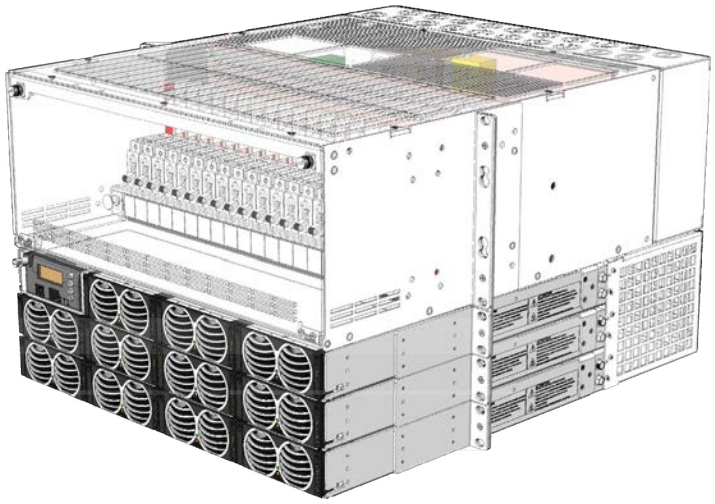
Power Supply System
Guardian Access M38
Instruction Manual



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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	Abbreviation	Description
ACX	Advance Controller Extended	MC	Main Cabinet
ACD	AC Distribution	MCCB	Molded Case Circuit Breaker
DC	Distribution Cabinet	MCB	Miniature Circuit Breaker
EC	Extension Cabinet	PBC	Battery Cabinet
FMP	Fan-cooled Modular Power Rectifier	PBDU	Battery Distribution Unit
GDN	Guardian system	PCC	Prime Controller Card
Genset	Diesel Generator	PDU	Power Distribution Unit
LVD	Low voltage disconnection	PLD	Partial Load Disconnection

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

This chapter contains an overview of the system and a short description of the units in the system.

The Guardian Access M38 is a 5-7RU high 19” rack-mounted, integrated DC power system providing an output of -48VDC.

This highly configurable system incorporates 1 to 3 rectifier shelves with up to 11 Guardian family high efficiency hot-swap rectifiers.

A maximum total current of 600A (N+1) is available. This may be shared between the load and battery charge current, the latter being programmable via the controller. The rectifiers are internally fan cooled with speed control which is a function of load and temperature, keeping acoustic noise to a minimum.

DC distribution can accommodate up to 20 pluggable breakers. 4 or 8 of these in each case may be connected to the bus via the Low Voltage Battery Disconnect (LVBD).

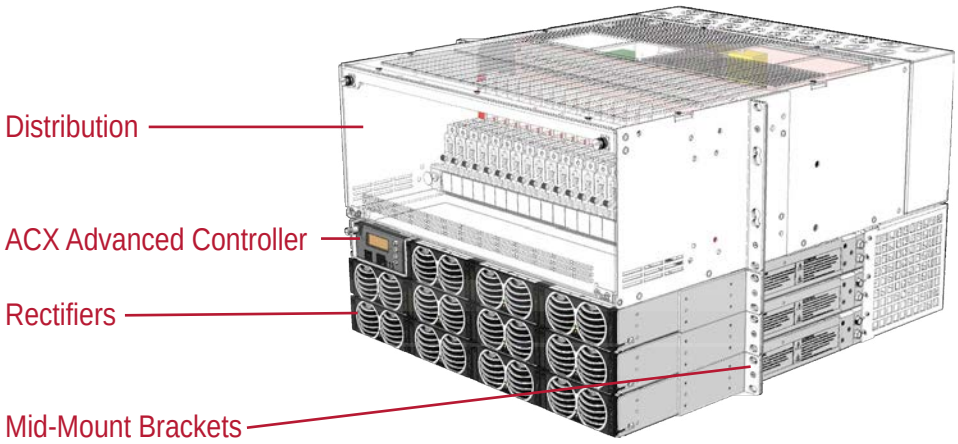


Figure 2-1 Power System Overview

2.2 Principal of Operation

The Guardian Access M38 is capable of delivering up to 29kW steady state power to the combined load and batteries. The maximum current available is 600A. The system is based on hot-swappable 48V rectifier modules which are working in parallel with automatic load sharing.

The power system is normally configured with N+1 redundancy, with N as the number of rectifier modules necessary for feeding the load and charging the battery and 1 as the redundant rectifier module. In normal operation the rectifier modules are used to feed the load and simultaneously maintain any connected batteries in a fully charged state.

Once the mains input power has failed, the rectifiers are shut down and the batteries feed the load immediately. If the battery voltage drops below a preset level, the LVBD circuit disconnects the batteries automatically to prevent over-discharge and prolonging battery life. When the mains input power is restored, the rectifiers will start up automatically to feed the load, close the LVBD circuit, and recharge the batteries.

System performance is supervised and controlled by the ACX Advanced controller. The DC output voltage, alarm thresholds, LBVD circuit operation, temperature compensated battery charging can be set by the controller. Any malfunction will be indicated by LED, text in the display and operation of dry contacts.

However, the system controller is not a single point of failure. In the event of controller malfunction, basic tasks like feeding the load and charging batteries will be maintained by the rectifier modules directly at preset default values.

The alarm and threshold settings of the power system can be set either through the buttons and operation menu on the local controller, or remotely through the PowCom™ supervision software.

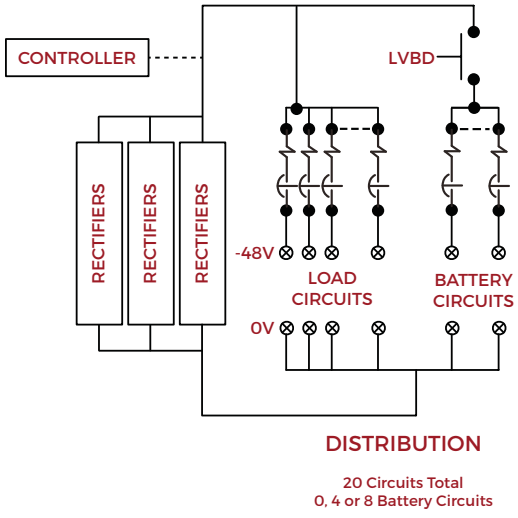


Figure 2-2 Principal of Operation

2.3 System Parameters

OUTPUT	
Power (max)	29kW (N+1) = 31.9kW
Output Current (max)	Load: 600A | Battery: 600A (discharge), 100A (charge)
Voltage	46-57VDC

INPUT	
Voltage	1-phase 230/240VAC (L-N-PE) 2-phase 240VAC (L1-L2-PE) 3-phase (3-wire) - 190/200/208/216/220/240VAC (L1-L2-PE / L2-L3-PE / L3-L1-PE) 3-phase (4-wire) - 200/210/220/230/240VAC (L1-N-PE / L2-N-PE / L3-N-PE)
Frequency	47-63Hz
Input Current	17.2A max. @ 180-240VAC per rectifier
Power factor	>0.98

DC DISTRIBUTION & BATTERY MANAGEMENT	
Load Circuits Up to 20	Breakers - Pluggable - 3A to 100A single pos., 125 to 200A two pos. TPS Fuses - Pluggable module provides 1 fused load circuit using 1 position - 3A to 70A available
Battery Circuits 0, 4 or 8	Pluggable bullet type - 100A one position, 125A two position or 200A two position
Programmable LVBD	1 x 600A Programmable
Temperature Compensation	Programmable

MONITORING AND CONTROL	
Controller	ACX Advanced
Local Interface	4 x 20’ LCD, 4-key menu, USB 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 0-60VDC)
Alarm Outputs	10 x potential free relays (C, NC, NO)
Digital Inputs	2 x, Logic 0: U<10VDC, Logic 1: U>12VDC
Digital Outputs	2 x, open collector type
Temperature measurement	2 x Temperature probe (Battery, Ambient)

CONNECTIONS	
Battery	2-hole, 1/4”-20 on 5/8” C-C
Load	2-hole, 1/4”-20 on 5/8” C-C
AC Input	Max. 10AWG/5.25mm^2, screw type connector, L/N or L1/L2 per rectifier position
Alarms / Signals	Max. 14AWG/1.5mm^2, screw type connector

MECHANICAL

Dimensions (W x H x D)	19” (483mm) x 12.25” (312mm) x 21.6” (553mm)
Weight of the system (fully equipped)	137lbs (62kg)
Mounting Options	19” / Mid-mount
Cable Entry	Top Access

STANDARD COMPLIANCE / ENVIRONMENTAL

EMC and Immunity	EN 300 386 ; EN61000-6-3 (Emission) ; EN61000-6-2 (Immunity)
Safety	UL 60950-1, 2nd Edition, 2019-05-09 CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10
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 +55°C
Storage Temperature	-40°C to +85°C

RECTIFIER MODULE - FMPe30.48J

Efficiency (max)	96.2%
Input Current (max)	<18.5A
Output Current (53.5V float)	62.5 @ 48V | 56.1A @ 53.5V
Output Power	3000W @ >185VAC 1720W @ 90-185VAC
Operating Temperature	55°C (without derating)
Input Voltage	85-300VAC (Nominal 100-240VAC)
Output Voltage	44-57.6VDC
Load sharing	< 5% of nominal current
Dimensions (HxWxD)	1.6 (41) x 4.2 (107) x 14 (355) ”(mm)
Weight	4.6lbs / 2.1kg
Cooling	Fan-cooled, speed controlled
Protection	Short circuit, automatic current/power limiting, input/output overvoltage, thermal
Alarms	Fan failure, Short circuit/arcing protection, High temperature/output voltage Low output voltage, Input voltage out of range Low fan speed (warning) Internal communication failure
LED Indication	**Green:** AC normal operation **Yellow:** Steady - Low fan speed, High temperature Flashing - Communications failure **Red:** Module alarm / shutdown
Audible noise	<45dBA @ ≤25°C (50% load) | <60dBA (100% load)

2.4 System Components

With the exception of the rectifier modules the M38 system is delivered with all components mounted according to the ordered configuration. The main components are described below and in later chapters of this manual.

2.4.1 System Controller

The M38 power system is controlled by the ACX Advanced. The description and operation of this controller is covered in a separate manual which is available at:

https://www.unipowerco.com/pdf/acx-man.pdf

2.4.2 Distribution Unit

The distribution unit includes configurable load breakers, battery breakers, a shunt for battery current measurement, fuse alarms for load & battery breakers and a Low Voltage Battery Disconnect.

2.4.2.1 Low Voltage Battery Disconnect (LVBD)

Generally, the system is equipped with low voltage battery disconnection, which prevents the batteries from deep discharging, thus prolonging the battery life. A disconnection requires a detected mains failure at the supervision unit.

If disconnection occurs, the batteries will not supply power to the load until they have been recharged to set voltage level, which can be adjusted by the user.

If disconnection occurs, the batteries will be reconnected when mains supply returns.

2.4.3 Rectifier Module

The fan-cooled rectifier converts the AC input to -48VDC output for loads and batteries. It is designed for parallel operation and plug-in installation in the power shelf and supplies extremely stable DC power.

Each rectifier incorporates an internal microprocessor that sends frequent updates to the system controller and adjacent rectifiers. This ensures accurately controlled load sharing among rectifiers and supplies status and identification information to the controller.

The rectifier module features two LEDs for status indication, thermal protection with power derating, and input over voltage disconnection with automatic reset. The rectifier module is hot-swappable and can be quickly removed and replaced without disrupting the system or load.

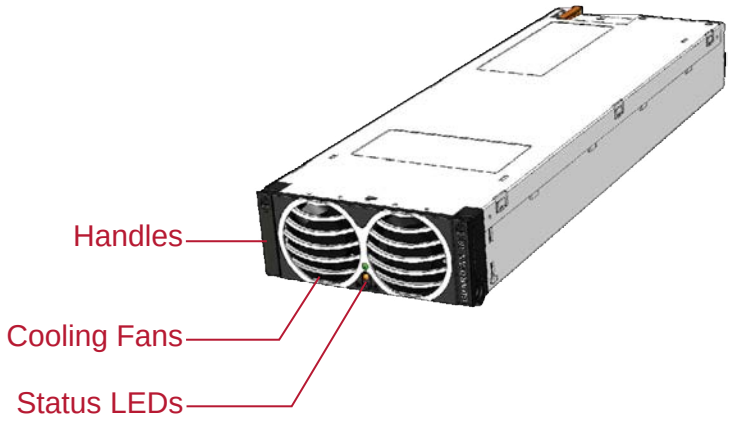


Figure 2-3 Guardian Rectifier

The power system is normally configured with N+1 redundancy, with N as the number of rectifier modules necessary for feeding the load and charging the battery and 1 as the redundant rectifier module. In normal operation the rectifier modules are feeding the load and simultaneously maintaining the batteries in a fully charged state.

2.4.4 Rectifier Shelf

The rectifier shelf is used for interconnecting the rectifier modules. Each rectifier shelf has four module positions except the first slot in the first shelf which contains the controller. Module #1 will not appear in the system asset inventory. Module position are numbered from the left to right as viewed from the front.

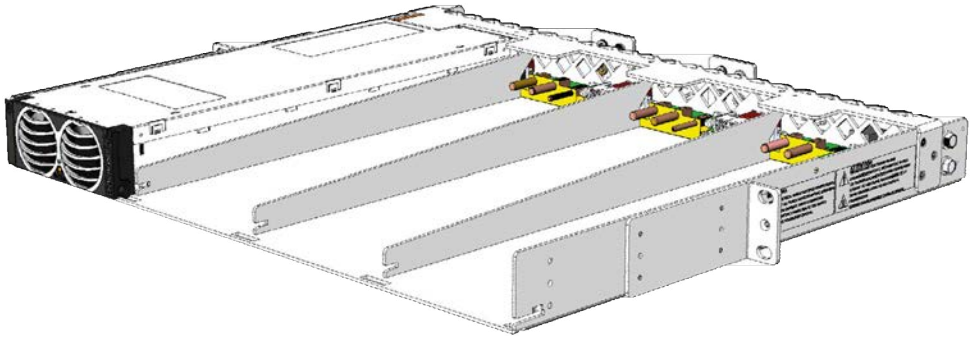


Figure 2-4 Guardian Rectifier Shelf

NOTE The rectifier shelves are numbered from top to bottom. The module position is numbered from the left to right viewed from the front.

NOTE The top shelf always has the ACX Advanced controller installed in the left-hand position.

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 and system ratings. The label is located on the outside wall of 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 polarity and voltage levels with a mulitmeter 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.

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.

WARNING Always follow manufacturer procedures for spill containment and neutralization in case of acid release. Be sure to provide adequate ventilation, hydrogen gas may be given off during neutralization.

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 traceability, 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

Maximum 55°C operating ambient:

Up to 200A CB maximum load must not exceed 80% of it's rating.

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

WARNING There are potential hazards related to installing this power system. It is important to carefully read and understand the contents of the Safety chapter before performing system installation.

CAUTION Make sure sufficient room is left around the system to enable optimal air circulation and thus prevent the system from overheating. Keep vent openings from blocking.

The following information should be read before attempting to install the Power System.

4.1 Preparation

4.1.1 Installation Overview

The following is the recommended sequence for the installation procedures. The sequence may change according to job or actual configuration.

- Unpack and check that all the equipment and materials have been delivered.
- Obtain the recommended tools.
- Check the connecting cable size.
- Mount the power system sub-rack to a cabinet or an open frame.
- Remove the top cover and knockouts for cable entry.
- Connect the earth grounding cable.
- Connect the AC input power.
- Connect the loads to the Distribution Unit as required.
- Connect the battery cables between power system and batteries.
- Connect the external alarm, symmetry cable and temperature sensor cable as required.
- Insert the rectifiers into the rectifier frame.
- Reinstall the top cover.

4.1.2 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.

4.1.3 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 screwdrivers etc. 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.

4.1.4 Cable Size

Please use the recommended cable size given below for the system installation.

Port	Current Max.	Cable Size Min.(AWG)	Cable Size Min.(mm²)	Recommended Lug	Temperature Rating
AC Input -L1	17.2A	10 AWG	6mm²		90°C
AC Input -N/L2	17.2A	10 AWG	6mm²		90°C
AC Input -PE	-	10 AWG	6mm²		90°C
Battery / DC Load	200A	00 AWG	70mm²	LCC2/0-14AW-X	90°C
Battery / DC Load	150A	1 AWG	50mm²	LCC1-14AW-E	90°C
Battery / DC Load	125A	1 AWG	50mm²	LCC1-14AW-E	90°C
Battery / DC Load	100A	4 AWG	25mm²	LCC4-14AW-L	90°C
Battery / DC Load	80A	6 AWG	16mm²	LCC6-14AW-L	90°C
DC Load	70A	6 AWG	16mm²	LCC6-14AW-L	90°C
DC Load	60A	6 AWG	16mm²	LCC6-14AW-L	90°C
DC Load	50A	6 AWG	16mm²	LCC6-14AW-L	90°C
DC Load	40A	8 AWG	10mm²	LCC8-14AW-L	90°C
DC Load	30A	10 AWG	6mm²	LCC10-14AW-L	90°C
DC Load	25A	10 AWG	6mm²	LCC10-14AW-L	90°C
DC Load	20A	12 AWG	4mm²	LCC10-14AW-L	90°C
DC Load	15A or less	14 AWG	2.5mm²	LCC10-14AW-L	90°C

Table 4-1 Recommended Electrical Cable Size

NOTE This table is only to be used as a guide. Always consult local electric codes for proper wire sizing.

4.2 Mounting in a Relay Rack

There are two mounting brackets installed on the left and right side of the power system to enable you to securely fasten the sub-rack to an open frame relay rack.

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

WARNING Due to the overall weight of the system chassis it will be necessary to provide adequate support whilst the installation procedure is being carried out.

To mount the system, follow the steps below:

1. Determine the installation position according to system measurement. Refer to Appendix A for details.
2. Place the system into the open frame.
3. Fasten the system to the open frame by using 16 12-24 x ½" screws and the mounting brackets. Tighten the screws to 6 Nm.

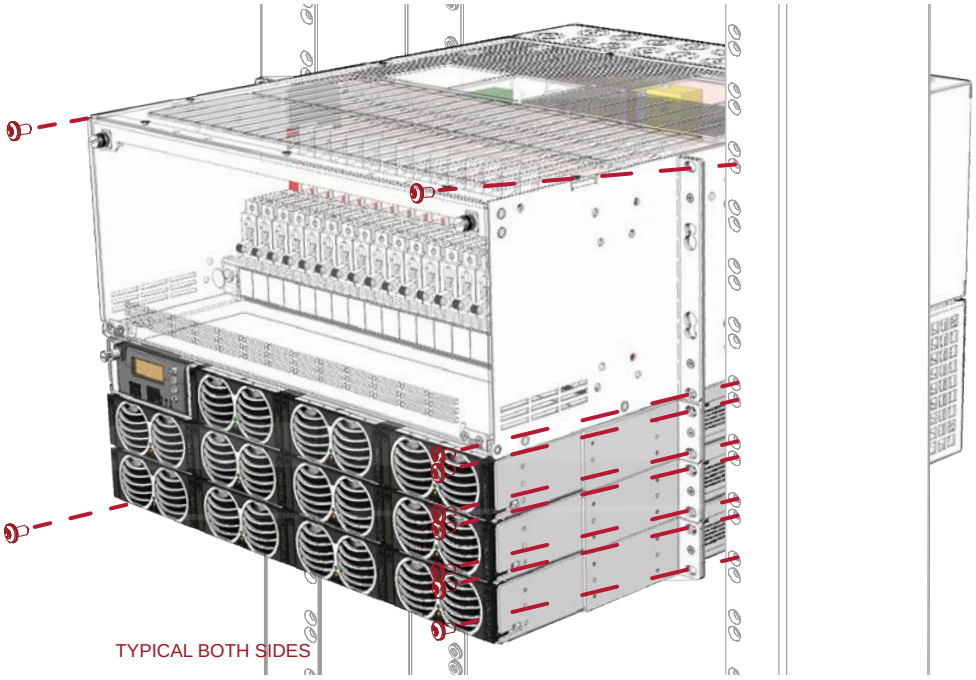


Figure 4-1 System Mounting

4.3 Cable & Bus Bar Entry

All connections to the system are made from the top. AC cables enter through a conduit plate at the top rear. All signal cables, DC output power cables and battery cables enter through knock-out entry ports in the plastic cover that is installed over the remaining area of the top surface.

To allow access to the various connection points the top plastic cover and rear cover plate will need to be removed.

4.3.1 Removing Covers

1. Remove the plastic top cover by loosening the nine screws, as shown in figure 4-2.

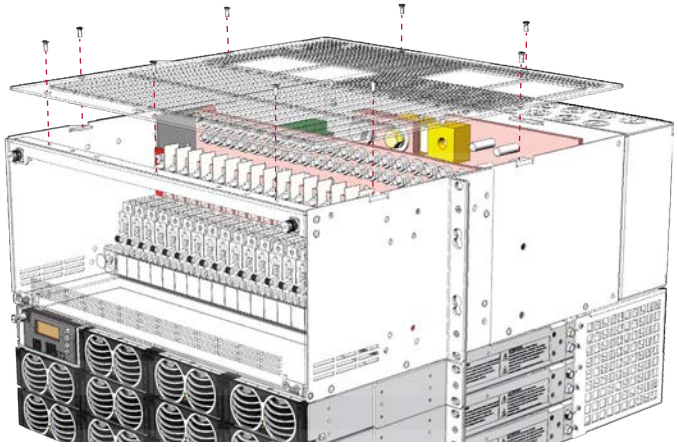


Figure 4-2 Remove Top Cover

2. Remove the rear cover by loosening the four screws, two each side.

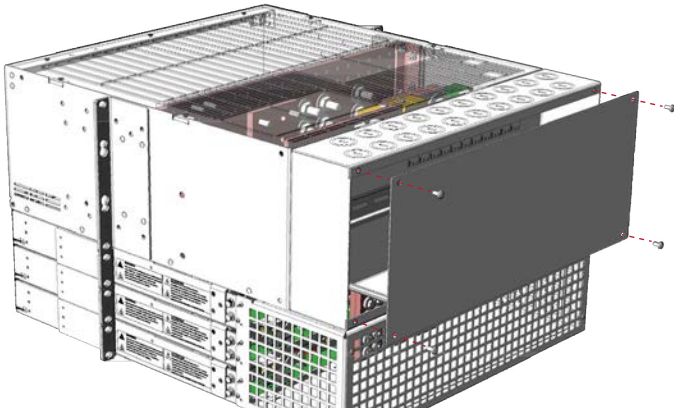


Figure 4-3 Remove Rear Cover

4.3.2 Cable Entry Openings

The top plastic cover is designed with several knockouts for signal and alarm cable entry, grounding cable entry and DC Power cable entry.

The top rear plate is designed with a total of 18 knockouts for AC cable entry.

When connecting and routing the AC cable, first remove the knockouts, then install the cable glands to fix the AC cables.

4.4 Connecting Grounding Cable

An Earth grounding connection is essential before connecting the AC supply.

The grounding point for the system, located in the rear left hand wall in the vicinity of the AC input terminal blocks, consists of two 7/16” diameter holes on a 1” center spacing. These can be used to attach a suitable cable with nuts & bolt, either internally or externally.

1. Switch off all breakers on the distribution panel.
2. Connect an insulated cable, terminated with a two hole lug and with a cross-sectional area of 16mm² (5AWG), between the earth connection point of the system and the Main Earth Terminal (MET).

NOTE Suitable lugs include Panduit LCCF4-38D-L or equivalent.

3. Tighten the cable connection to a torque of 8 Nm.

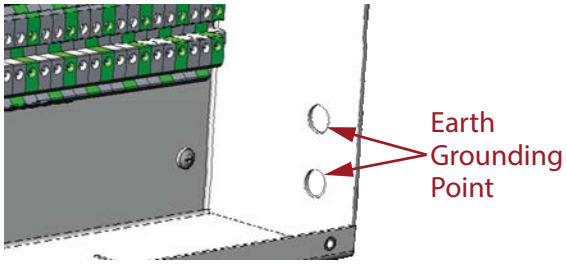


Figure 4-4 Earth Grounding Connection

4.5 AC Input Connection

Each rectifier position in the system is separately supplied with AC power via it's own AC input terminal block. Individual rectifiers operate at a nominal 230VAC, so this arrangement allows for the system to be connected to any AC source where 230/240VAC is present between Line and Neutral or separate phases.

This section shows how to make connections according to the phase configuration present at the installation site.

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

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

WARNING Only a qualified electrician may carry out the mains installation.

CAUTION Depending on deployment region with regards to lightning strikes and heavy inductive energy, it is highly recommended to install AC Surge Protection, Type II, at the distribution panel.

WARNING 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.

1. Strip the AC input cable conductors to the correct length for connection to the terminals.
2. Route the AC input cable through the AC cable entry gland, connect the PE, L1 & N/L2 cables to the terminals as shown in figures 4-5 and 4-6, and tighten the screws to 1.5-1.8Nm.
3. The mains input terminal block provides connection for individual rectifier positions and can be connected to:
   - 1-phase L+N+PE (Figure 4-5)
   - 2-phase L1+L2+PE (Figure 4-6)

NOTE Wire colors may vary depending on country. Follow local codes for all connections.

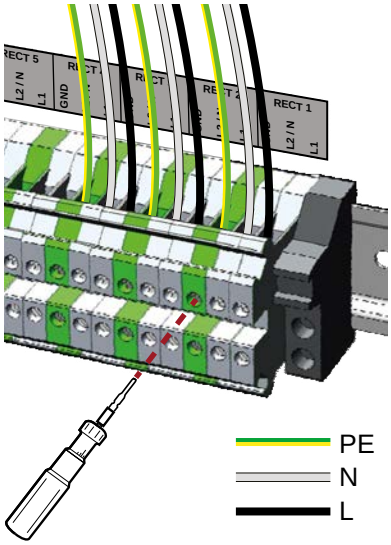


Figure 4-5 AC Cable Connection (1-phase - L+N+PE)

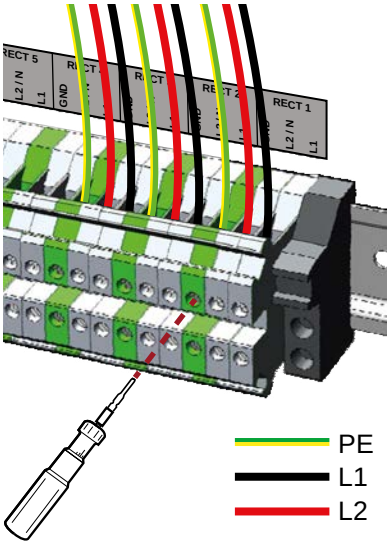


Figure 4-6 AC Cable Connection (2-phase - L1+L2+PE)

CAUTION The recommended breakers indicated below are only given as guidance; always follow local electric code when sizing breakers and wiring.

NOTE Recommended mains breaker for operation at nominal voltages of 208V, 230V, 240V:

FMPe30.48G	FMPe20.48G
1-phase operation: UL Listed, 1-pole, 20A	1-phase operation: UL Listed, 1-pole, 15A
2-phase operation: UL Listed, 2-pole, 20A	2-phase operation: UL Listed, 2-pole, 15A

CAUTION Consult UNIPOWER Field Service for guidance on operation of other rectifier models or operation at other voltage levels outside of the rectifiers nominal operating range.

CAUTION When connecting the system for 3-phase operation, always make sure that the rectifiers are connected in groups of 3 to ensure that the load on the AC supply is as balanced as possible. Connections for rectifiers are either L+N or L+L single input; 3-phase connections can be facilitated at the customer panel, or at the system by qualified personnel and assisted by Applications Engineering. 3-phase connections and breakers connecting multiple rectifiers together remove rectifier redundancy and are not recommended.

4.6 DC Load and Battery Connection

This section details how to make load and battery connections. Use suitably sized cables with appropriate termination lugs according to Table 4-1 on page 23.

Check that all the MCBs are in the OFF position.

NOTE Remember to feed the cables through the appropriate knock-outs in the plastic top cover, otherwise it will not be possible to refit this once all connections have been made.

4.6.1 DC Load Cable Connection

1. Connect the negative (-) DC supply cable to the appropriate -48V Feeds DC distribution MCB bus bar. Make sure that the cable has the correct rating for the selected MCB. Tighten the cable connection to a torque of 8 Nm. See Figures 4-11 and 4-12 on page 31.
2. Connect the positive (+) DC supply cable directly to the 0V Returns bus bar. Start connecting the loads to the bus bar from the first position on the left. Make sure, the cable is the correct rating for the load. Tighten the cable connection to a torque of 8 Nm. See Figures 4-11 and 4-12 on page 31.

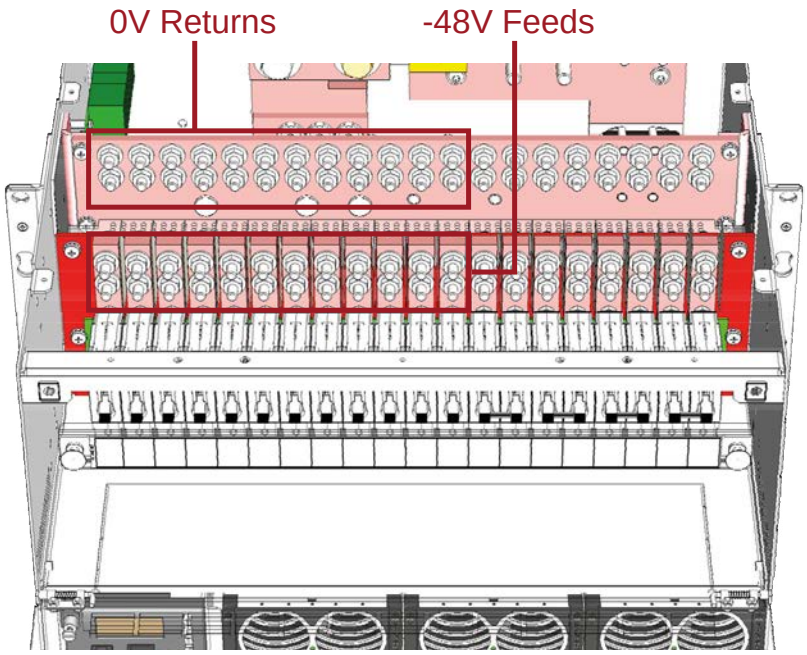


Figure 4-7 DC Load Connection (8 battery circuit configuration shown)

4.6.2 Battery Cable Connection (systems with battery breakers)

1. Check that all the battery MCBs are in the OFF position.
2. Connect the "+" cable of each battery string to the 0V Returns bus bar of the system. Tighten the cable connection to a torque of 8 Nm. See Figures 4-11 and 4-12.
3. Connect the "-"cable of each battery string to the relevant -48V Battery circuit bus bar. Tighten the cable connection to a torque of 8 Nm. See Figures 4-11 and 4-12.
4. Connect the other ends of the battery cables to the "-"and "+" terminals of the batteries as described in section 4.7.

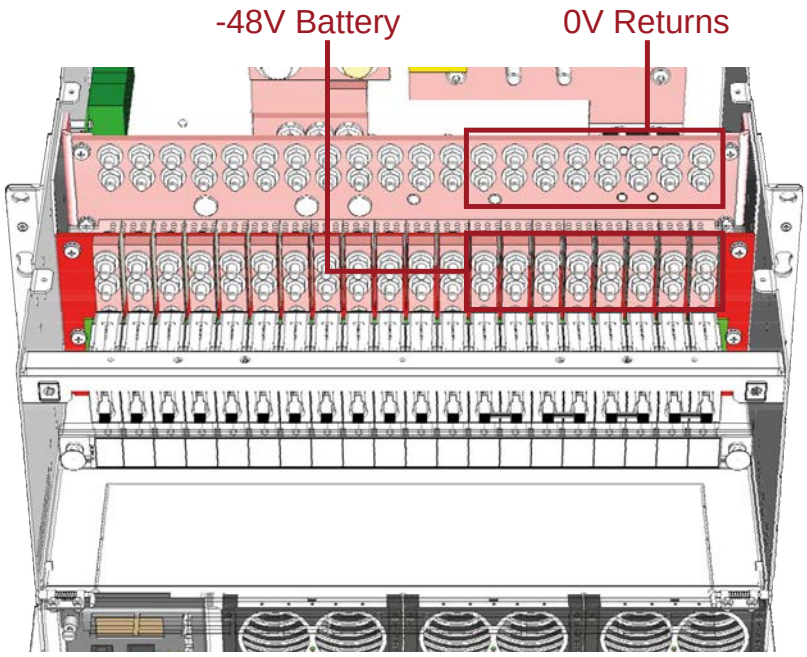


Figure 4-8 Battery Cable Connection (8 battery circuit configuration shown)

CAUTION Figures 4-7 and 4-9 show the system configuration with 8 battery breaker circuits.

For systems configured with 4 battery breaker positions. make sure that batteries are connected only to the designated battery circuits which are the 4 positions on the right hand side when viewed from the front.

For system configured with 0 battery breaker positions, batteries should be connected directly to DC bus bars with appropriate external protection breakers in-line.

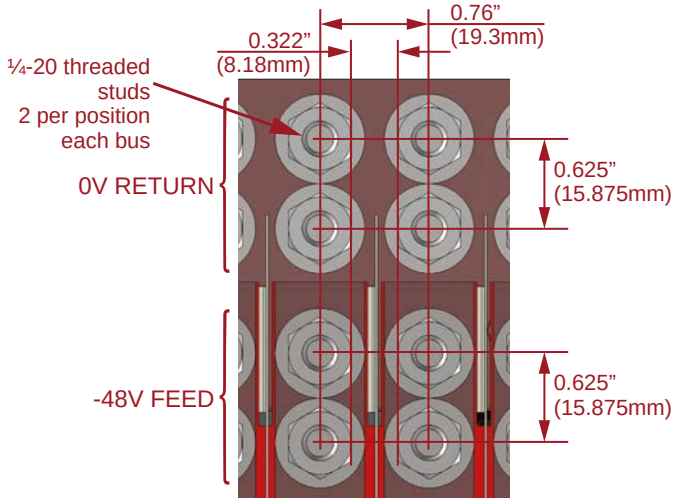


Figure 4-9 Bus Bar Dimension

2-pole breakers are supplied with link bars that must also be installed to connect the two associated -48V feeds. See figure 4-10.

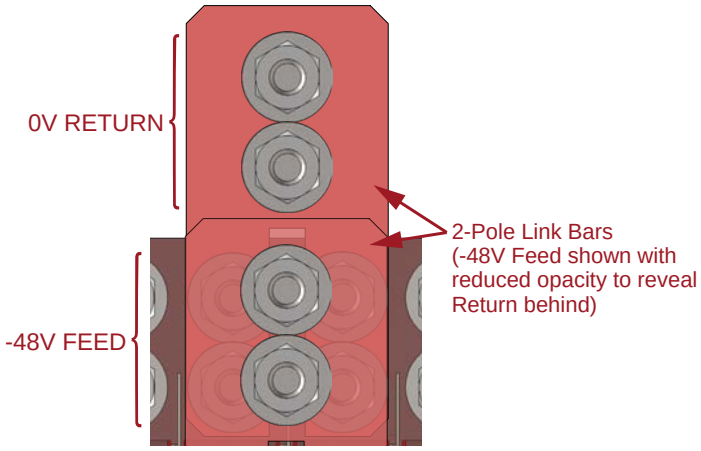


Figure 4-10 2-Pole Breaker Kit Link Bar Detail

NOTE Load and battery breakers are the same type. Battery breakers must be rated of 80A, 100A, 125A, 150A or 200A. Lower ratings are not approved.
See the datasheet configuration guide.

NOTE For installation of breakers and fuses along with details of available ratings,see section 4.11 on pages 38 & 39.

4.6.3 Battery Cable Connection (systems without battery breakers)

1. Connect the "+" battery cable to the 0V Returns bus bar of the system. Tighten the cable connection to a torque of 8 Nm. See Figures 4-11 below.
2. Connect the "-"cable battery cable to the -48V Battery bus bar of the system. Tighten the cable connection to a torque of 8 Nm. See Figures 4-11 below.
3. Connect the other ends of the battery cables to the "-"and "+" terminals of the batteries as described in section 4.7.

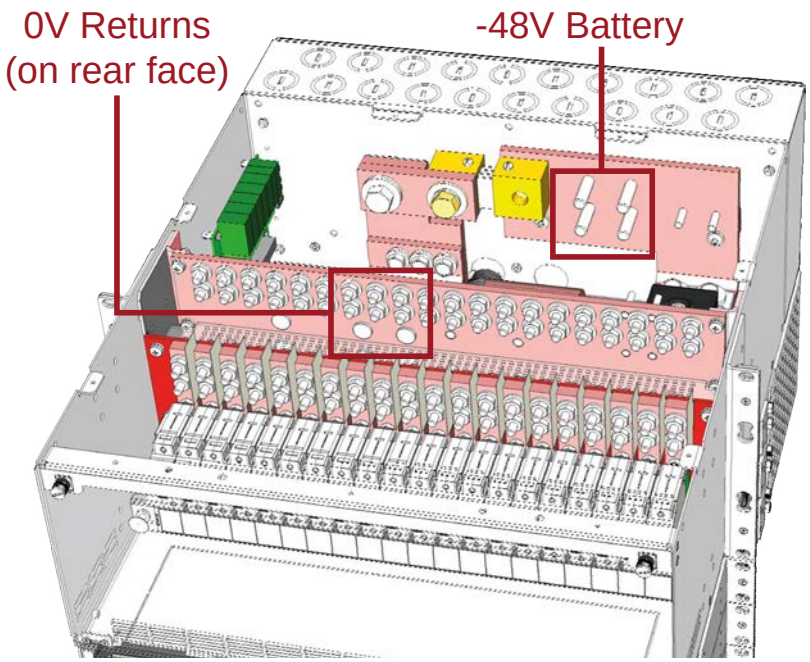


Figure 4-11 Battery Cable Connection (bulk configuration shown)

Studs (to accept 2-hole lugs, 3/8" hardware, 1" center-to-center) are provided for battery terminations.

4.7 Battery Installation

The batteries should be handled according to the battery manufacturer's recommendations. When placed into the cabinet, the recommended distance of 5-15mm between the battery blocks should be adhered to to ensure proper ventilation.

1. Attach inter-block connections between the battery blocks (Figure 4-12, Detail 1).
2. Connect the negative "-"cable to the negative pole of the battery string (Figure 4-12, Detail 2). Tighten the connection to a torque of 5-6Nm.
3. Connect the positive "+" cable to the positive pole of the battery string (Figure 4-12, Detail 3). Tighten the screw to 5-6Nm.
4. Attach plastic pole protection caps to the battery poles (Figure 4-12, Detail 4).

Repeat steps 1to 4 to connect the battery cables to the remaining battery strings.

NOTE The battery installation procedure is an example and may vary depending on the battery type.

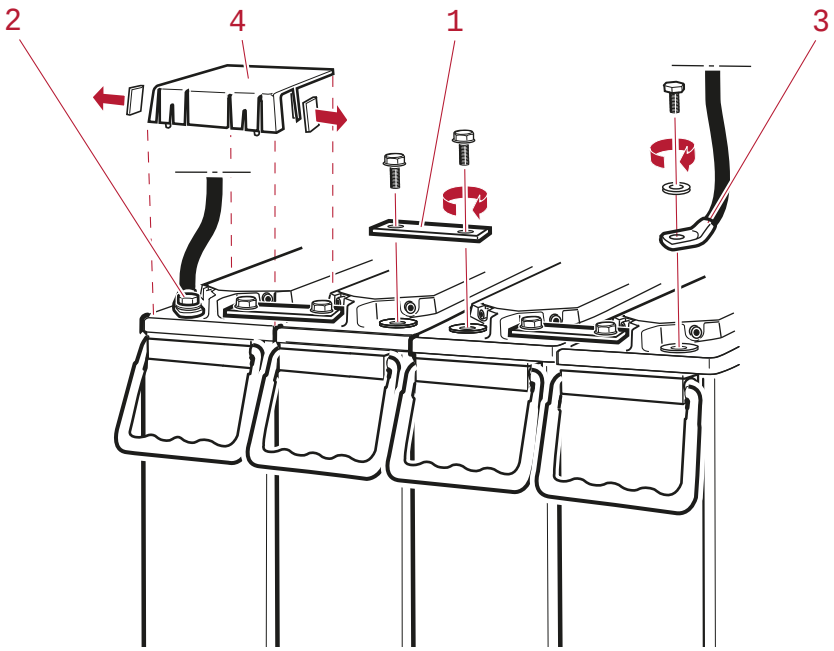


Figure 4-12 Battery Installation (Example only)

4.8 Alarm and Signal Connections

The Guardian Access M38 system utilizes the ACX Relay Board which provides up to 10 alarm relay outputs. In addition, this board provides connections for the battery temperature sensor, external temperature sensor, two digital inputs, two digital outputs and 10 multipurpose I/O connections. The latter are usually pre-programmed to allow connection of the battery symmetry measurement cables. This board is located on the left wall of the system towards the rear as shown in figure 4-13 below.

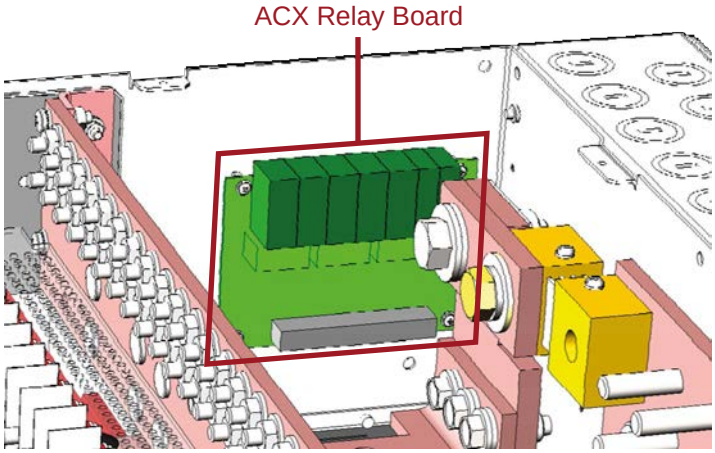


Figure 4-13 ACX Relay Board Location

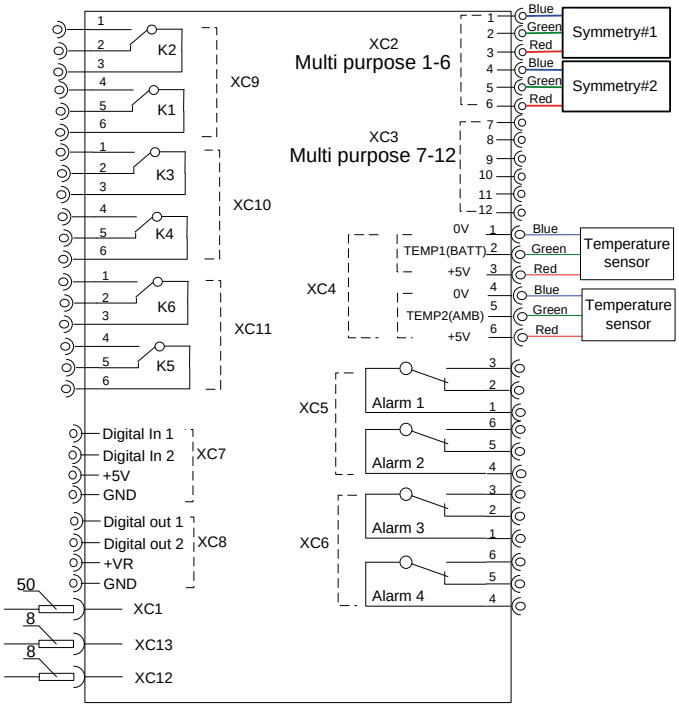


Figure 4-14 ACX Relay Board

4.8.1 Alarm Connection

To connect the alarm cables to the 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 wire back approximately 0.4” (10mm). Stranded wire may be soldered or covered with copper ferrule if desired.
4. Insert the wire into the opening of the green plug and tighten the screw to clamp the wire.
5. Re-insert the green plug with the alarm cable into the ACX relay board.

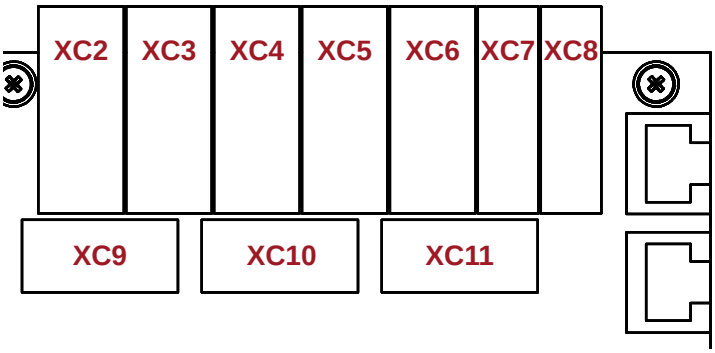


Figure 4-15 ACX Relay Board Alarm & Signal Connections

NOTE The alarm configuration will be dependent on your system configuration.

NEED MORE INFORMATION? For detailed information regarding Alarm connection see Appendix A, Installation Drawing.

4.8.2 Symmetry Connection

The ACX Advanced Controller can supervise 4-block symmetry measurements on 4 battery branches.

NOTE Symmetry cables should be ordered with the system as desired.

NOTE Multi Purpose inputs which are not used for symmetry measurement can be reconfigured to user defined analog inputs.

1. Insert a suitably sized cable lug into one pole of the inter-block connection plate. Fasten the lugs and plates to individual battery poles.
2. 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 4-16.

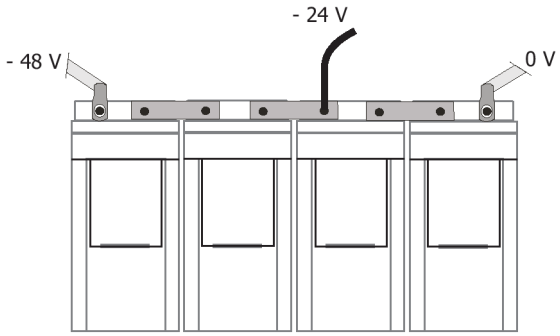


Figure 4-16 2-block Symmetry Measurement (for illustration only)

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 4-17.

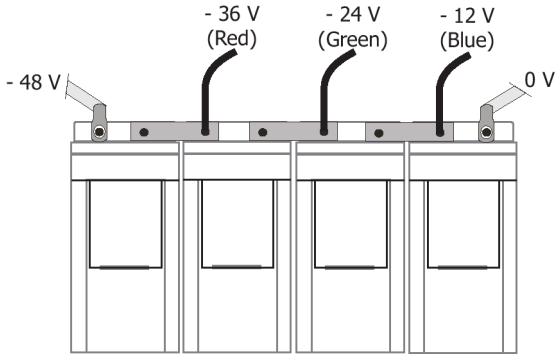


Figure 4-17 4-Block Symmetry Measurement (for illustration only)

NOTE The **i**nter-block Connection Kit is not delivered with the system.

4.8.3 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 4-18.

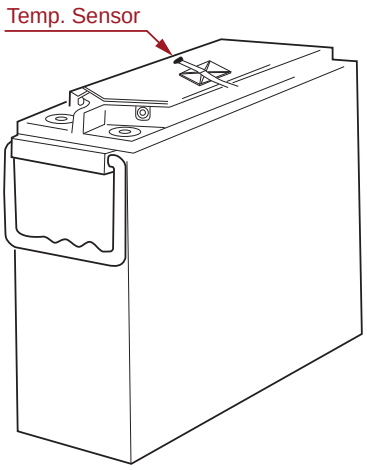


Figure 4-18 Temperature Sensor Connection

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.

After additional logic configuration, the temperature is displayed in the External Measurements menu in the ACX Advanced Controller or in PowCom™ software.

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

4.9 Reinstalling Covers

After completing all connections, reinstall the plastic top cover and rear cover by reversing the process described in section 4.3.1.

4.10 Rectifier Installation

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.

Rectifier modules should be installed starting from the top left position in the system.

1. Place the rectifier module in the slot in the rectifier shelf with the handle facing out.
2. Slide the rectifier module into the slot until it contacts the interface connection at the rear of the shelf, Figure 4-19 #1.
3. Fully insert the rectifier by pushing the handle towards the shelf. The rectifier handle will rise up and lock the rectifier into the position, Figure 4-19 #2.
4. Repeat steps 1 to 3 for all rectifiers to be installed.

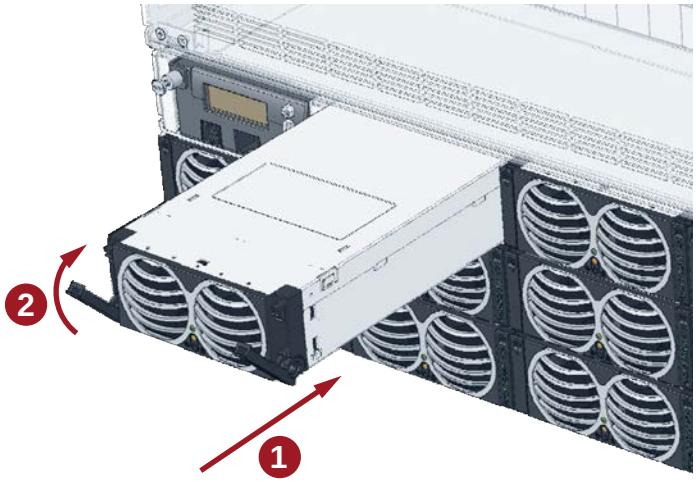


Figure 4-19 Rectifier Installation

4.11 Circuit Breaker Installation

All circuit breakers as well as the TPS Fuse Carrier Module are of the pluggable bullet type and can be inserted directly from the front of the system.

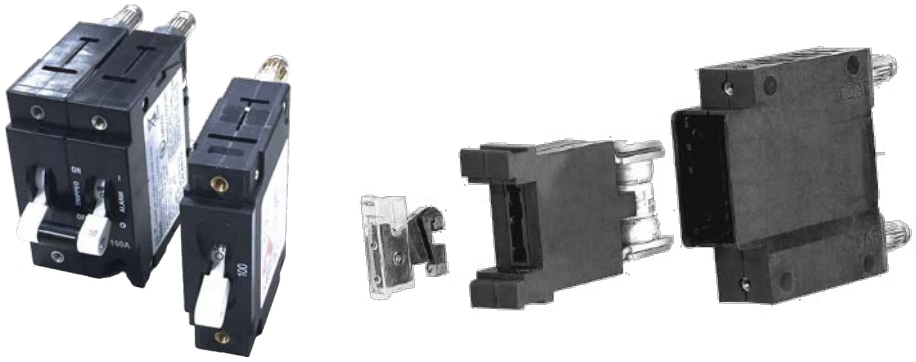


Figure 4-20 Breakers and Fuses

The following is information about the available breaker and fuse ratings along with the Fuse Carrier Module and associated alarm fuse.

NOTE The Fuse Carrier Module consumes one load position and when ordered will be supplied automatically with an alarm fuse. Load fuses must be specified separately as required.

CAUTION Only breakers, fuse modules and fuses listed below are approved for use in the M38 system. Products from alternative suppliers will breach agency approvals and may compromise safety.

BREAKERS

Amps	Positions	Order Code
2.5	1	348-1441-0020
5		348-1441-0050
10		348-1441-0100
15		348-1441-0150
20		348-1441-0200
25		348-1441-0250
30		348-1441-0300
40		348-1441-0400
50		348-1441-0500
60		348-1441-0600
80		348-1441-0800
100		348-1441-1000
125	2	775-1532-0125
150		775-1532-0150
200		775-1532-0200

TPS FUSES

Amps	Order Code
3	280.1413.00
5	280.1414.00
6	280.1416.00
10	280.1419.00
15	280.1422.00
20	280.1425.00
25	280.1428.00
30	280.1431.00
40	280.1433.00
50	280.1436.00
60	280.1439.00
70	280.1442.00
Alarm (0.18A)	280.0720.00
Carrier Module	775-1531-0000

Table 4-2 Remove Breaker Retaining Bar

1. Open the front door.
2. Remove the breaker retaining bar see figure 4-21.

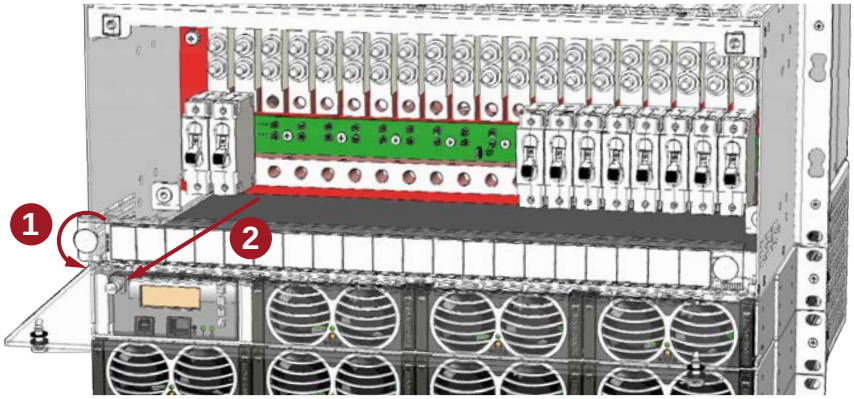


Figure 4-21 Remove Breaker Retaining Bar

3. Align the breaker to be installed with the appropriate socket , figure 4-22(1), and push in gently and firmly to engage, figure 4-22(2).

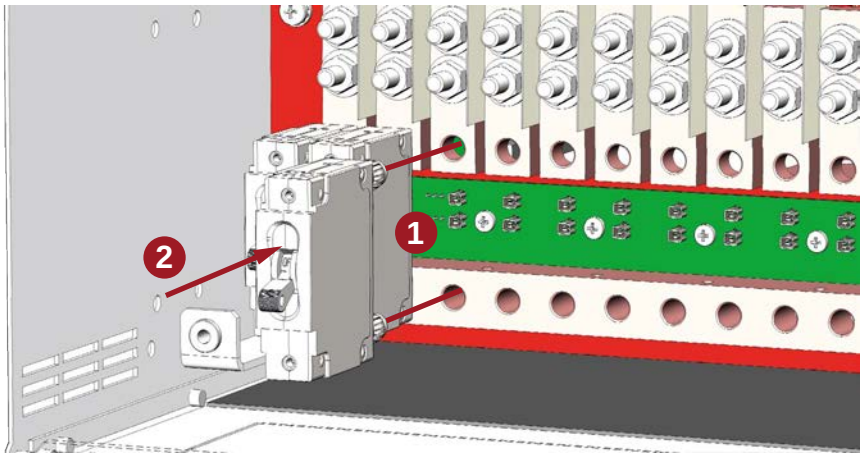


Figure 4-22 Insert Breaker

4. When all breakers have been installed, replace the breaker retaining bar and close the front door.

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 for testing purposes during commissioning. Alarm thresholds should be returned to their original set-points after testing.

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, with enough capacity to fully load 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 open the front door and remove the rear cover 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 breakers are set to the OFF position - ensuring the loads and battery strings are connected.
3. Ensure that all rectifier modules are removed. If not, remove each one in turn starting from the bottom rightmost position.
4. Check the battery polarity with the multimeter (3½ Digit, 0·1% dc). Place the positive lead of the meter to the positive bus-bar 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 cables to the batteries.
5. Turn on the AC mains voltage.
6. Measure the AC voltage on the AC terminal block between phases and neutral or between phases in situations where the rectifiers are connected directly between two phases. Nominally, the correct value is approximately 230V. If the value is incorrect, check the AC connection.
7. Plug in all rectifier modules, starting from the top leftmost position. Make sure to fasten the rectifiers again. The rectifiers will turn on automatically.
8. Set all load breakers into the “1” (ON) position.
9. The green LED on the controller should blink for approximately 20 sec.
10. The output voltage will increase slowly to U1 (float charge voltage).
11. Turn the battery breaker(s) to the “1” (ON) position.
12. Set the battery current limit according to the battery manufacturers requirements.
13. If any alarms are present, they should be reset in accordance with the procedure for the controller.
14. The system should now be without alarms.
15. Re-fit the rear cover and close the front door.
16. Check that all changes to drawings, if any, have been completed.
17. Clean the site.
18. 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)

CAUTION Always follow battery manufacturers' recommended settings for Float and/or Boost setpoints.

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 the "off" position and that no rectifiers are mounted in the sub-rack(s).		
3	Connect AC, and measure voltage on the mains input connections, They should be 230VAC (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 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 should be adjusted according to the battery manufacturer's requirements. Check the temperature read from the controller compared to the ambient temperature.		Comp.:…….V/10°C Read off:……°C
8	Check the symmetry measurement and set the number of battery strings according to the 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 must be checked according to the Table 6-1 at least once a year.

TYPE OF CONNECTION	MODEL / DESCRIPTION	TORQUE (Nm)	TORQUE (Inch LB)
AC Input Terminal Blocks	Combicon SRK	1	8.5
ACX Relay Board Terminal Blocks	Phoenix Mini Combicon	0.25	2

Table 6-1 Connection Torque Setting Check

6.1.2 Other Requirements

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

In addition, the system requires periodic inspections and routine cleaning. It is very important to keep the 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.

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 ACX Advanced Controller see the Alarms/Messages section of the controller manual:

https://www.unipowerco.com/pdf/acx-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	System voltage drops below the set limit. System shutdown.	Check the battery condition. Check the AC mains connection. Check the input breaker. Check the rectifier modules.
Communication Failure	Module failure. Modules not installed in the correct position. Broken or disconnected communication wire.	Check the non-communicating address If the rectifier address does not communicate re-install the module and wait for 5 minutes. Verify that the communication cable is properly connected and it is not damaged. Replace if necessary. If the board address does not communicate, check if it is installed in the system. If it is, replace the board. 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. Verify, if the controller is operating properly. If not, replace the controller.
Distribution Fuse Failure	Tripped load breaker / blown load fuse.	Verify there is no short circuit in load cabling. Reset the breaker, if it trips again, there is a problem with the load or a breaker itself. Replace the breaker / fuse if necessary.

Fault	Possible Cause	Suggestion/Solution
Battery Fuse Failure	Tripped load breaker / blown load fuse	Verify there is no short circuit in load or battery cabling. Verify the breaker / fuse is correctly rated. Reset the breaker, if it trips again, there is a problem with the load or battery or a breaker itself. Replace the breaker / fuse if necessary.
Symmetry Fault	Battery at end of life. Wrong symmetry cable connection. Wrongly set Symmetry limit value.	Verify the battery condition. Verify the symmetry cable connection. Verify the Symmetry limit value.
Low Battery Temperature	Battery temperature drops below the set Low battery temperature limit.	Check the heating of the system. Check the ambient temperature (it should not be lower than recommended battery temperature).
High Battery Temperature	Battery temperature exceeded the set limit.	Check the cooling or ventilation. Verify the battery condition. Check the Battery Current Limit.
Temp. Probe Failure	The temperature probe is not properly connected to the system. Faulty temperature probe. Temperature probe wire is interrupted. Temperature difference between the controller temperature and the probe temperature is greater than 60°C.	Verify the temperature probe connection. Verify the internal / external temperature via controller front panel. Replace the faulty probe with a new one. Identify the root cause of the hot environment at the batteries and/or controller.
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 locking screw in the top left corner of the controller front panel using a flat screwdriver, Figure 7-1 (1).
2. Rotate the locking bracket forward to release the controller, Figure 7-1 (2).
3. Pull the controller out of the shelf, Figure 7-1 (3).

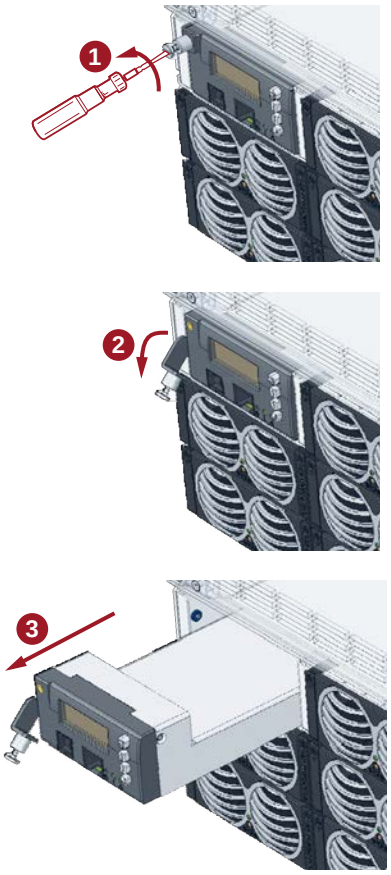


Figure 7-1 Controller Removal

4. 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.

This section describes how to replace a faulty rectifier in an active system.

1. Release the two rectifier handles and rotate them forward to between 30 and 45 degrees. This will unlock the rectifier and pull it slightly forward. Figure 7-2 (1).
2. Pull the rectifier out of the slot, Figure 7-2 (2).

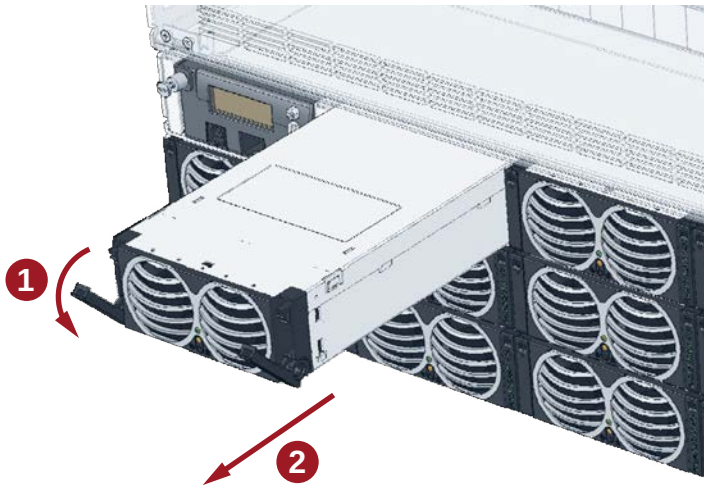


Figure 7-2 Rectifier Removal

3. Place the replacement rectifier module in the slot in the rectifier shelf with the handle facing out.
4. Slide the rectifier module into the slot until it contacts the interface connection at the rear of the shelf, Figure 7-3 (1).
5. Fully insert the rectifier by pushing the handle towards the shelf. The rectifier handle will rise up and lock the rectifier into the position, Figure 7-3 (2).

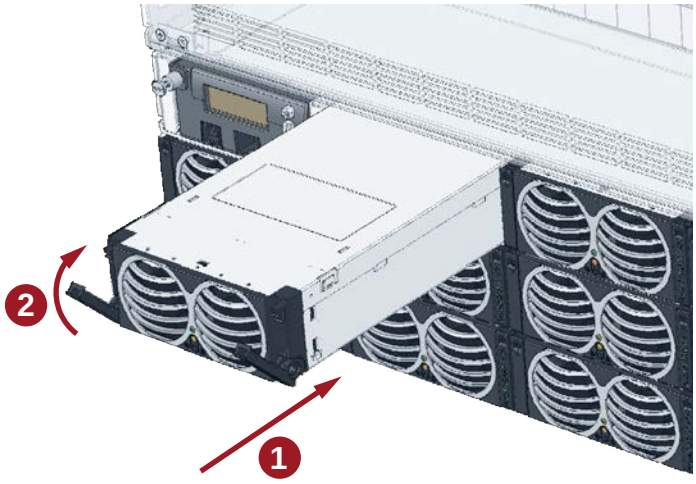


Figure 7-3 Rectifier Insertion

6. After 1 minute the yellow LED starts blinking. Wait for a maximum of 4 minutes for the indicator to stop blinking. Ignore the module alarm caused by the current sharing alarm.

7.3 Breaker Replacement

To remove a breaker or fuse module:

1. Open the front door of the system.
2. Remove the breaker retaining bar as described in section 4-11.
3. Firmly but gently pull on the breaker / fuse module until it comes free.
4. Insert the replacement breaker / fuse module as described in section 4-11.
5. Replace the breaker retaining bar and close the front door of the system.

CAUTION If the breaker or fuse module is being replaced because increased capacity is requires, ensure that the existing cables are adequate for the expected increased current.

A.1 System Layout

Mounting: 7RU x 19"

CONTROLLER:
ACX Advanced

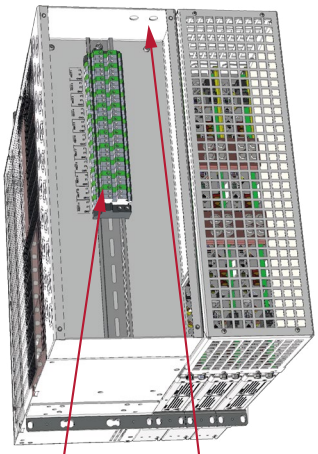
RECTIFIERS:
11 x Guardian 48V

AC Distribution:
1-phase, 2-phase or 3-phase - nominal 230VAC per rectifier

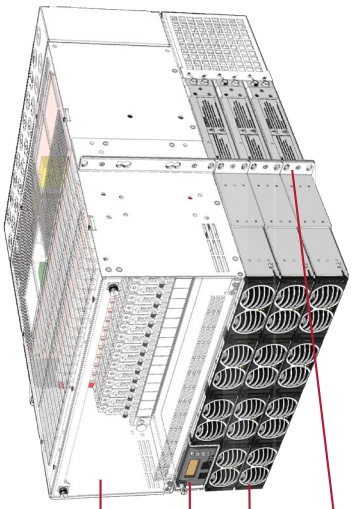
DC Distribution:
Up to 20 Load Breakers or TPS Fuses

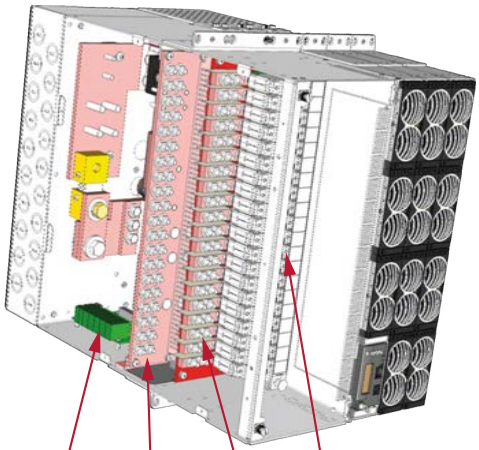
Battery Protection:
0, 4 or 8 Breakers

LVBD:
600A



System Layout



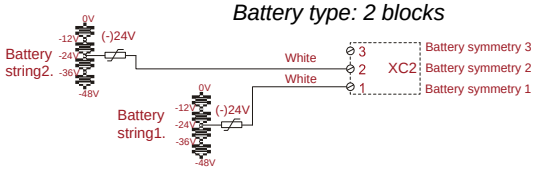


A.2 Installation Details - Connections

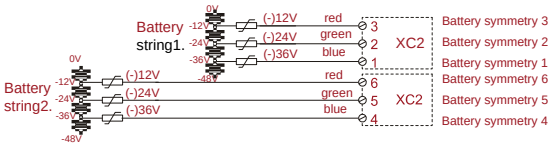
Symmetry cable connections

Table shows different ways of battery symmetry cable connections depending on actual software (see controller software sheet)

Battery type: 2 blocks

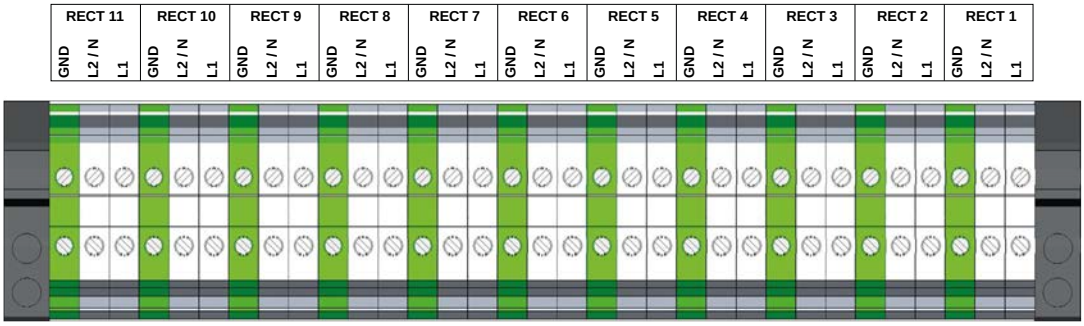


Battery type: 4 blocks

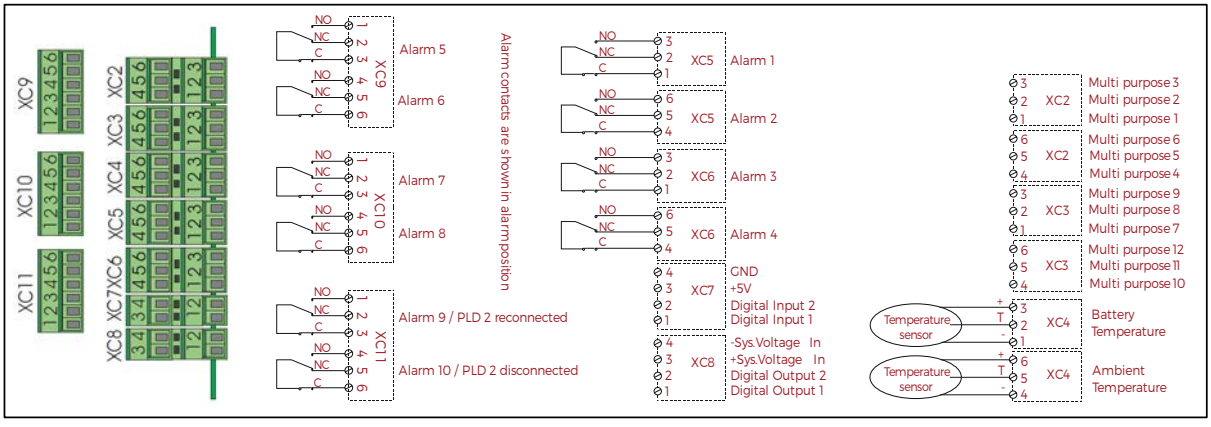


AC Input Terminals

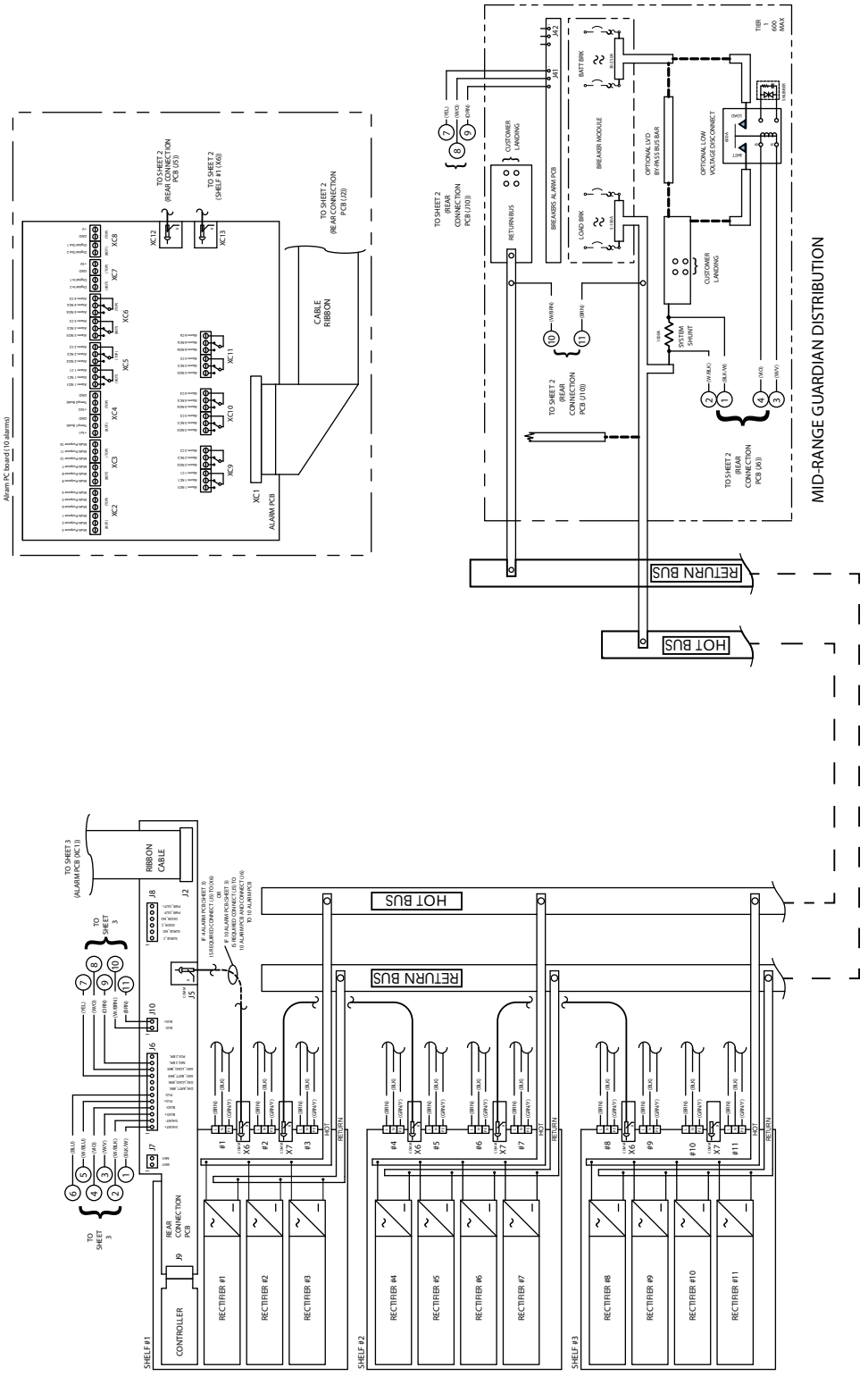
(see section 4.5 for connection details)



ACX Relay Alarm Interface



A.3 Block Diagram



A.4 Detailed Dimensions