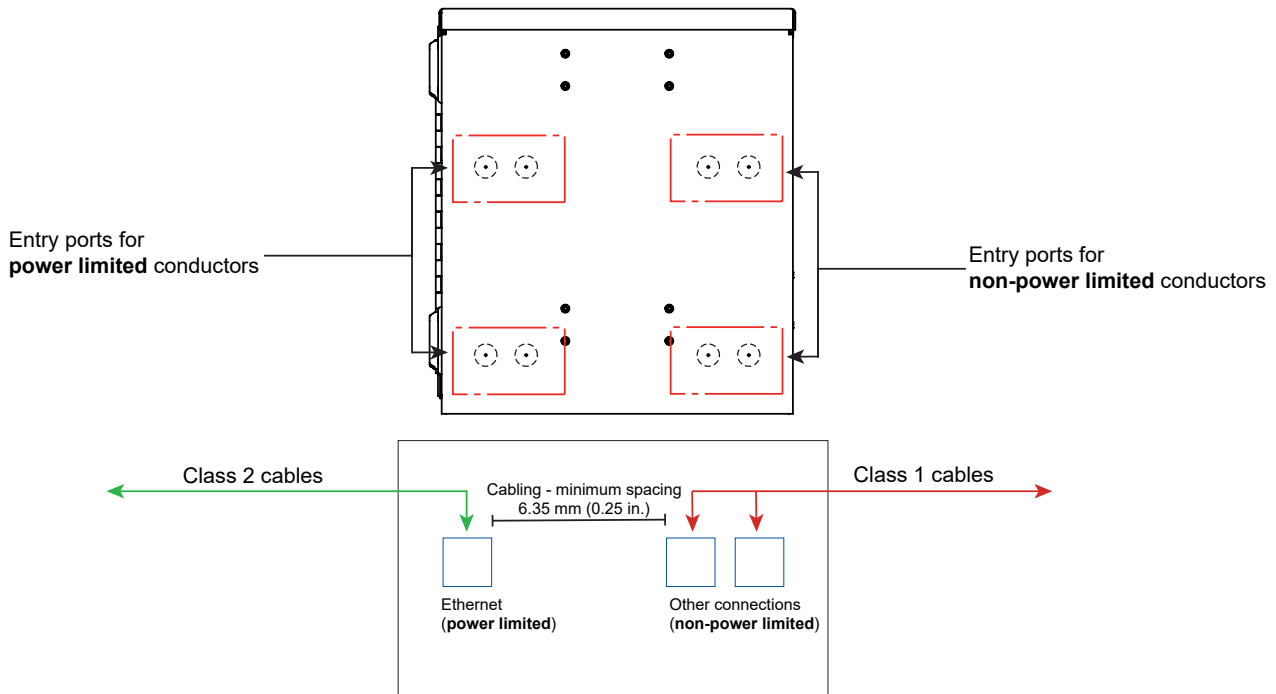


Figure 11: Rear cable entry locations

8.2.1 Power enclosure alarm wiring block

The alarm wiring block, located on the left side wall of the enclosure, uses screw-in type DIN rail mounted terminal blocks. 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 8 mm (0.315 in.) before connecting to terminal block.



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 — Cordex® 24V-400W and 48V-650W PSU alarms	
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.)
13	GMT fuse distribution alarm (N.O.)
14	GMT fuse distribution alarm (COM)
15	GMT fuse distribution alarm (N.C.)

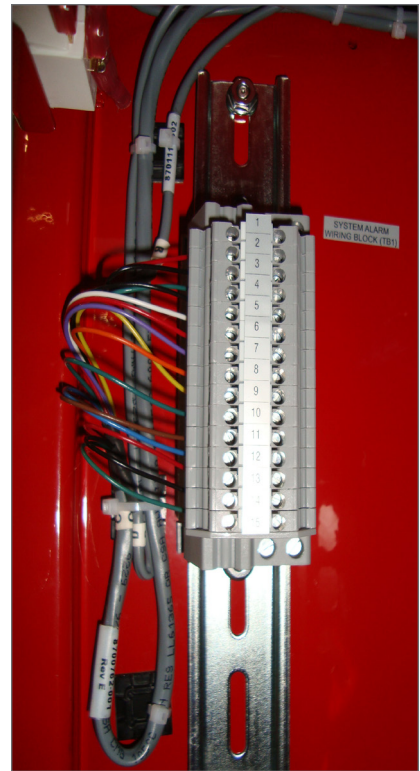


Figure 12: Enclosure alarm wiring block

8.3 Installation with Cordex® 24V-400W or 48V-650W PSU

8.3.1 DC power output

The DC load cable connections to the system are made to the GMT fuse distribution panel module located on the left side of the power enclosure system equipment rack.

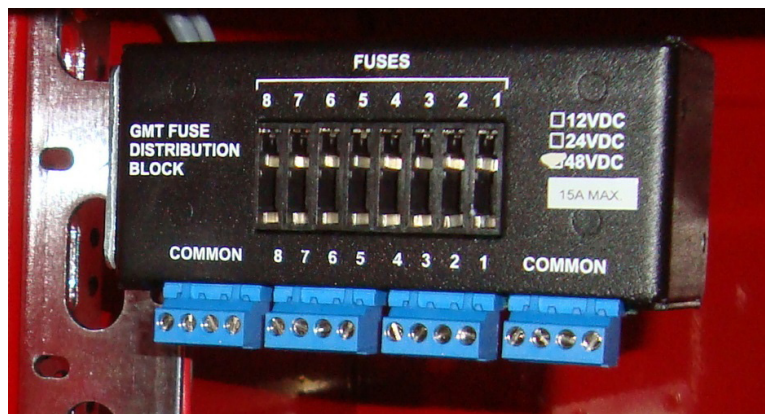


Figure 13: GMT fuse distribution module

8.3.2 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 document.



WARNING

Verify that all battery cables are disconnected.

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 positive [+] and negative [-] 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 Company 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.
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. The battery temperature probe shall not be spliced to a conductor larger than 0.75 mm² (18 AWG).
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 11.3 Nm; 100 in-lb).
12. Install the battery brace to the battery shelf.

Refer to the system startup procedure before reconnecting the battery cables.



ATTENTION

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

8.3.3 System startup

1. Ensure that the AC input power circuit breaker feeding the power enclosure system is turned off at the main AC load center (customer furnished).
2. Ensure that all battery string cable Anderson connectors are disconnected.
3. Using a voltmeter, verify that AC input power supply voltage is correct, then turn on AC load center input feeder circuit breaker to the power up enclosure system.
4. The Cordex® PSU power module OK LED will turn on after a preset start-up delay.
5. Verify correct battery polarity at connectors on all battery cables using a voltmeter.
6. Connect battery string cables, as required, to the output of the Cordex® PSU unit via the Anderson battery connectors provided.
7. Before leaving the site, ensure the enclosure door is shut and locked by turning the two compression latches into the locked position with the supplied latching key.

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.	
Verify inverter mode operation.	

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 110 Ah will provide 220 Ah at the C10 rate or 22 amps for 10 hours. Each battery is still providing 11 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.

I_{dc}	<ul style="list-style-type: none"> System load at 48 Vdc for Cordex[®] 48V-650W PSU System load at 24 Vdc for Cordex[®] 24V-400W PSU
T	Run time requirement
1.2	Design life factor required by UL 2524
V_{dc}	Battery bus voltage
V_{pc}	End voltage per cell (use for reference on data sheet)

10.1 Battery calculation for the Cordex[®] 24V-400W PSU

The following example shows how to calculate and select a battery to support the maximum load on the Cordex[®] 24V-400W PSU.

10.1.1 Calculate the load on the battery

A system with a system load of 10 amps at 24 Vdc needs to support 12 hours of run time. Battery bus voltage is 24 Vdc.

$$\text{Battery discharge current} = (I_{ac} \times 24) / V_{dc}$$

$$\text{Battery discharge current} = (2 \times 24) / 24$$

$$\text{Battery discharge current} = 10 \text{ A}$$

10.1.2 Calculate the required battery size

Multiply the battery discharge current of 10 amps by 12 hours and by the design life factor of 1.2.

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

$$\text{Amp hours} = 10 \times 12 \times 1.2$$

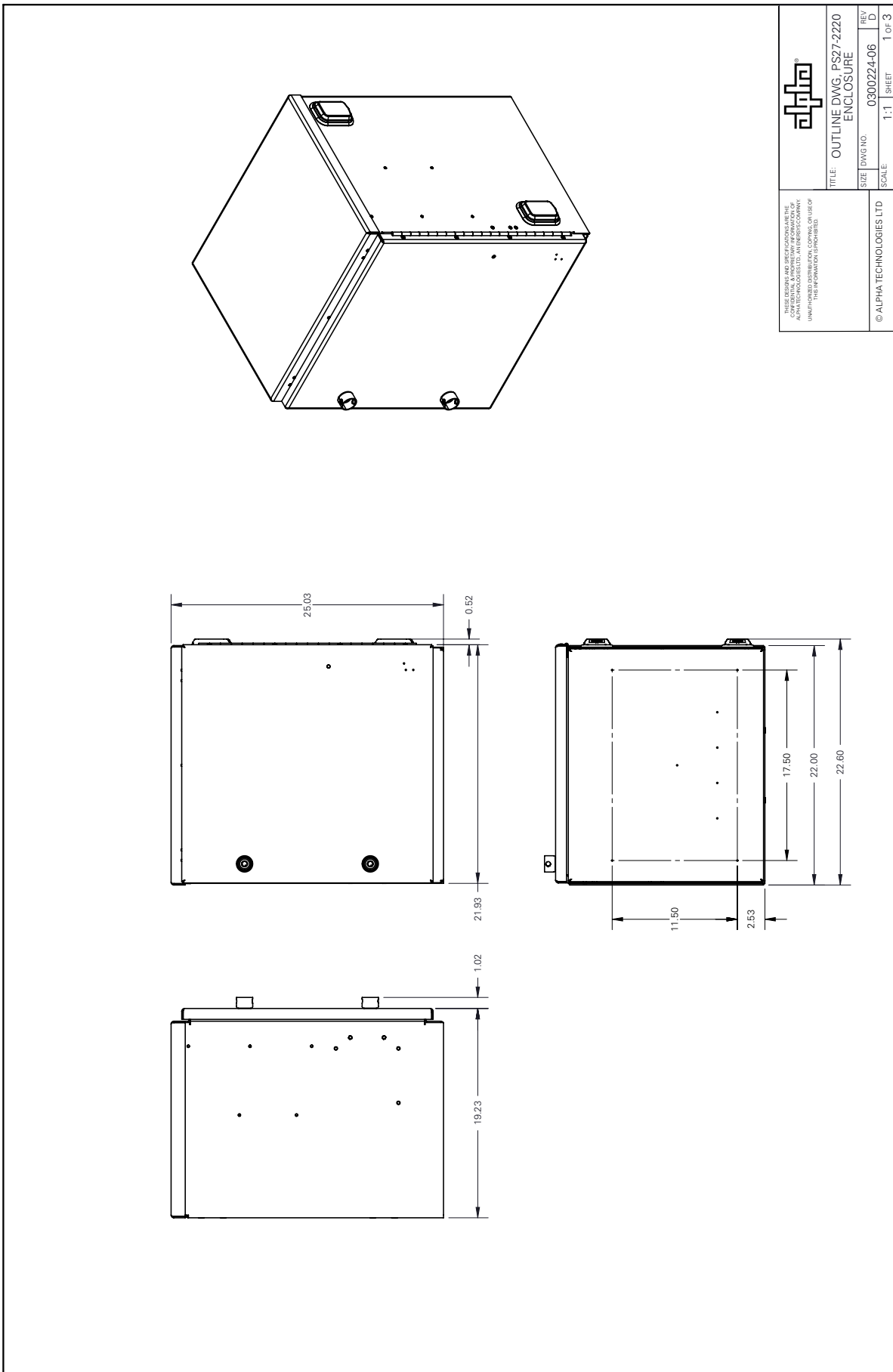
$$\text{Amp hours} = 144 \text{ Ah}$$

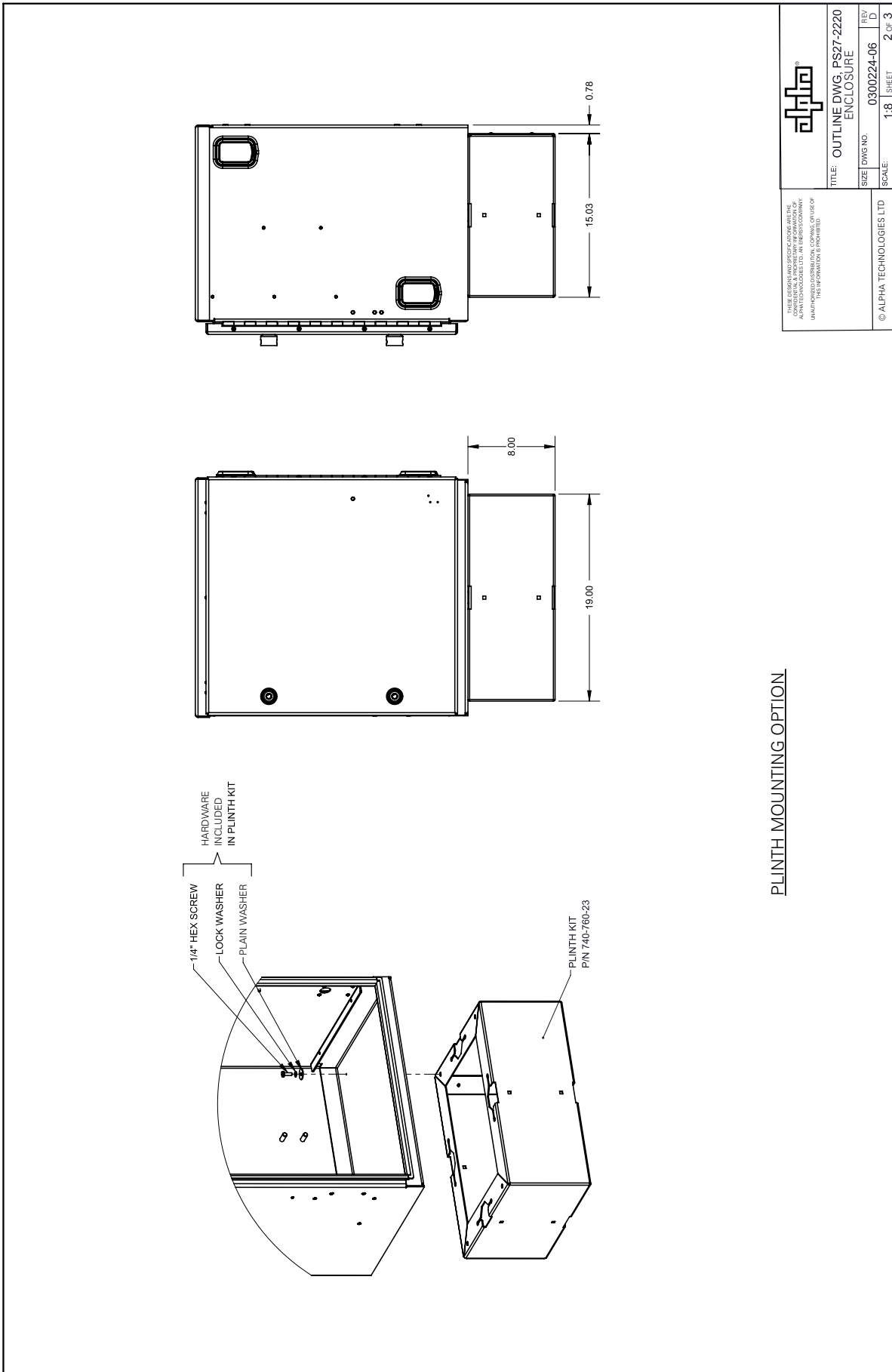
10.1.3 Battery selection

Refer to the manufacturer's data sheet and select a battery. The battery must use the discharge curve 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 10-hour rate.

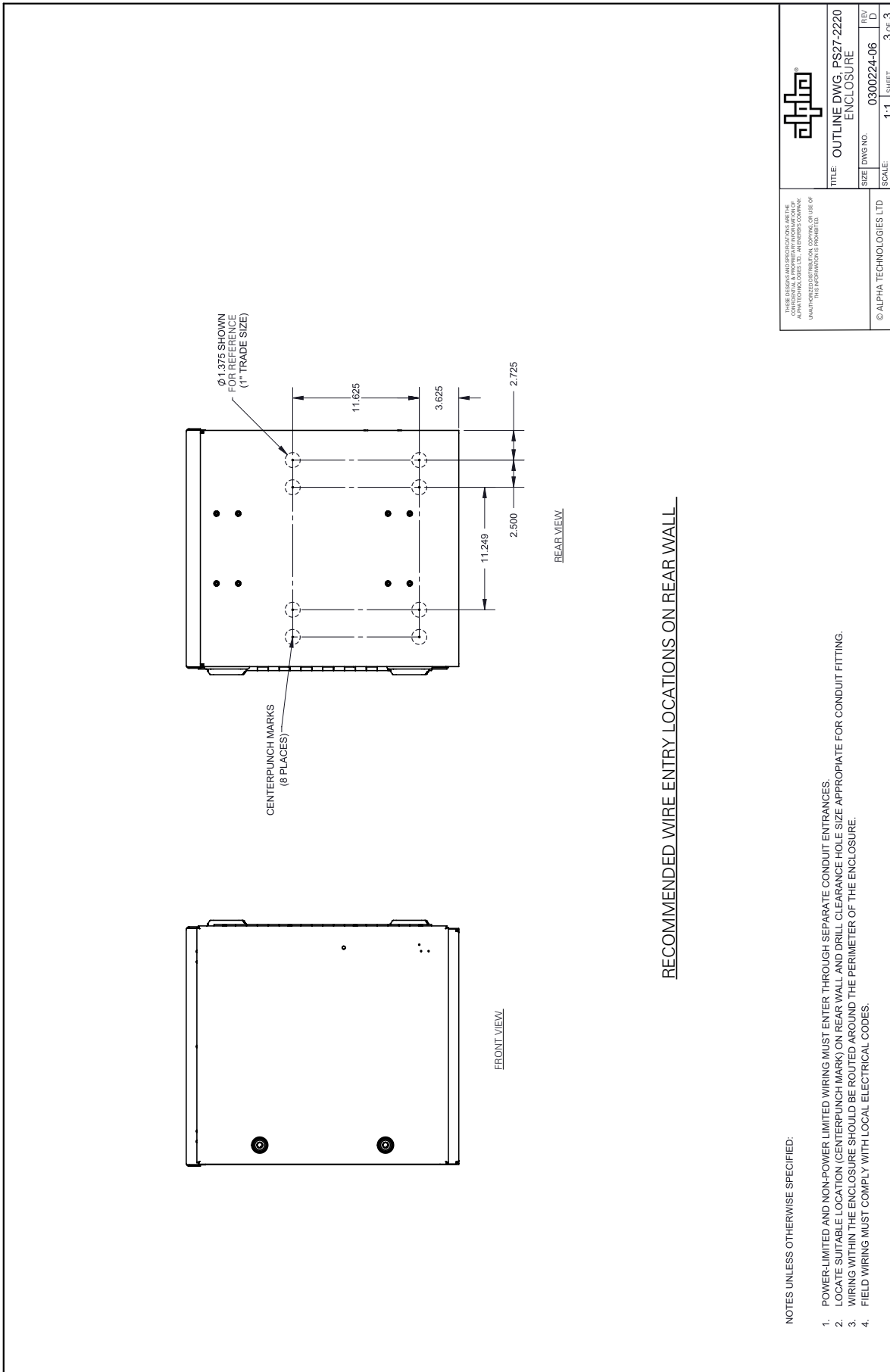
11. Acronyms and definitions

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® CXC 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



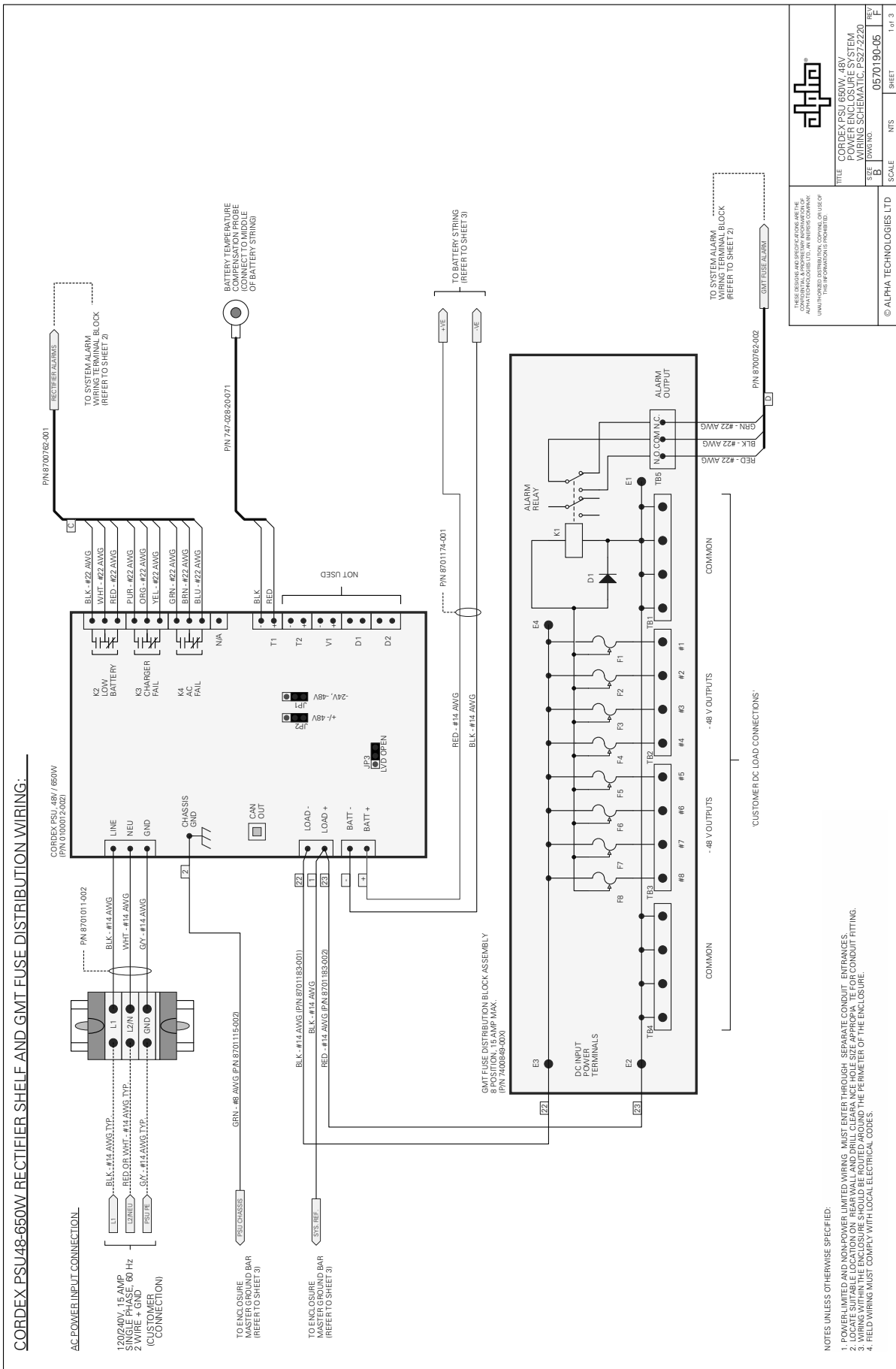


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		SIZE: DWG NO. 0300224-06	REV: D
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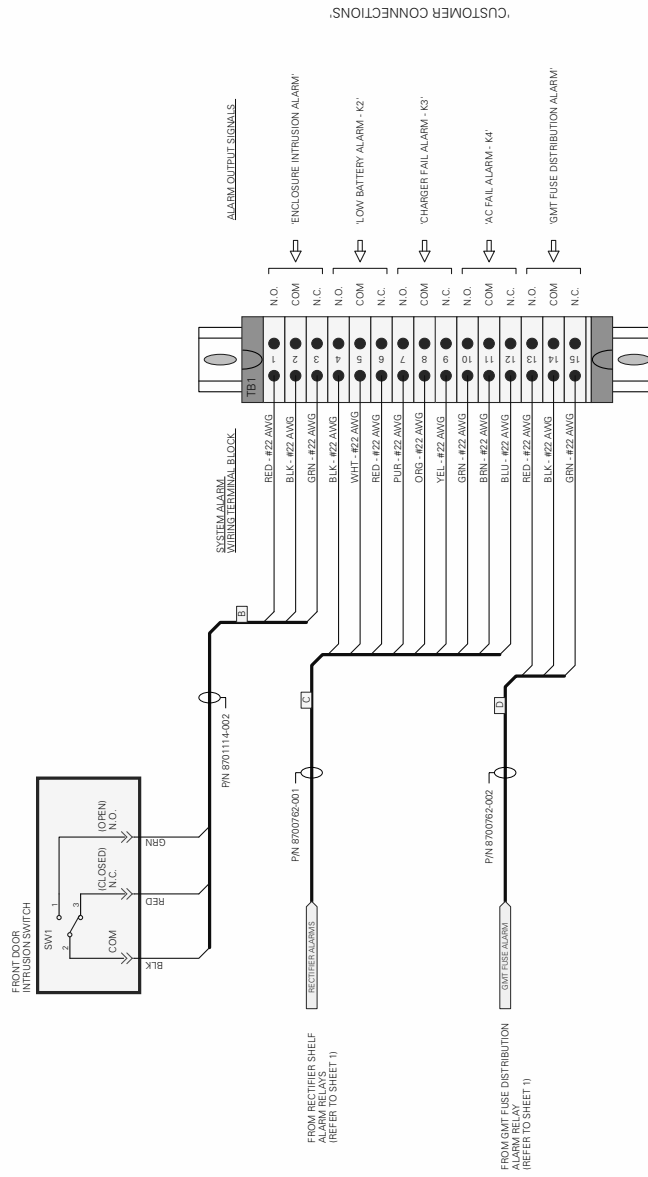
NOTES UNLESS OTHERWISE SPECIFIED:

1. POWER-LIMITED AND NON-POWER LIMITED WIRING MUST ENTER THROUGH SEPARATE CONDUIT ENTRANCES.
2. LOCATE SUITABLE LOCATION (CENTERPUNCH MARK) 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.



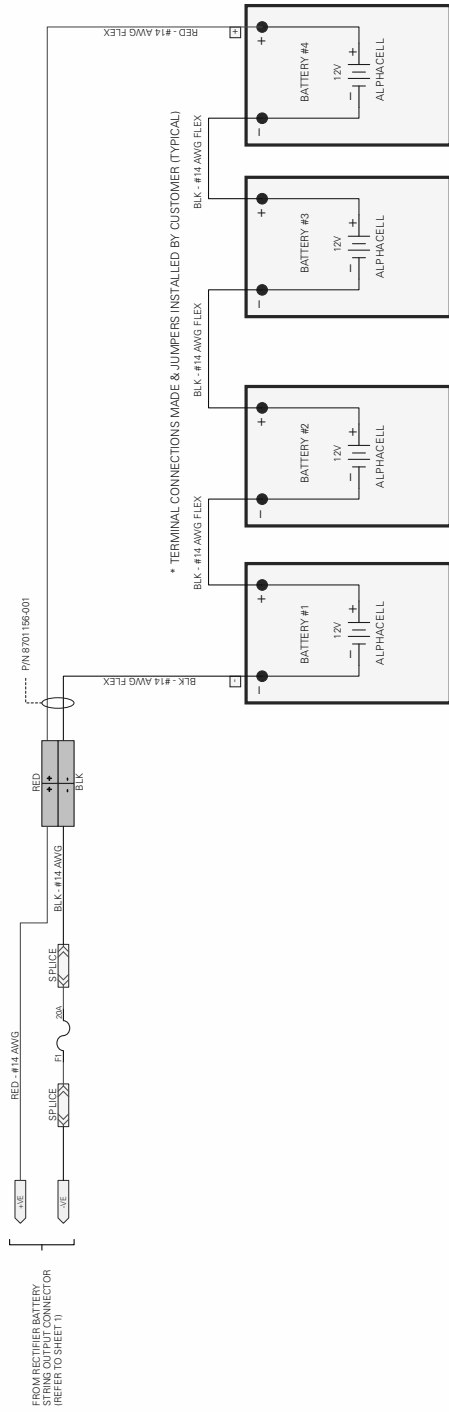
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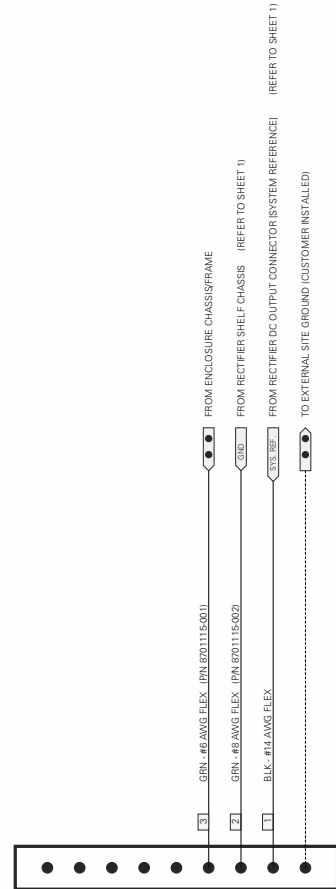


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SYSTEM 48V BATTERY STRING CABLING:



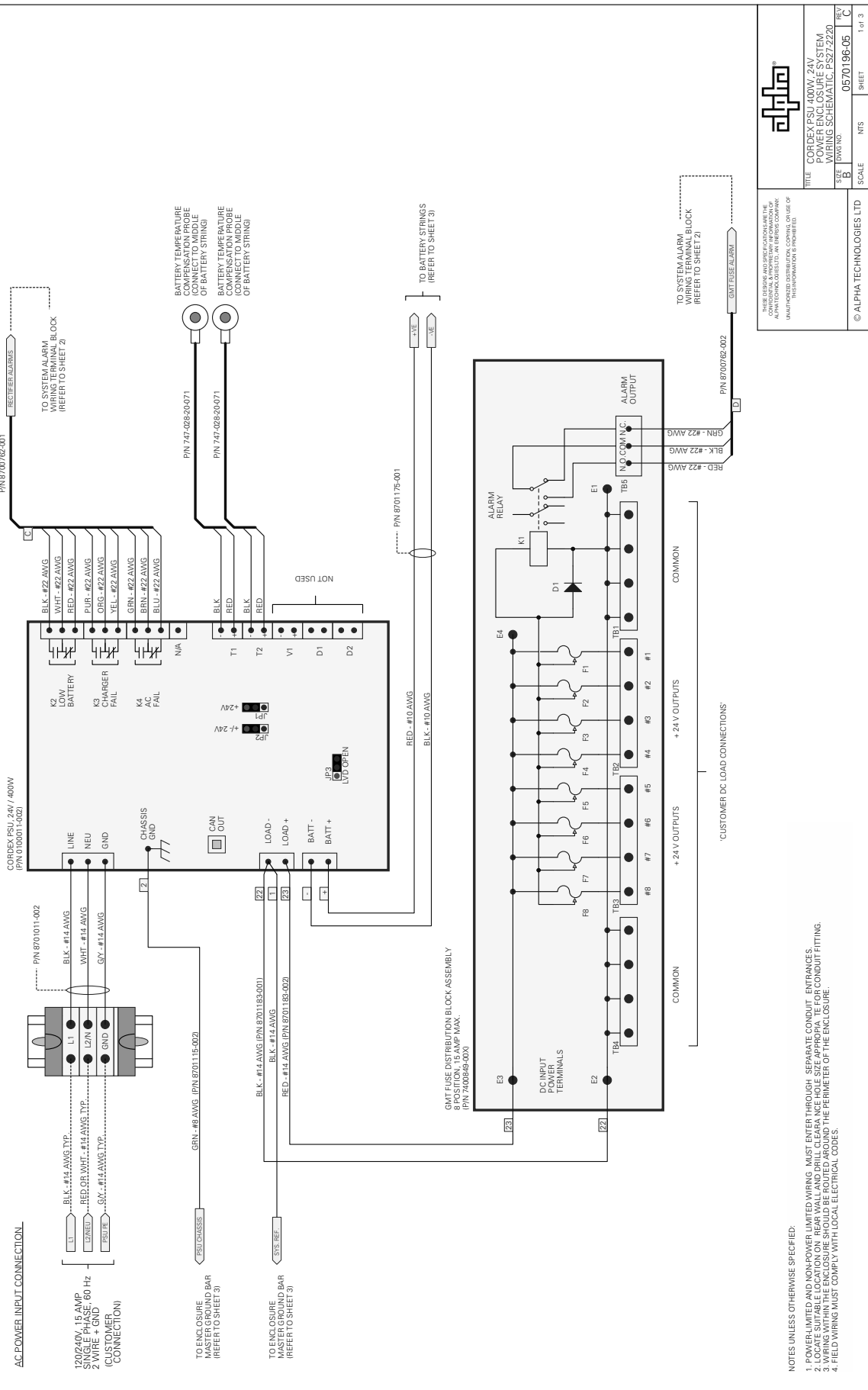
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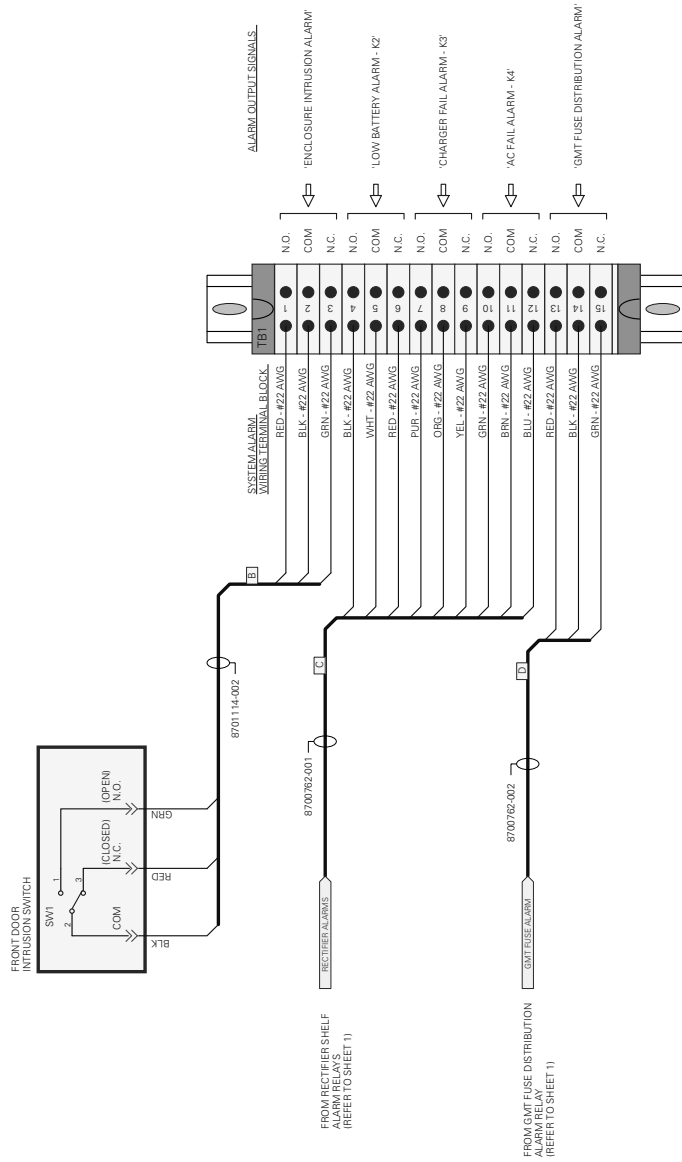


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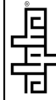
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