



Power Supply System Aspiro 2U Front Access Instruction Manual



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UNIPOWER, LLC
65 Industrial Park Rd
Dunlap, TN 37327
Phone: +1-954-346-2442
Toll Free: 1-800-440-3504
Web site: www.unipowerco.com

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1. About This Manual

This chapter contains an overview of the information that is presented in this Power System Manual. This includes information on objectives, the intended audience, and the organization of this manual. In addition, this chapter also defines the conventions used to indicate warnings, cautions and noteworthy information.

1.1 Objectives

This manual describes the Power System, explains how to unpack and install the system, how to perform the initial power-up and operational system check.

The information presented in this document is current as of the publication date.

1.2 Audience

This manual is to be used by installers and technicians who are preparing the site for a new installation and installing the power system. This manual assumes that the technician has an understanding of power systems in general and understands safety procedures for working around AC and DC voltage.

The user of this document should be familiar with electronic circuitry and wiring practices and have some expertise as an electronic, power, or electromechanical technician.

1.3 Document Key

This manual uses the following conventions:



WARNING This symbol indicates a situation that could cause bodily injury. Always be aware of hazardous conditions when working in or around the power system.



CAUTION This symbol indicates a situation that might result in equipment damage. The reader should be aware that their actions could result in equipment or data loss.



NEED MORE INFORMATION? This symbol is used to reference information either in this manual or in another document.



NOTE This symbol means the reader should take note. Notes are helpful suggestions or reminders.

Table 1-1 Abbreviations

Abbreviation	Description
PCC	Prime Controller Card
ACX	Advance Controller Card
LVD	Low Voltage Disconnection
PLD	Partial Load Disconnection (load shedding)
XR04.48	400 W Rectifier
XR08.48	800 W Rectifier
XPG12.48	1200 W Rectifier
DB22	Distribution Drawer (4 x load, 1 x battery)
D22	Distribution Drawer (3 x load)
D33	Distribution Drawer 2 x load)
B33	Distribution Drawer (2 x battery)

1.4 Product Support

Product support can be obtained using the following address and telephone numbers.

Manufacturing facility:
UNIPOWER, LLC
65 Industrial Park Rd
Dunlap, TN 37327
United States

Phone: +1-954-346-2442
Toll Free: 1-800-440-3504
Web site – www.unipowerco.com

When contacting UNIPOWER, please be prepared to provide:

1. The product model number, spec number, S build number, and serial number
- see the equipment nameplate on the front panel
2. Your company's name and address
3. Your name and title
4. The reason for the contact
5. If there is a problem with product operation:
 - Is the problem intermittent or continuous?
 - What revision is the firmware?
 - What actions were being performed prior to the appearance of the problem?
 - What actions have been taken since the problem occurred?

1.5 Disclaimer

UNIPOWER is not responsible for system problems that are the result of installation or modification of the instructions provided in this manual.

2.1 Overview

Aspiro DC power systems offer a range of solutions for diverse applications such as broadband access, cable head ends, micro/pico BTS Cells, Enterprise, E911, and GSM-R.

The Aspiro shelf system utilizes efficient, dense, and reliable plug-in rectifier modules XR04.48, XR08.48 or XPGe12.48, with output power available at either 400W, 800W or 1200W per rectifier, based upon a soft-switching approach. Features include wide input operating range, wide operating temperature, full self-protection and three LEDs for immediate rectifier status indication.

The Power system is highly configurable with installed capacity from 400W up to 4800W together with DC distribution, system controller and battery backup.

The power system can be managed locally through messages and alarm displayed on the LCD screen of the system controller or remotely, using the PC-based PowCom™ software, or through a web browser with Ethernet connection.

Aspiro 2U system consists of:

- | | |
|-----------------------------------|--|
| 1. System Controller ACX Advanced | 5. Internal Connection Board |
| 2. Load Distribution Unit | 6. AC Surge Protection Device (Option) |
| 3. Alarm Interface Module | 7. Rectifier Module |
| 4. AC Input Terminal Block | 8. Battery Distribution Unit |

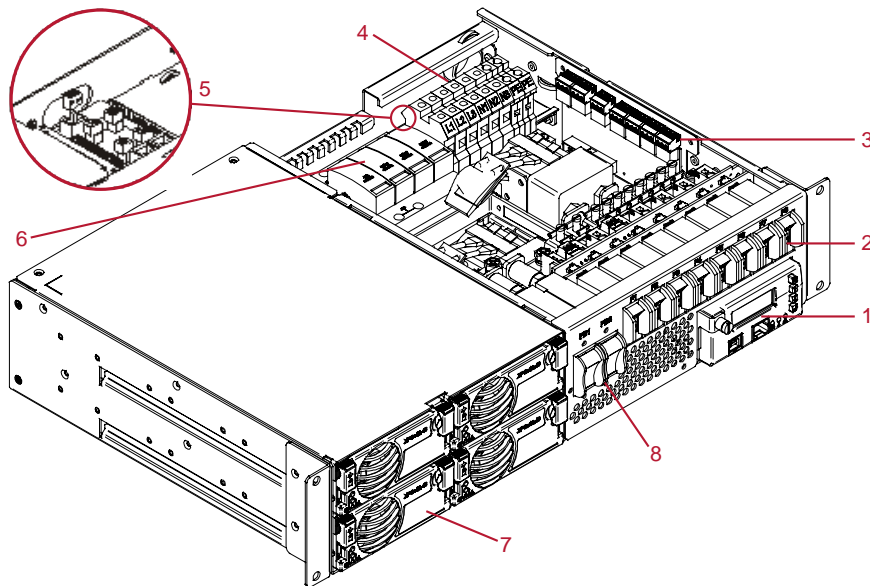


Figure 2-1 Power System Overview

2.2 System Parameters

OUTPUT

Power (max)	4800W (XPGe12.48G), 3200W (XR08.48G), 1600W (XR04.48G)
Output Current (max)	60A @ 55°C (XPGe12.48G & XR08.48G) 30A @ 55°C (XR04.48G)
Voltage	46-57VDC

INPUT

Voltage	1-phase 100-120/200-240VAC (L + N + PE) 3-phase 230/400VAC (L1 L2 L3 + N + PE)
Frequency	47-63Hz
Input Current	1-phase 32A @ 100-120VAC, 14A @ 200-240VAC 3-phase 8A per phase @ 230/400VAC
Power factor	>0.98
Surge Protection	Optional

DC DISTRIBUTION & BATTERY MANAGEMENT

Battery Breakers	2 x 30A, 45A, 60A, 80A or 100A
Symmetry Inputs	Up to 6
Programmable LVD / PLD	125A (voltage) / 125A (voltage/time)
Load Breakers	8 x (NADER NDB3 Series)
Ratings*	1A, 4A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A

MONITORING AND CONTROL

Controller	PCC or ACX Advanced
Local Interface	4 x 20' LCD, 4-key menu, USB (ACX only) and RS232
Remote Interface	Ethernet / Modem using PowCom™ software
Visual Indication	Green LED - System On Yellow LED - Message(s) Red LED - Alarm(s)
Analog Inputs	12 x voltage inputs (range 0-100VDC) - 6 max. for symmetry
Alarm Outputs	4 x potential free relays (C, NC, NO)
Digital Inputs	2 x, Logic 0: U<10VDC, Logic 1: U>12VDC (ACX only)
Digital Outputs	2 x, open collector type (ACX only)
Temperature measurement	2 x Temperature probe (Battery, Ambient)

CONNECTIONS

Battery connections	M6 lugs, +Ve common from bus bar
AC connections	Max. 9AWG/6mm ² , screw type connector
Load breaker connections	+Ve termination direct to breakers, +Ve common from busbar 11AWG/4mm ²
Alarm connections	Max. 14AWG/1.5mm ² , screw type connector

RECTIFIER MODEL	XPGe12.48	XR08.48	XR04.48
Efficiency	95% typical @ I _{out} nom	90% typical @ I _{out} nom	88% typical @ I _{out} nom
Input Current (max)	<7.3A	<10.5A	<5.3A
Output Current (max)	22.4A	15.0A	7.5A
53.5V float			
Output Power	1200W @ >180VAC 750W @ 90-180VAC	800W	400W
Operating Temperature (without derating)	55°C	65°C	65°C
Input Voltage (Nominal 100-240VAC)	90-300VAC	85-300VAC	
Output Voltage	46-57VDC		
Load sharing	< 5% of nominal current		
Dimensions (WxHxD)	40.6 (1.6") x 101.62(4") x 228.5(9") mm		
Weight	1.1 kg		
Cooling	Fan-cooled, speed and alarm controlled, air flow direction rear to front		
Protection	Short circuit proof, automatic current limiting, selective shutdown of modules at excessive output voltage.		
Alarms	High output voltage/ shutdown, Low voltage/ module failure		
LED Indication	Green: Power ON Yellow: Current limit/ thermal protection Fan failure / Over temperature Pre-warning / thermal protection Communication Failure (flashing) Red: Module failure / high output voltage shutdown		
Audible noise	<55dBA according to ISO7779		

MECHANICAL

Dimensions (WxHxD)	19" (483mm) x 3.5" (88mm) x 11.7" (297mm)
Weight of the system (fully equipped)	32lbs (14.5kg)
Mounting Options	19"/ ETSI / Mid-mount
Cable Entry	Rear Access (top cover has to be removed to make connections)

STANDARD COMPLIANCE / ENVIRONMENTAL

EMC and Immunity	EN55022:2006 +A1:2007, EN55024:1998 +A1:2001 +A2:2003, EN61000-3-2:2006+A1:2009 +A2:20009, EN61000-3-3:2008 ETSI EN300386 V1.4.1
Safety	EN60950-1: 2006 + A11:2009
Environment	Storage: ETS300 019-2-1, Transport: ETS300 019-2-2, Operation ETS300 019-2-3, Damp Heat: IEC60068-2-78
Operating Temperature	-40°C to +65°C (derated above 55°C)
Storage Temperature	-40°C to +85°C

2.3 System Components

The Aspiro system is delivered with all components mounted according to the ordered configuration. The main components are described below and in later chapters of the manual.

2.3.1 System Controller

The Aspiro power system can be controlled by the ACX Advanced or PCC controller. The description and operation of these controllers is covered in separate manuals which are available at:

ACX Advanced: <https://www.unipowerco.com/pdf/acx-man.pdf>

PCC: <https://www.unipowerco.com/pdf/pcc-man.pdf>

2.3.2 DC Distribution Unit

The distribution unit can be configured for a variety of pluggable battery and load breaker selections, a shunt for battery current measurement and fuse alarms for load and battery breakers. The front access enables easy replacement of breakers and fuses if needed.

The distribution unit is designed for switching the battery and load on and off. The battery and load breakers (MCB) are supervised by measuring the voltage drop across each breaker. In case of load breakers, any MCBs that are not connected to a load will not cause breaker alarm even if they are left open.

A battery fuse alarm is generated after the battery voltage drops below a certain level. This depends on the actual battery capacity and condition.

2.3.2.1 Low Voltage Disconnect (LVD)

The system is equipped with low voltage battery disconnection, which prevents the batteries from deep discharging, thus prolonging the battery life. The disconnection requires detected mains failure at the controller. If disconnection occurs, the batteries are reconnected when the mains supply is restored.

A maximum of two breakers with current rating maximum 100A can be installed.

2.3.2.2 Partial Load Disconnection / Load Shedding (PLD)

During a mains outage the controller opens the PLD contactor when the batteries have discharged down to a certain voltage or if the battery voltage has been under a certain voltage for a predetermined time. The disconnection has to be set according to the present load and battery manufacturer's discharge tables or requirements.

A maximum of seven breakers with current rating maximum 30A can be installed.

2.3.3 Rectifier Module

The Fan-Cooled XPGe12.48 (1200W), XR08.48 (800W) and XR04.48 (400W) rectifiers are modular power supplies designed for parallel operation and hot-plug installation in the Aspiro Power Systems.

Each rectifier provides extremely reliable DC power in a very high density. The module incorporates power monitoring through an internal microprocessor, giving up to the second updates to the system controller and companion rectifiers. This guarantees tightly controlled load sharing among rectifiers, and provides status and identification information to the controller.

The rectifiers operate in parallel using active load sharing. They incorporate soft-start at both the input and the output, which protects against high incoming and outgoing currents. The output voltage of the rectifier is automatically adjusted to the required voltage by the controller.

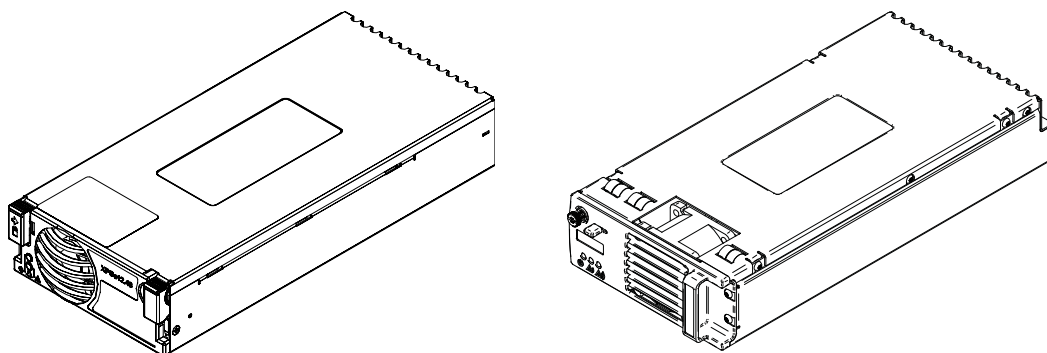


Figure 2-2 XPGe12.48 and XR04.48/XR08.48

XPGe12.48 rectifiers cannot be used in the same rack as XR04.48 / XR08.48 rectifiers.



CAUTION XPGe12.48 rectifiers cannot be used in the same system as XR04.48/XR08.48 rectifiers.

3.1 Safety Warnings and Guidelines

The following warnings and guidelines should be followed by properly trained and authorized personnel when installing, operating, commissioning or maintaining this equipment. Neglecting the instructions may be dangerous to personnel and equipment.

3.1.1 System Markings

The following markings are found on the Power System:

Ground Symbol



DC Ground Symbol



Product Label - The product label contains the system part number, model number, system ratings and safety approvals. The label is located inside the system.

Safety Label - The safety label is located inside the system.

3.1.2 Safety Recommendations

Any device that uses electricity requires proper guidelines to ensure safety.

- The Power System should only be installed or serviced by a qualified personnel.
- Always keep tools away from walkways and aisles. Tools present a tripping hazard in confined areas.
- Keep the system area clear and dust-free during and after the installation.
- Always know the location of emergency shut-off switches in case of an accident.
- Always wear appropriate eye protection and use appropriate tools for working with high voltage equipment.
- Do not perform any action that creates a potential hazard to other people in the system area.
- Never work alone in potentially hazardous conditions.
- Always check for possible hazards before beginning work.
- Remove watches, rings and jewelry that may present a hazard while working on the power system.

3.1.3 Installation Warning

The following safety guidelines should be observed when transporting or moving the system:

- Before moving the Power System, read the system specifications sheet to determine whether the install site meets all the size, environmental, and power requirements.
- The system should only be moved by qualified personnel and equipment.
- The Power System should be properly mounted to the building structure at the install location to prevent bodily injury.
- Installation of the equipment in the rack should be properly installed so that hazardous conditions are not present due to uneven loading.
- When installing the system in a rack, allow adequate room to prevent blocking of the vent openings on the power equipment and to allow for optimal air circulation and to reduce the chance of system overheating.

3.1.4 Restricted Access Area Warnings

The Power System is designed for installation in locations with restricted access often secured by a locking mechanism. It can therefore be accessed only by a trained service person, who is fully aware of the restrictions applied to the location, or by an authority responsible for the location.



NOTE This may be disregarded for systems delivered in a UNIPOWER Outdoor enclosure.

3.1.5 System Enclosure

Appropriate measures need to be taken to avoid intrusion of any unwanted objects or insects into conductive areas of the power system as there is a potential risk of system damage.

Disclaimer: UNIPOWER LLC assumes no liability or responsibility for system failures resulting from inappropriate enclosure around the system.

3.1.6 Operating Temperature Warnings

To prevent the Power System from overheating, an automatic shutdown mechanism has been installed. It is not recommended to continually operate the Power System in an area that exceeds the maximum recommended operating temperature.

3.1.7 Electrical Safety Warnings

The following are electrical safety recommendations for working near the Power System:



WARNING Observe low voltage safety precautions before attempting to work on the system when power is connected. Potentially lethal voltages are present within the system.



WARNING Caution must be exercised when handling system power cables. Damage to the insulation or contact points of cables can cause contact with lethal voltages. For safety reasons, cables should be connected to the power system before power is applied.

- Remove all metallic jewelry like watches or rings that may present a hazard while working on the power system.
- Before connecting the AC input source to the power system, always verify voltage.
- Verify the AC source capacity. See system specifications for AC information.
- All AC connections must conform to local codes and regulations, e.g. ANSI, CEC, NEC, etc.
- When making AC connections, all AC power and DC load distribution breakers should be in the OFF position.
- All circuit breakers should meet the original design specifications of the system. In addition, equipment connected to the system should not overload the circuit breakers as this may have a negative effect on overcurrent protection and supply wiring, causing system or user harm.
- Verify the DC capacity before making connections. See system specifications for DC information.
- Potentially lethal voltages are present within the system. Ensure that all power supplies are completely isolated by turning all power switches OFF, disconnecting all relevant connectors and removing all relevant breakers before attempting any maintenance work. Do not rely on switches alone to isolate the power supply. Batteries should also be disconnected.
- Potentially lethal voltages are present within this system. Ensure that low voltage safety requirements are implemented before attempting to work on the system with power connected.
- Potentially lethal voltages can be induced if the equipment is not grounded (earthed) correctly. Ensure that all ground connections are secure.

3.1.8 Grounding



WARNING Grounding connection must be performed **before** operating the system. Refer to local codes, e.g. ANSI, CEC, NEC, T1-333, ETSI 300-386-TC specifying the connection of power system to building ground. In case of any doubt regarding the grounding connection, please contact a person responsible for the system.



WARNING The system should be hard-wired to the incoming earth ground. A solid high current ground connection capable of sinking the maximum system current is required.



CAUTION A conductor is connected between the ground point and the 0 VDC bus bar on the PBDU distribution. This conductor is connected to its own earth bar and not shared with other safety conductors.

3.1.9 Batteries



WARNING When installing or replacing batteries, there is risk of explosion if an incorrect battery type is used.

3.1.9.1 Lead Acid Batteries



WARNING This equipment may use Lead Acid Batteries. When handling batteries, follow the instructions included with the battery set, as the fluids contained within these batteries are known to be a health hazard. The disposal of lead acid batteries is subject to legal requirements for hazardous waste disposal. Local guidelines should be followed for disposal.

Ensure the following guidelines are observed when dealing with equipment that may contain lead acid batteries:

- Any attempt to burn these batteries may result in an explosion and the generation of toxic fumes.
- Should a lead acid battery suffer damage, it must be moved into a well-ventilated area. Contact with the corrosive fluid must be avoided.
- Neutralize any acid corrosion with copious amounts of a solution of baking soda and water, and then wipe off all traces of soda.
- If the lead acid battery is removed from the equipment, any exposed contact must be insulated prior to disposal.
- Ensure that protective full-face shields, rubber gloves and aprons are worn and insulated tools are used when working with the batteries. It is advised also to have water available in case acid gets in contact with the eyes.

3.1.10 In Case of an Accident

In the event of an accident resulting in injury:

1. Use caution and check for hazards in the area.
2. Disconnect power to the system.
3. If possible, send someone to get medical aid. If not, check the condition of the victim and call for help.

3.2 Caution

3.2.1 Storage and Transportation



CAUTION During storage and transportation, the units must remain in their original packages in order to avoid mechanical damage, maintain tracability, and protect the units against electrostatic discharge.

3.2.2 Disposal



CAUTION The product should not be disposed with other wastes at the end of its working life so as to prevent possible harm to the environment or human health from uncontrolled waste disposal.

3.2.3 Handling Electrostatic Sensitive Devices



CAUTION An electrostatic sensitive device is an electronic component that may be permanently damaged by the discharge of electrostatic charges encountered in routine handling, testing and transportation.

3.2.4 Traceability



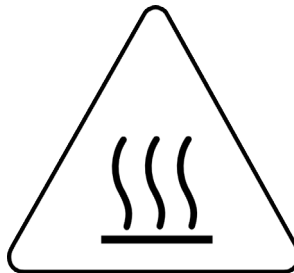
CAUTION Units are labeled with permanently attached product identification labels. The labels are designed to be indelible throughout the life span of the equipment, unless mistreated. Make sure that the product identification labels are present on the equipment and are not subjected to unusual wear or mistreatment.

3.2.5 Breakers



CAUTION Breakers should always be replaced with the same type and rating in order to avoid damage to system components.

3.2.6 Hot Surfaces



CAUTION Areas of the Power System may become hot. Take precautions and handle with care to avoid bodily harm.

4.1 Unpacking

Check that the received equipment is in accordance with the packing list. Ensure that the cabinet and the equipment have not been damaged during transportation.

Report any parts that are damaged, missing or incorrect. If possible, correct the problem before continuing.

4.2 Tools

The following tools are required for a safe installation of the system:

- Anti-static hand strap.
- Socket wrench, insulated.
- Screwdriver set, flat, insulated.
- Screwdriver set, torx, insulated.
- Screwdrivers, pozidrive (cross head), sizes 1, 2, and 3, insulated.
- Torque spanner (for battery connection), insulated.



WARNING Use only single-ended, fully insulated tools. Shafts of for example screwdrivers should be insulated.



CAUTION Installation in USA / Canada must conform with the requirements in NEC/CEC.



CAUTION Care must be taken when installing this system. The units can be damaged and can cause damage if not handled with care. Pay particular attention to the order in which units are installed.

4.3 Rack Mounting



NOTE For ease of mounting the power rack it is recommended to remove the rectifiers.

The power system is designed for 19"/ETSI mounting to a cabinet or an open frame. The mounting brackets on the sides of the power system fit the chassis in three different positions for various mounting depth.

See [appendix A](#) for detailed dimensional Drawings.



NOTE When mounting the system to an open frame, the brackets should be moved to the middle position.

To mount the subrack into a cabinet, follow the steps below:

1. Determine the installation position according to the subrack measurement. If necessary, fix the mounting bracket in a different position, see Figure 4-1. (The default position of mounting brackets is 19" rack width, front mount.)

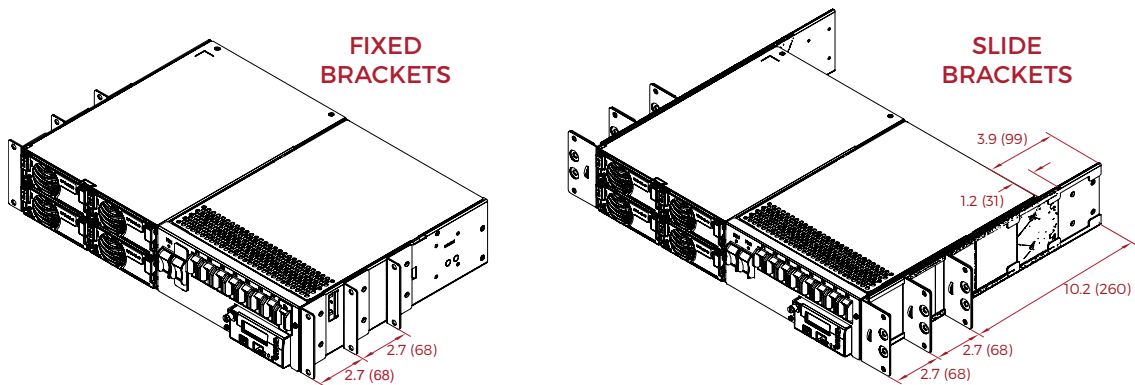


Figure 4-1 System Mounting

2. Place the subrack into the cabinet.
3. The subrack with adjustable brackets has to be fastened to the cabinet in the middle of the mounting bracket with two M6 x 12mm screws. Tighten the screws to 6Nm, Figure 4-2.

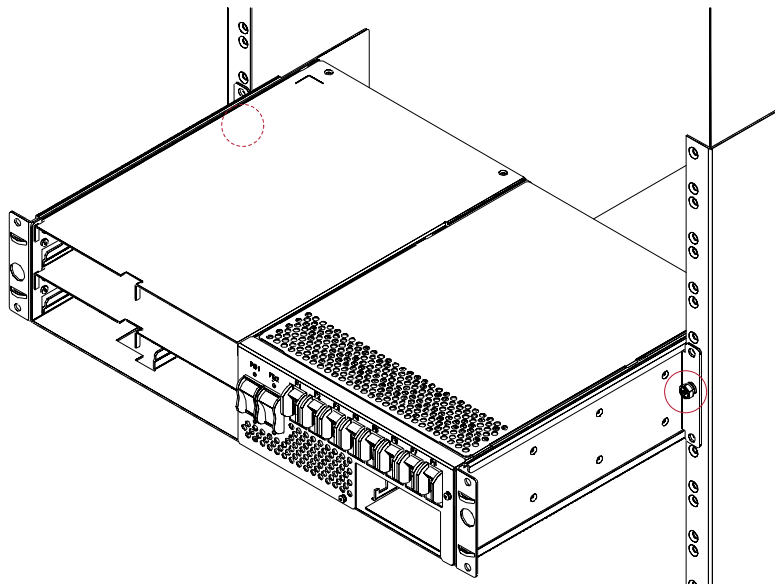


Figure 4-2 Slide Bracket Fixing

4. Then fasten the subrack, either with adjustable or fixed brackets, to the cabinet with four M6 x 12mm (2 on each side of the subrack). Tighten the screws to 6Nm, Figure 4-3.

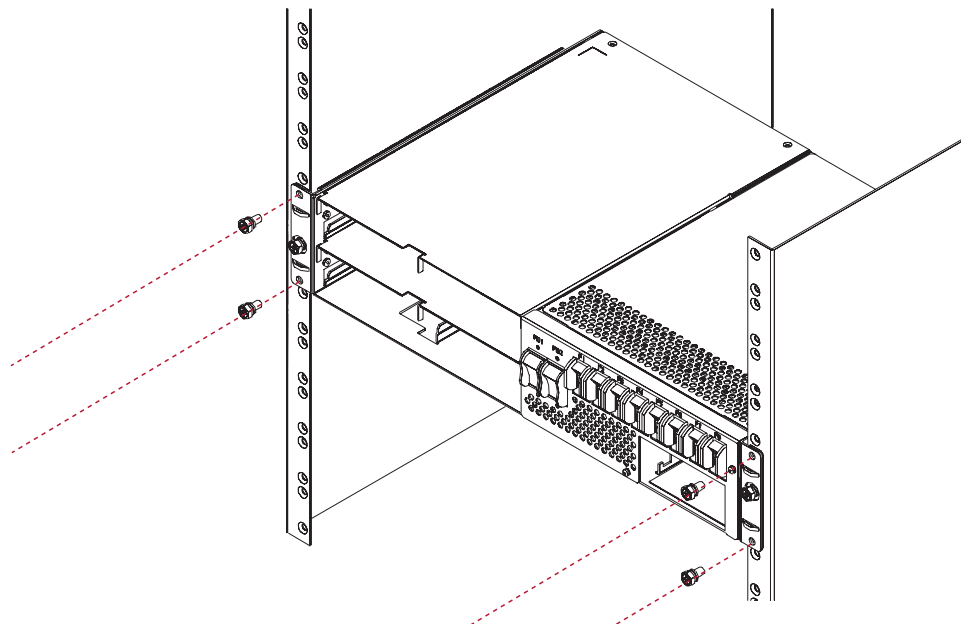


Figure 4-3 System Bracket Fixing

4.4 Cable Entry

If the top distribution cover is installed, it should be removed for connecting AC, DC, alarm, grounding, temperature and symmetry measurement cables.

Push the top cover backwards and then lift it to remove.

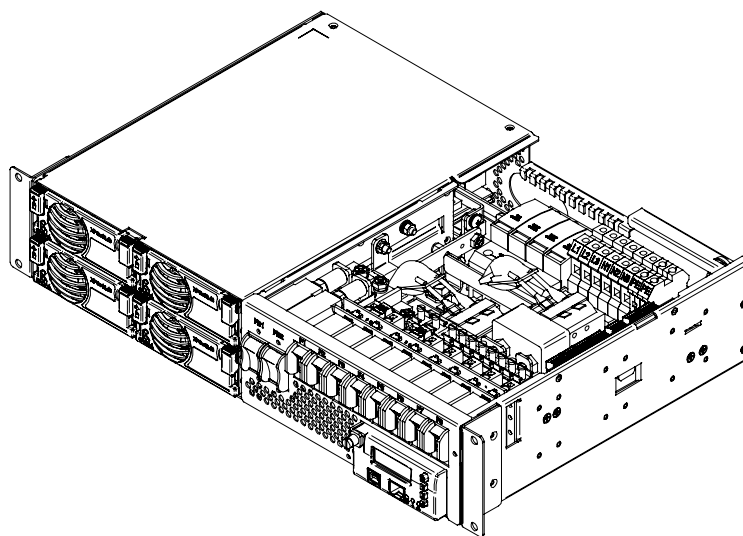


Figure 4-4 System With Cover Removed

4.5 Grounding Connection

The power system needs to be properly grounded to the rack or cabinet frame to ensure its safe and efficient operation, see Figure 4-5.

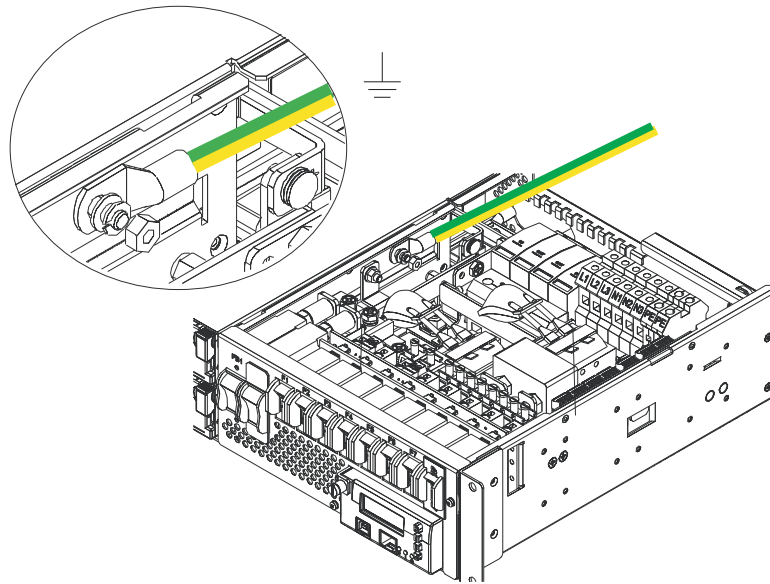


Figure 4-5 Grounding Connection

4.6 AC Input Connection



WARNING Ensure that mains input is turned off before connecting. The grounding must be connected to PE terminal as first.



WARNING High leakage current. Ensure earth is connected before connecting mains supply.



CAUTION Depending on deployment region with regards to lightning strikes and heavy inductive energy, it is highly recommended to install AC Surge Protection Class C, if not delivered with the system..



WARNING Used cable must be inserted into the terminal with as little insulation removed as possible, so as to prevents any stranded conductor coming loose and touching any other conductive parts. Tighten terminals securely with torque 1.5-1.8Nm.

To connect, route the AC input cable through the cable entry and connect to the AC terminals.

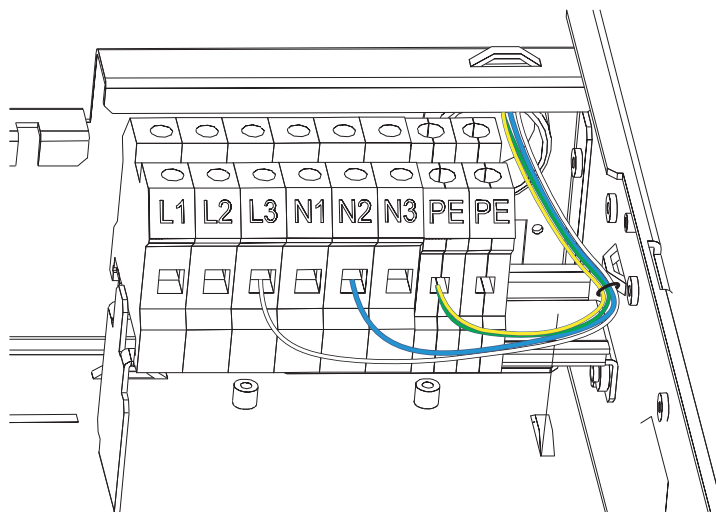


Figure 4-6 AC Input Terminal Block (1-phase)

The mains input terminal blocks can be connected to: 3-phase 400VAC, 1-phase 230 VAC or 2-phase 230VAC, see Figure 4-7.

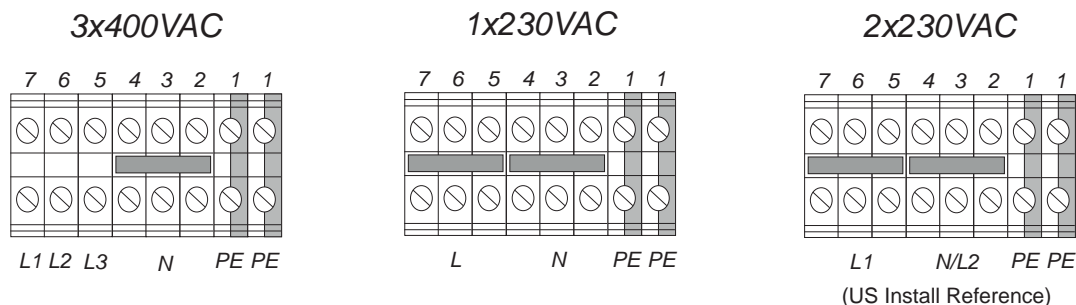


Figure 4-7 AC Connection Options

Recommended AC mains breaker:

400VAC 3-phase: UL listed, triple pole 20A C-characteristic

230VAC 1-phase: UL listed, double pole 40A C-characteristic

4.7 DC Load Connection

Before connecting DC load cables, check the appropriate cable ratings. Maximum cable size is 9AWG/6.0mm².

1. Check that all the load MCBs are in the OFF position.
2. Connect the negative (-) DC cable to the relevant circuit breaker.

- Insert a flat screw driver into the square hole of green spring terminal to compress the spring.
 - Push the stripped cable into the round hole of the same terminal.
 - Take out the screw driver to clamp the cable in the correct position.
3. Connect the positive (+) cable from the load to the relevant positive terminal on the bus bar. Insert the stripped cable into the opening on top of the terminal and tighten the screw to 2.5Nm. See figure 4-8

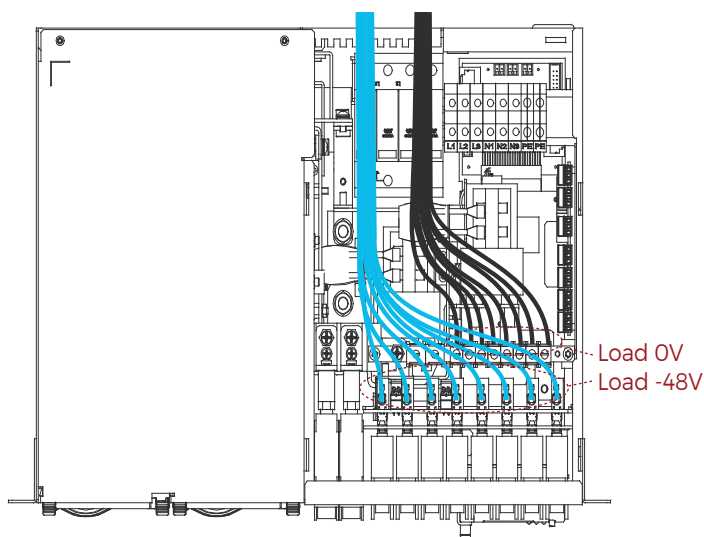


Figure 4-8 DC Load Connection

4.8 Battery Connection

The battery cables are not delivered with the subrack system.

Check that all the battery MCBs are in the OFF position.

Connect the (-) battery cable of each battery string to the copper bar with the screw. Tighten the cable to a torque 4.0Nm.

Connect the (+) battery cable of each battery string to the positive bus bar of the subrack. Tighten the cable terminal to 3.5Nm. See figure 4-9

Connect the other ends of the battery cables to the (-) and (+) terminals of the batteries. Refer to [Table 6-1](#) for correct torque.

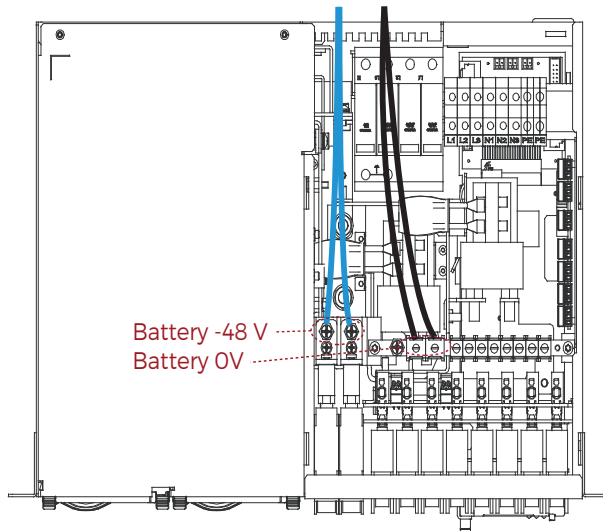


Figure 4-9 Battery Connection

4.9 Alarm and Signal Connections

For remote supervision of the alarms, there are a maximum 4 potential free alarm contacts available. Each alarm contact represents different alarm condition, dependent on system configuration.

The alarm connections are located on the top right side of the subrack on the Alarm Interface.

Use suitably sized alarm cables: Max. 14AWG/1.5mm².

The Connection of all alarms are shown in Figure 4-10.

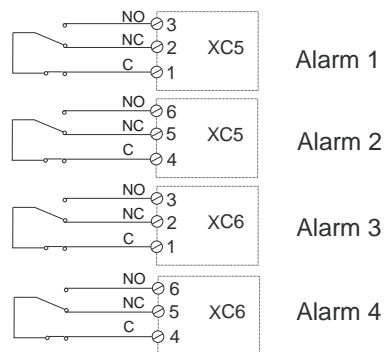


Figure 4-10 Alarm Connections



NOTE Alarm contacts are shown in alarm position.

To connect the alarm cables to Alarm interface board, follow the steps below:

1. Remove the green plug from each connector.
2. Determine whether to reference normally closed or normally open with reference to common for each alarm contact.
3. Strip the wires back approximately 10mm. Stranded wire may be soldered or fitted with a copper ferrule if desired.
4. Insert wire into the correct positions in the green connector and tighten the screw to clamp the wire.
5. Insert the green plug back into the Alarm Interface board.

4.10 Symmetry Connection



NOTE Symmetry cables are pre-connected to the system.

1. Attach the interblock connection plates between the batteries.
2. Insert a suitably sized cable lug into one pole of the interblock connection plate. Fasten the lugs and plates to individual battery poles.
3. For 2-block battery symmetry measurement fix one wire of the symmetry cable to the cable lug in the mid-point of the battery string, see Figure 4-11.

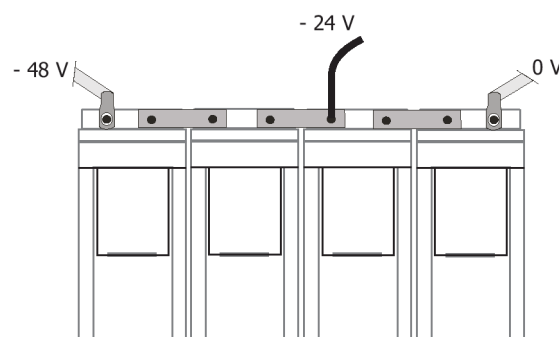


Figure 4-11 2-block Symmetry Measurement (for illustration only)

4. For 4-block measurement fix the 3 wires (red, green and blue) of the symmetry cable to individual cable lugs. Color coding of the cables must be followed for proper symmetry measurement, see Figure 4-12.

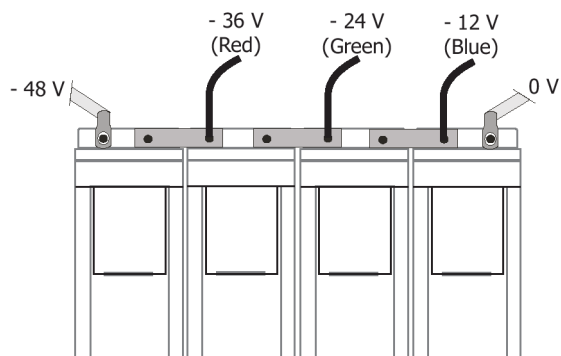


Figure 4-12 4-Block Symmetry Measurement (for illustration only)



NOTE The interblock Connection Kit is not delivered with the system.

4.11 Temperature Sensor Connection



NOTE The power system is usually delivered with pre-connected temperature sensor cables. If not, use a three-pin plug and connect according to the [Appendix A - Installation Details](#).

Battery Temperature

Temperature sensor 1 measures the temperature of the battery bank while the controller adjusts the float charge voltage according to the temperature compensation factor set in the controller. This factor must be set in the controller according to the battery manufacturer 's recommendations.

Fasten the temperature sensor in the middle of the battery bank, Figure 4-13.

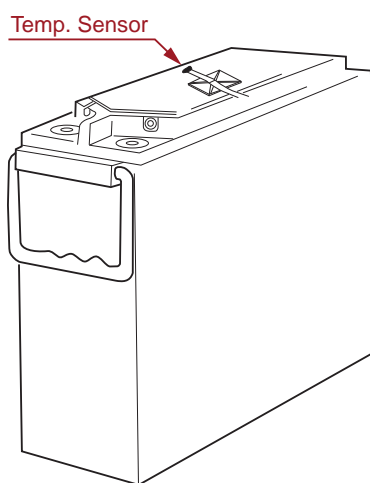


Figure 4-13 Temperature Sensor Connection



NOTE The temperature compensation factor can be set only for temperature sensor 1.

Ambient Temperature

Temperature sensor 2 allows a second temperature reading, most commonly the ambient temperature around the system. Place the sensor as required.

The temperature is displayed in the External Measurements menu in the ACX controller or in PowCom™ software.



NOTE Temperature sensor 2 can be activated only in the systems with the ACX controller installed.

4.12 Rectifier Installation

Rectifier module should be installed starting from the bottom left position in the rectifier shelf.

Rectifier Installation:

1. Place the rectifier module in the mounting slot with handle facing out.
2. Slide the rectifier module into the slot until it contacts the interface connection at the rear of the shelf.
3. a) For XR04.48/XR08.48 fully insert the rectifier by pushing it into the shelf, fasten the rectifier in the slot and tighten the screw with a screw driver.
b) For XPGe12.48 fully insert the rectifier by pushing the handle towards the shelf. The rectifier handle will rise up and lock the rectifier into position.



NOTE Ensure that the rectifier handle is in the OPEN position (forms 35-40° angle with rectifier body) before inserting the module into the slot.

4. Repeat steps 1 to 3 if more rectifiers are to be installed.

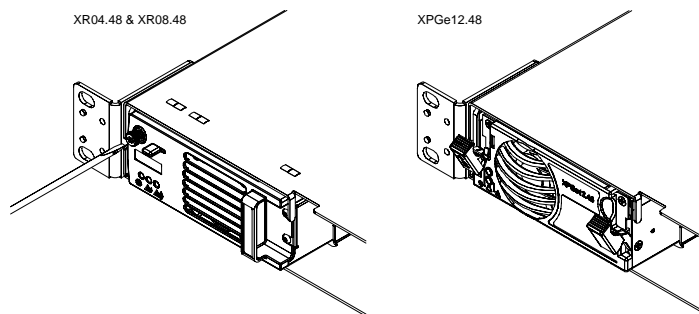


Figure 4-14 Rectifier Installation

4.13 Connection of External PDU to DC Parallel Kit (Option)

1. Turn OFF all the breakers and the AC input before installation.
2. Connect the vertical cable DC parallel cable lug to the positive and negative bus bar with two M5 x 16mm screws.
3. Connect the external PDU load breaker alarm cable to pin1 of alarm terminal block.

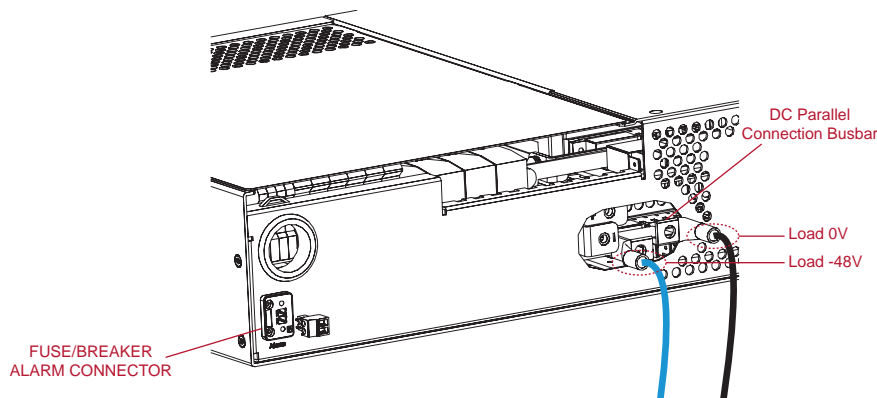


Figure 4-15 External PDU Connection

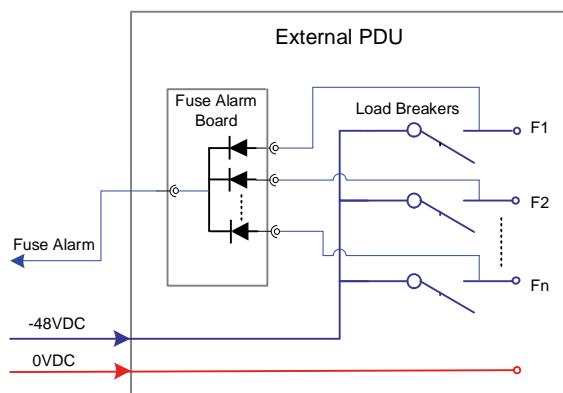


Figure 4-16 DC Parallel Principle

4.14 Reinstalling Top Cover

When all connections are done reinstall the Top and Rear Cover Kits if ordered.

Place the top cover on top of the Distribution Unit. Make sure that the top cover and Distribution Unit fit tightly.

Install the front panel of the Distribution Unit to make the top cover fixed and irremovable.

If the Extension Rear and Top Cover Kits are ordered, reinstall the AC input cover at the back of the unit.

5.1 Commissioning Overview

Before delivery the system was thoroughly inspected and tested. The following chapter is a guide to the set-up and operation of the control functions of the system.



NOTE Before starting commissioning read the product description for the individual components.



WARNING ONLY TECHNICAL STAFF WITH THE NECESSARY EXPERIENCE AND KNOWLEDGE, WITH REGARD TO THE POWER SUPPLY SUPPORT SYSTEM AND ITS BATTERIES, MAY PERFORM THE COMMISSIONING. IT IS IMPORTANT TO FOLLOW ALL SAFETY REGULATIONS.

If there are any difficulties in increasing the voltage to alarm level, the alarm level can be adjusted to a lower level.

5.2 Tools and Test Equipment

5.2.1 Tools List

The essential commissioning tools are listed in the Installation chapter.

5.2.2 Test Equipment

- Multimeter (3½ Digit, 0–1% DC)
- Load resistance, to fully load of two rectifiers

5.3 Preparation

Check the installation to ensure the following:

- Grounding: The equipment is correctly grounded. The grounding cable size, color and routing conform to the requirements.
- Power: The incoming mains AC power is available for this site. The site power switch and circuit breakers are clearly labeled. The power cables are correctly terminated.
- The site is clean and safe. Check that the system/cabinet is free of any unwanted objects or insects that may have got in during the installation.

5.4 Commissioning procedure

1. Remove the covers and check that all connections are made according to the installation drawing. Verify that all connections are properly tightened with sufficient torque.
2. Ensure that load and battery MCB breakers are set to OFF position - ensuring the load and battery strings are connected.
3. Ensure that all rectifier modules are removed. If not, remove each one in turn starting from the rightmost position.
4. If the rectifier subrack has dip switches for addressing, verify that the dip switches are set correctly.
5. Check the battery polarity with the multimeter (3½ Digit, 0.1% dc). Place the positive lead of the meter to the positive busbar and the negative lead to the battery breaker. The meter must now show a positive voltage. If the voltage is negative, change over the connection of the blue and black battery cables to the batteries.
6. Turn on the AC mains voltage.
7. Measure the AC voltage on the AC terminal block between phases and neutral. The correct value is approximately 230V. If the value is different, check the AC connection.
8. Plug in all rectifier modules, starting from the leftmost position. Make sure to fasten the rectifiers again. The rectifiers will turn on automatically.
9. Set all load breakers into the “1” (ON) position.
10. The green LED on the controller should blink for approximately 20 sec.
11. The output voltage will increase slowly to U1 (float charge voltage).
12. Turn the battery breaker(s) to the “1” (ON) position.
13. Set the battery current limit according to the battery manufacturers requirements.
14. If any alarms are present, they should be reset in accordance with the procedure for the installed controller, ACX or PCC.
15. The system should now be without alarms.
16. Attach all the system covers in their correct places.
17. Check that all changes to drawings, if any, have been completed.
18. Clean the site.
19. Fill in the commissioning record (see end of chapter).

5.5 Test of output voltage

5.5.1 Float charge (U1)

Ensure that the controller is operating.

Connect a load, approx. 50% of total capacity, to the system.

Check the voltage according to the battery manufacturer's requirements. If the batteries require a different float charging voltage, adjust the output voltage from the controller. (See the section for the appropriate controller)

If no change is required, use the following values:

Battery type	Float charge	Boost charge
Open lead-acid batteries	2.23 V/Cell	2.33 V/Cell
Valve regulated lead-acid batteries	2.27 V/Cell	-

Table 5-1 Float/Boost Charge Voltages

5.5.2 Adjustment of Float Charge, U1

Unless otherwise ordered the default output voltage is factory pre-set to 53.5V. The total voltage has to be in accordance to the number of battery cells.

Please verify number of cells and the battery manufacturers requirement.

Adjust the output voltage from the control unit as necessary.

5.5.3 Boost charging (U2) (if applicable)

Open lead-acid batteries.

Automatic boost charging - calculation based on the time the battery voltage has been below certain levels. Automatic activating of boost charging for this calculated time multiplied by a (boost) factor.

Activate boost charging from the "Set/select U1-U4" menu in the controller.

Return to float charge manually by selecting "U1", or automatically after a pre-set time.

VRLA batteries.

Most of the manufactures of valve regulated lead acid batteries **do not recommend** boost charging. If this type of battery is used, the boost function should be disabled.

Boost charging figures

Observe and write down all of the boost charging figures. Parameters to be read/set/adjusted from control unit or PC with PowCom™ installed.

5.6 Battery supervision

For systems with symmetry cables supplied:

Set the number of battery strings according to the number of battery strings in the system. The settings are to be made in the control unit via a PC with PowCom™ installed or directly in the controller (if symmetry failure is indicated).

The symmetry fault alarm can be simulated by pulling out one symmetry cable from the battery string. Measure that setting to make sure that it is in accordance with the battery manufacturer's recommendations.

For systems with temp. probe cable supplied:

Temperature compensation is factory pre-set. Check that the temp. probe is activated and verify that the compensation level is in accordance with the battery manufacturer's requirements. (If no compensation level is available from the battery manufacture, UNIPOWER recommends that it is set to 0.5V).

5.7 Battery test

Settings should be made according to the battery manufacturer's requirements, but as a rule of thumb the following settings can be used for standard VR lead batteries:

No. of test pr. year	=	2
U3 Test	=	1,9 V/cell
End voltage b.test	=	1,94V/cell
Batt. test time	=	40% of expected backup time
Ah limit for test	=	40% of nominal battery capacity

Parameters should be set/adjusted from the controller (Battery test menu) or "Supervision - Set parameters" menu in PowCom™.

5.8 Commissioning record

This is a step-by-step commissioning record for easy commissioning of Power Supply Systems. Do not continue if any faults occur during this commissioning. The checkpoints are to be considered as a minimum for commissioning of the system.

		Checked (✓)	Result
1	Check that the rack is level		
2	Check that all breakers are turned to “off” position and that no rectifiers are mounted in the subrack(s).		
3	Connect AC, and measure voltage on the mains input connections in the cabinet, Is to be 230V AC (Measure 230V from phase to N when 400V mains input is used)		L1-N:.....V AC L2-N:.....V AC L3-N:.....V AC
4	Mount the rest of the rectifiers		
5	After connection of battery, verify right polarity by measuring the voltage drop across the battery breakers (normally not more than 5V DC).		
6	Check float charge, U1, and boost charge, U2. It is to be adjusted according to the battery manufacturers requirements.		U1:.....V DC U2:.....V DC
7	Check temperature compensation. It is to be adjusted according to the battery manufacture requirements. Check temperature read from the controller compared to the ambient temperature.		Comp.:.....V/10°C Read off:.....°C
8	Check symmetry measurement and set number of battery strings according to actual number of supervised battery strings in the system.		Number: Alarm limit:.....
9	Check alarm transmission by running an alarm test.		

Table 5-2 Commissioning Record

6.1 Maintenance

6.1.1 Checking Terminal Connection

The connections on the terminal blocks and circuit breakers must be checked according to the Table 6-1 at least once a year.

TYPE OF CONNECTION	MODEL / DESCRIPTION	TORQUE (Nm)	TORQUE (Inch LB)
0 V Load	AKG 5AWG/16mm ²	2.5	22
0 V Battery	AKG 2AWG/35mm ²	3.5	31
(-) Battery Terminal	Screw M6	4	35
Signals	Phoenix Mini Combicon	0.25	2
AC Input	UK10 / UKLKG10	1.5-1.8	13-16
SPD Terminal	Screw M5	4.5	40

Table 6-1 Connection Torque Setting Check

6.2 Troubleshooting

This troubleshooting chapter helps to determine the cause of the problem and suggests possible repair solutions. If the first step of the recommendation does not solve the problem continue to the next one.



NOTE If the malfunctioning of the system persists, please contact UNIPOWER technical support.

NOTE For a description of Alarms and Messages generated by the system controller see the Alarms/Messages section of the appropriate controller manual:



ACX Advanced: <https://www.unipowerco.com/pdf/acx-man.pdf>
PCC: <https://www.unipowerco.com/pdf/pcc-man.pdf>

By default, alarms are set to be indicated with a red light (higher priority) and messages with a yellow light (lower priority).

Fault	Possible Cause	Suggestion/Solution
Low System Voltage	Module failure. Loss of AC power. Load exceeds module capacity.	Replace faulty module. Verify AC input connection. Add module to system.
High System Voltage	Module failure. System voltage exceeds the set limit.	Replace the faulty module. Check the High Voltage Alarm limit setting.
Mains Error	AC supply OFF on one rectifier in the system with one plugged in rectifier. AC supply OFF on at least two rectifiers in the system with minimum two plugged in rectifiers.	Verify that the AC input breaker is ON. Verify AC input connection.
AC Low Voltage	AC voltage drops below the set limit.	Verify the Low AC voltage limit setting. Verify AC Input connection. Verify AC Input voltage.
AC High Voltage	AC voltage rises above the set limit.	Verify the High AC voltage limit. Verify the AC Input voltage.
Module Failure	Faulty module. AC OFF on a single rectifier (if more than one rectifier is installed). Rectifier current sharing fault. Low DC output voltage, overvoltage shutdown, module fan failure, module is overheated.	Check if module sends alarm flag. Verify the AC voltage to the failed module. Re-insert the faulty module, wait for 30 seconds Replace the faulty module.
Urgent Module Failure	More than one rectifier is reporting Module failure.	See Module failure alarm.
High Load	Faulty module . Rectifier load current exceeds the set High load limit [%].	Compare the load current with installed rectifier capacity. Add a rectifier or reduce load. Verify the High load limit setting. Replace the faulty module.
Overvoltage Shutdown	Faulty module	Re-insert the module, wait for 5 minutes. Replace the faulty module.

Fault	Possible Cause	Suggestion/Solution
Load/Battery Disconnection	<p>System voltage drops below the set limit.</p> <p>System shutdown.</p>	<p>Check the battery condition.</p> <p>Check the AC mains connection.</p> <p>Check the input breaker.</p> <p>Check the rectifier modules.</p>
Communication Failure	<p>Module failure.</p> <p>Modules not installed in the correct position.</p> <p>Broken or disconnected communication wire.</p>	<p>Check the non-communicating address</p> <p>If the rectifier address does not communicate re-install the module and wait for 5 minutes.</p> <p>Verify that the communication cable is properly connected and it is not damaged. Replace if necessary.</p> <p>If the board address does not communicate, check if it is installed in the system. If it is, replace the board.</p> <p>If there is a non-communicating module or unit, remove the non-communicating address from the controller (Accept removed parts). Do so only if you are sure you do not use them any more.</p> <p>Verify, if the controller is operating properly. If not, replace the controller.</p>
Distribution Fuse Failure	<p>Tripped load breaker / blown load fuse.</p>	<p>Verify there is no short circuit in load cabling.</p> <p>Reset the breaker, if it trips again, there is a problem with the load or a breaker itself.</p> <p>Replace the breaker / fuse if necessary.</p>

Fault	Possible Cause	Suggestion/Solution
Battery Fuse Failure	Tripped load breaker / blown load fuse	<p>Verify there is no short circuit in load or battery cabling.</p> <p>Verify the breaker / fuse is correctly rated.</p> <p>Reset the breaker, if it trips again, there is a problem with the load or battery or a breaker itself.</p> <p>Replace the breaker / fuse if necessary.</p>
Symmetry Fault	<p>Battery at end of life.</p> <p>Wrong symmetry cable connection.</p> <p>Wrongly set Symmetry limit value.</p>	<p>Verify the battery condition.</p> <p>Verify the symmetry cable connection.</p> <p>Verify the Symmetry limit value.</p>
Low Battery Temperature	Battery temperature drops below the set Low battery temperature limit.	<p>Check the heating of the system.</p> <p>Check the ambient temperature (it should not be lower than recommended battery temperature).</p>
high Battery Temperature	Battery temperature exceeded the set limit.	<p>Check the cooling or ventilation.</p> <p>Verify the battery condition.</p> <p>Check the Battery Current Limit.</p>
Temp. Probe Failure	<p>The temperature probe is not properly connected to the system.</p> <p>Faulty temperature probe.</p> <p>Temperature probe wire is interrupted.</p> <p>Temperature difference between the controller temperature and the probe temperature is greater than 60°C.</p>	<p>Verify the temperature probe connection.</p> <p>Verify the internal / external temperature via controller front panel.</p> <p>Replace the faulty probe with a new one.</p> <p>Identify the root cause of the hot environment at the batteries and/or controller.</p>
Alarms Blocked (only with LCD display)	Alarm is manually activated by the serviceman on the site (used during system servicing, no other alarm is displayed)	Needs to be manually turned OFF to allow the alarms to be displayed

If none of the above solves the problem please contact customer support, see section 1.4.

7.1 Controller Replacement

A faulty Controller can be easily replaced with a new one:

1. Loosen the front screw in the top left corner of the controller front panel using a flat screwdriver, see Figure 7-1.

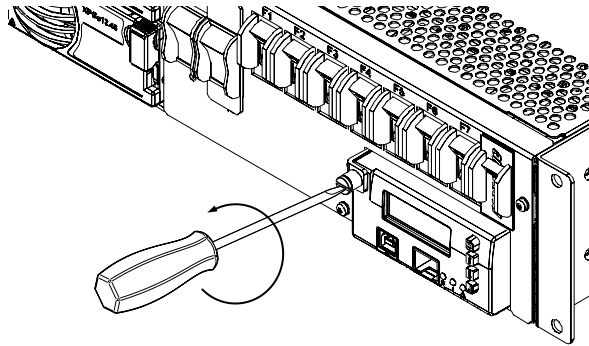


Figure 7-1 Unlocking the Controller

2. Pull the controller out of the shelf as shown in Figure 7-2.

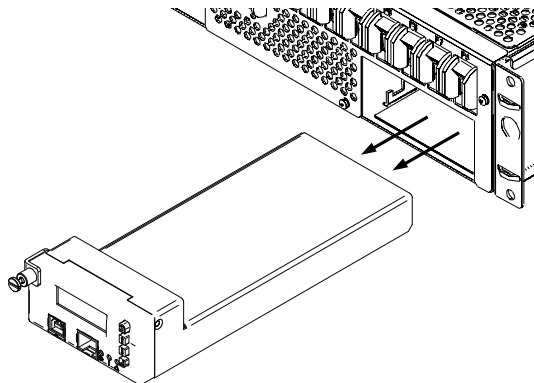


Figure 7-2 Removing the Controller

3. Reverse the process to insert the new controller into the empty slot and fasten the screw.



CAUTION After controller start-up, verify if the appropriate configuration file is uploaded to the controller. If necessary refer to the [PowCom™ User Guide](#).

7.2 Rectifier Replacement



NOTE Rectifiers can be hot-swapped.

7.2.1 XR04.48 / XR08.48 Replacement

To replace an XR04.48 or XR08.48 rectifier, follow the steps below:

1. Loosen the screw on the rectifier front panel using a screwdriver, Figure 7-3 (1).
2. Push the release spring to the right and at the same time pull the handle to remove the rectifier from the slot, Figure 7-3 (2).
3. Replace the module and fasten the screw.

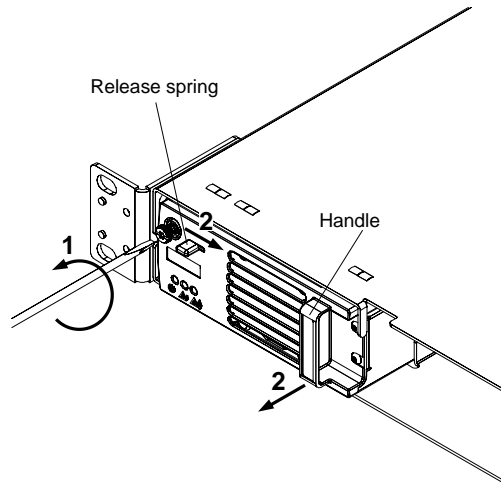


Figure 7-3 Replacing an XR04.48 or XR08.48 Rectifier

7.2.2 XPGe12.48 Replacement

1. Insert a flat screwdriver into the rectangular opening next to the left handle to unlock it, Figure 6-4 (1).
2. Once unlocked, pull both handles down and remove the rectifier from the slot, Figure 6-4 (2).
3. Replace rectifier. Make sure that the rectifier handle is in OPEN position (forms 35-40° angle with rectifier body) before XPGe12.48 is fully inserted in the slot.
4. Push both handles upwards until the left handle locks the rectifier into the correct position.

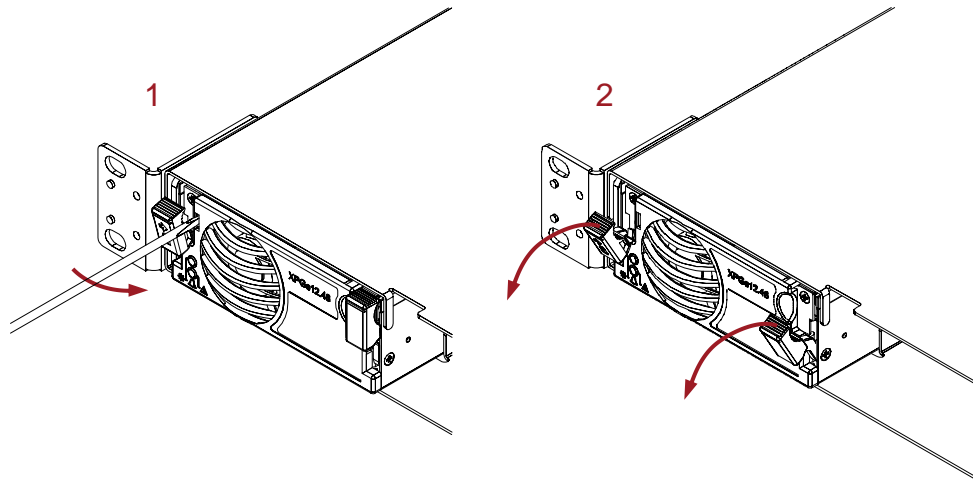


Figure 7-4 Replacing an XPGe12.48 Rectifier

7.3 Battery and Load Breakers Replacement



WARNING Make sure the system is switched OFF.

The power rack is designed front accessible for easy maintenance. Battery and load breakers can be replaced without removing the power rack from the cabinet.

This section describes how to replace faulty breakers.

1. Unscrew the three retaining screws and then remove the front and the top covers see Figure 7-5 and Figure 7-6.

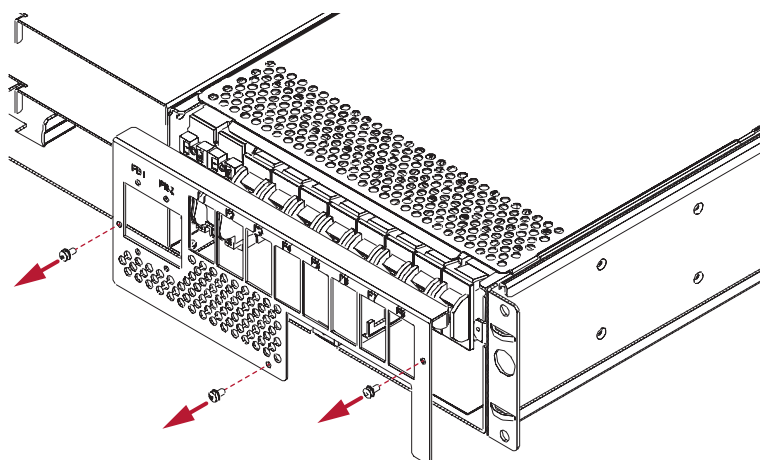


Figure 7-5 Removing the front panel

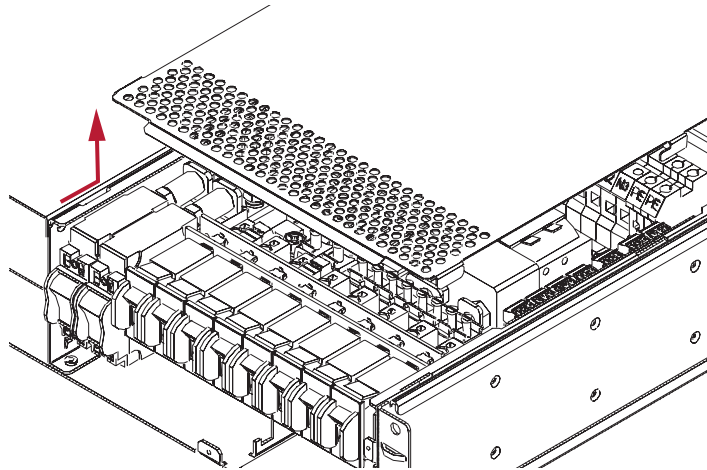


Figure 7-6 Removing the top cover

2. Pull out the faulty breakers Figure 7-7.

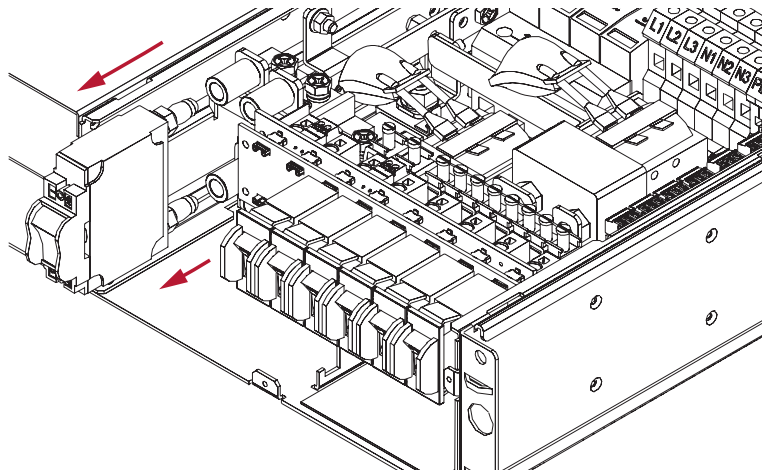


Figure 7-7 Pulling out a faulty breaker

3. Install the correct breakers, front panel and the top cover.

7.4 Surge Protection Device Replacement

This section describes how to replace a faulty surge protection module.

1. Switch off AC input power.
2. Remove the top cover.
3. Pull out the failed surge protection module.
4. Insert a new surge protection module into the corresponding position.
5. Reinstall the top cover.
6. Switch on AC input power.

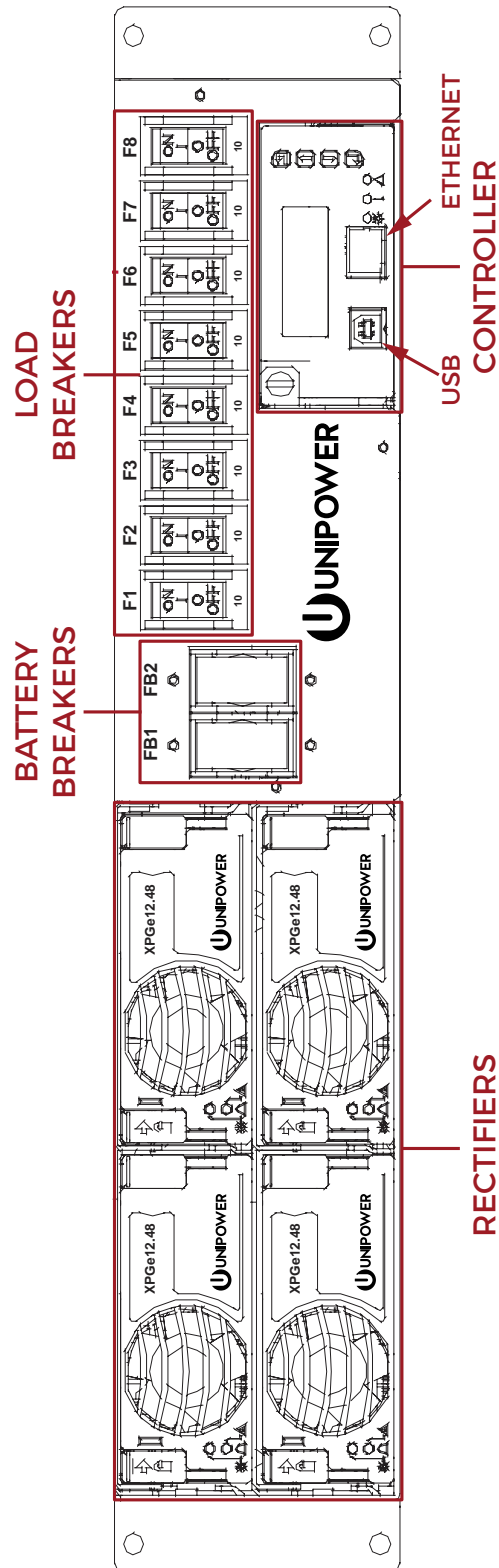
7.5 Other Requirements

Verify at least once a year if the output voltage is within acceptable limits. The result of the test should be recorded and filed to see any deviations.

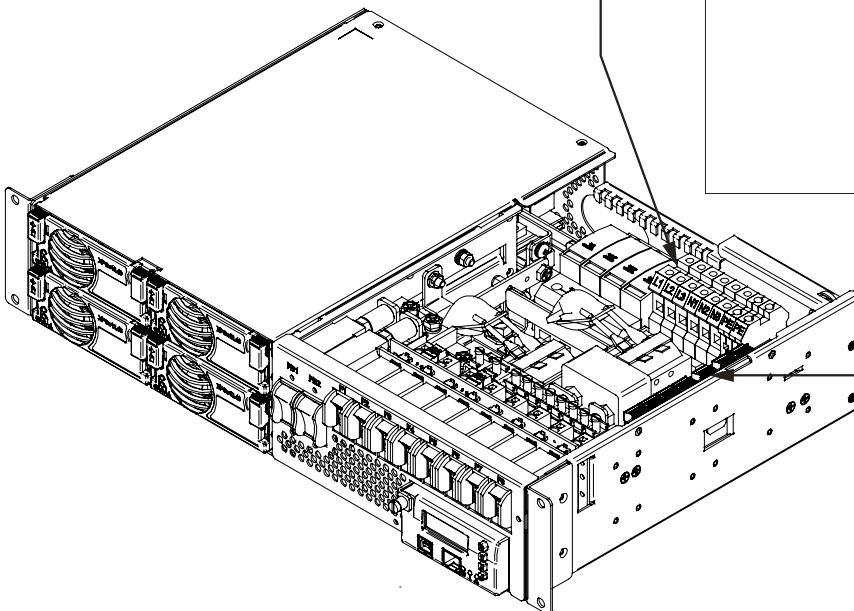
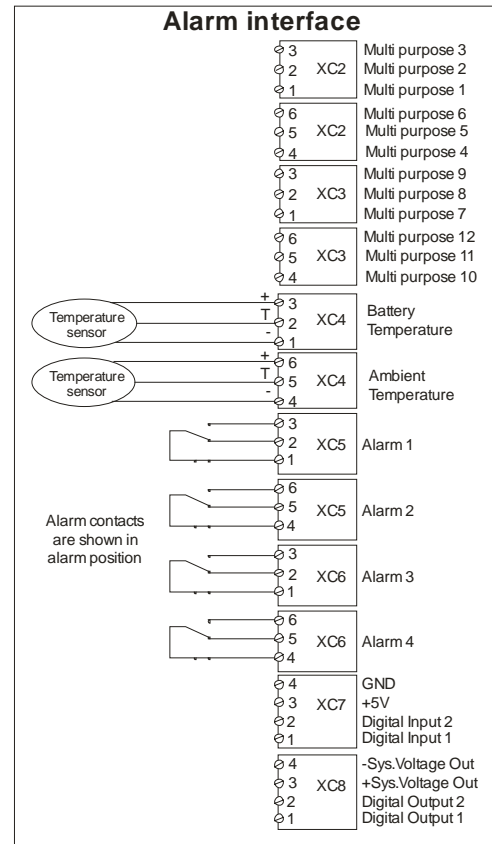
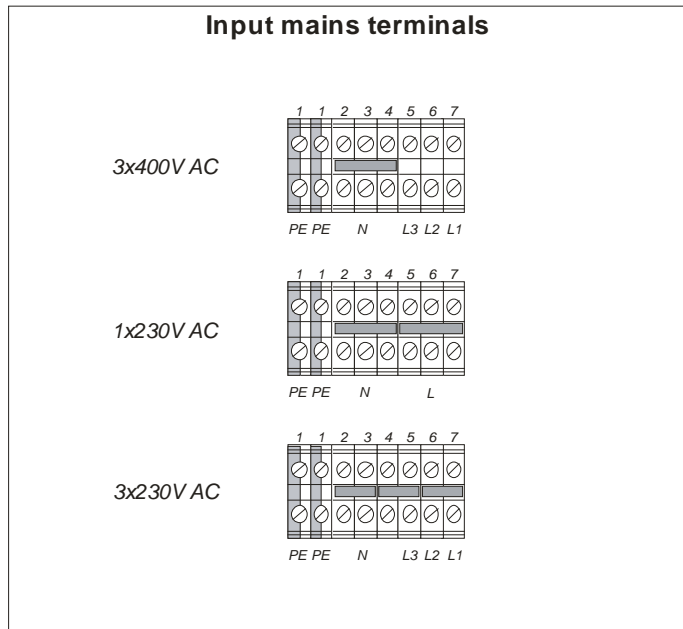
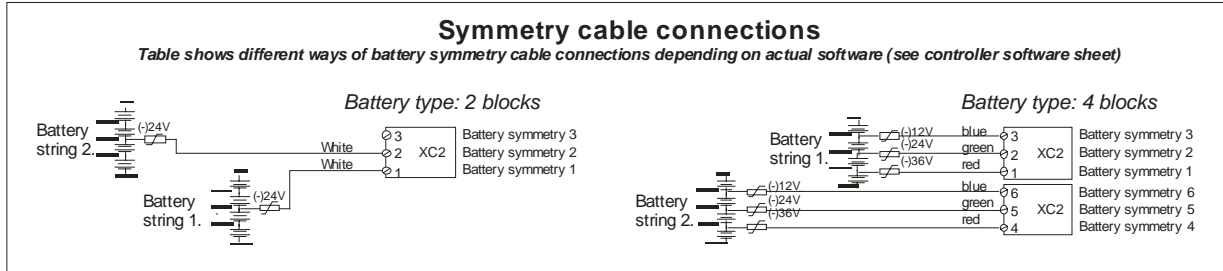
The Power system requires periodic inspections and routine cleaning. It is very important to keep all areas and components of the system free from dust or other unwanted objects to ensure free air circulation and safe operation of the system,

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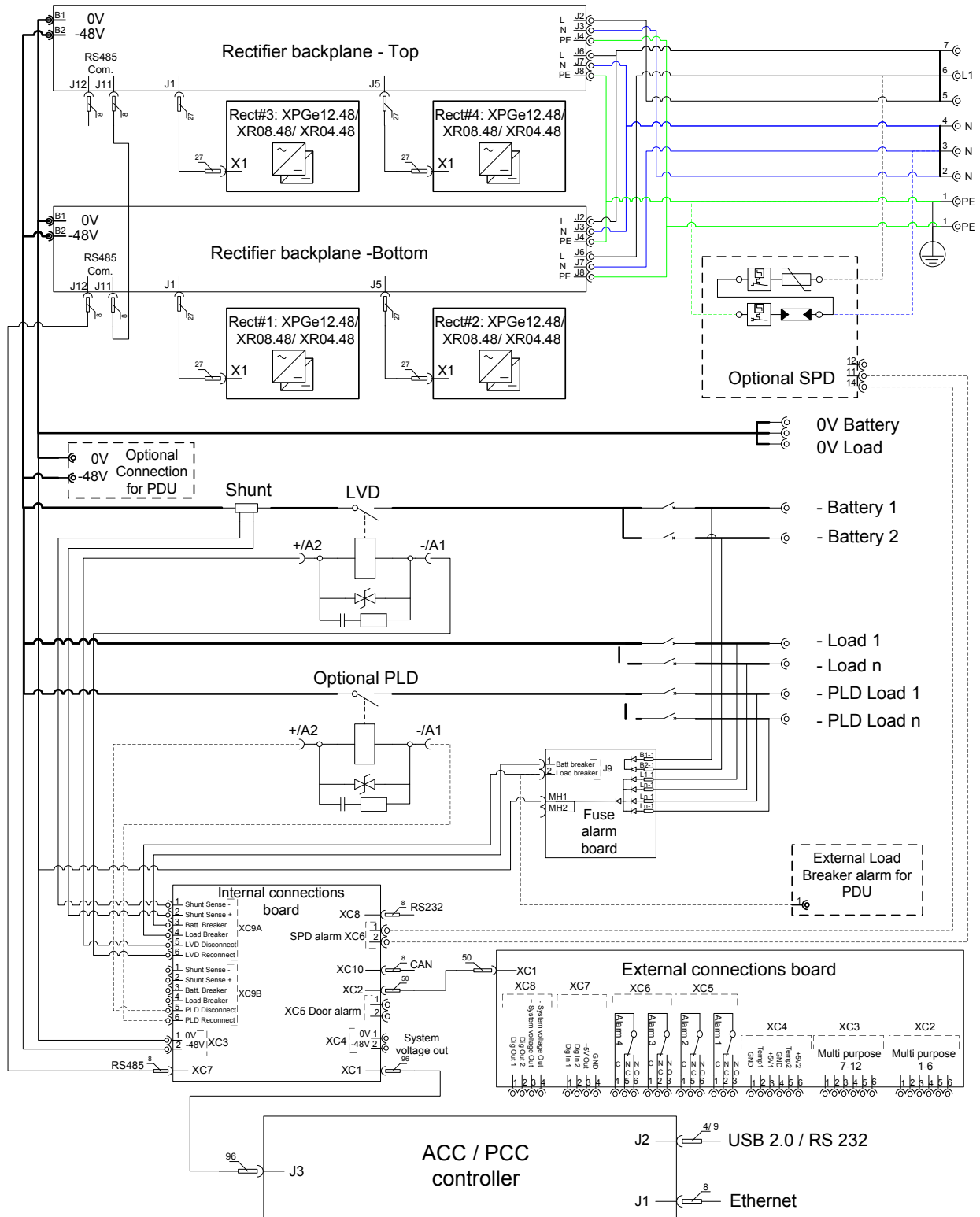
Front View Layout Description



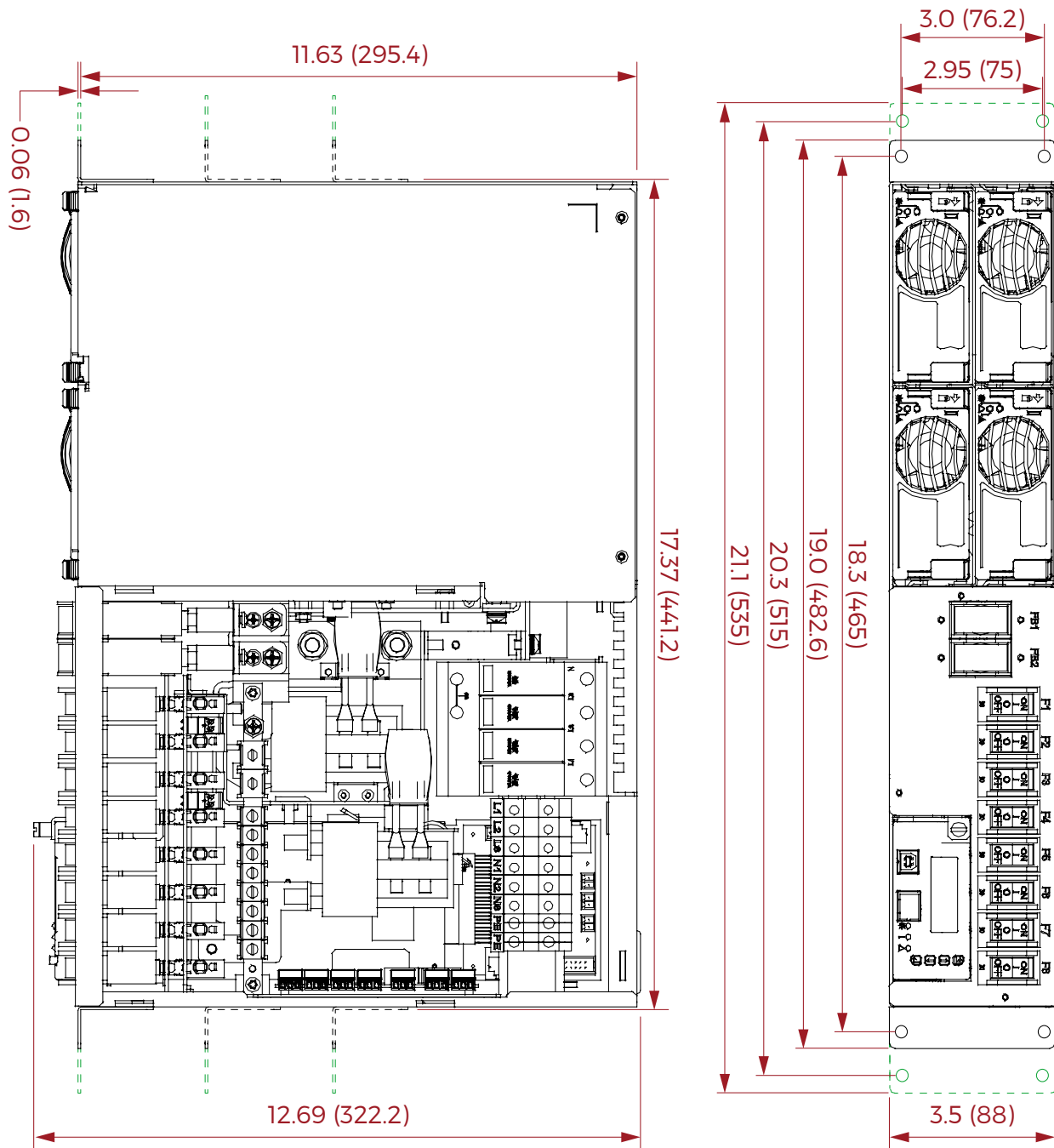
Installation Details - Connections



Block Diagram

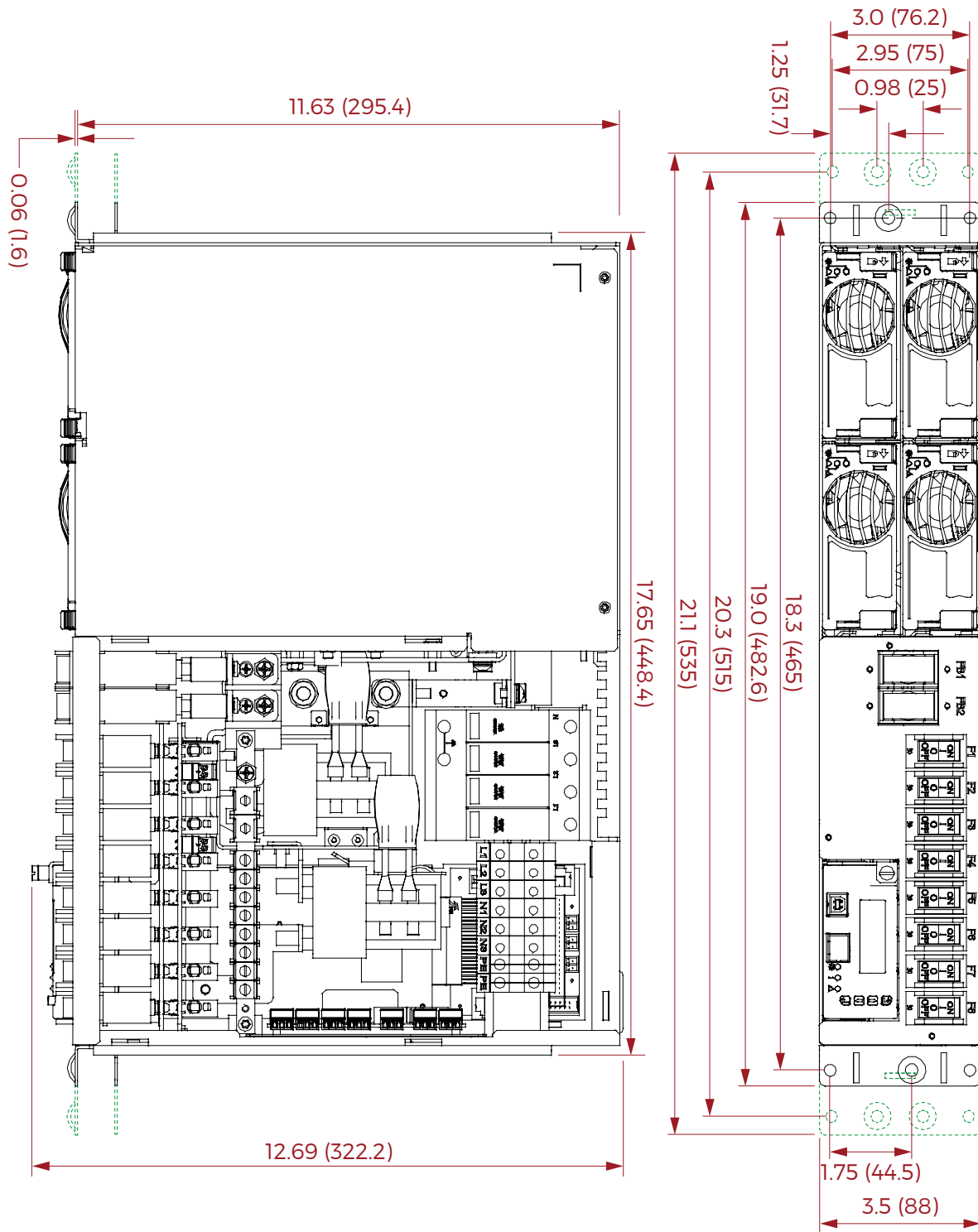


Detailed Dimensions - Fixed Bracket Option



Note: ETSI mounting details are shown in green.

Detailed Dimensions - Slide Bracket Option



Note: ETSI mounting details are shown in green.