

**MAJORCHARGE® POWER SYSTEM**

INSTALLATION & OPERATION MANUAL



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**Revision History**

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**Notes:**

Model Number:

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Serial Number:

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Installation Date:

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**This user's manual contains important technical instructions to be followed by qualified personnel responsible for the installation, start-up and maintenance of this unit. It is recommended that this manual be read attentively to insure safe and reliable operation of this equipment.**

## Warranty

This product is warranted against defect in materials and workmanship for a period of two (2) year from date of shipment. During warranty period, Majorpower Corporation will, at its option, either repair or replace products that prove to be defective.

### Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from unauthorized modification, misuse, improper installation, or operations beyond those described in this manual. No other warranty is expressed or implied.

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## 1. INTRODUCTION

Thank you for choosing MAJORPOWER as the power conversion products supplier to your company. Our power conversion products are designed and built for full reliability at multiple locations and variety of applications. These intelligent, dependable power systems provide economical power support for all your network needs.

This manual contains information and technical details for wall mounted models in the MAJORCHARGE power system family. The general operation procedures are common, however in some instances, all or part of the information will not apply to the specific model purchased.

**This user's manual contains important technical instructions to be followed by qualified personnel responsible for the installation, start-up and maintenance of this unit. We recommend that this manual be read attentively to insure safe and reliable operation of this equipment.**

Should you require any assistance, please call our Application Engineering department at:



**Tel: 888-708-6610 or (919) 563-6610**

**Fax: 888-708-6620 or (919) 563-6620**

**Email: [tech-support@majorpower.com](mailto:tech-support@majorpower.com)**

## 2. IMPORTANT SAFETY INSTRUCTIONS

### Safety Statement

SAVE THESE INSTRUCTIONS - This manual contains important equipment instructions that should be followed during installation and maintenance of the power equipment.

To reduce the risk of electric shock, install the equipment in a temperature and humidity controlled indoor environment, free of conductive contaminants. Ambient temperature should not exceed 50°C (122°F).

- The following precautions should be respected when working on power equipment:
- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.

### Additional Safety Notes

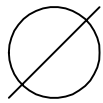
- Upon receipt, examine the shipment box for damage. Notify the carrier immediately, before opening if damage is evident.
- Do not open or disassemble the equipment, warranty will be voided.
- Do not operate near water or in excessive humidity.
- Keep liquid and foreign objects from entering the equipment.
- Install the equipment in a well-ventilated area. Do not block fresh air vents, or exhausts of the unit.
- Do not operate the equipment close to combustible gas or open fire.
- The AC breaker must provide adequate isolation between the system input and commercial AC main
- The system has passed stringent system testing prior to shipment. To avoid electrical shock, the rectifier system requires a single ground point permanently connected to earth ground
- Before installing the system, verify the AC input voltage and frequency, the AC breaker rating and type, and other environmental conditions as noted in the specifications
- Do not operate the equipment if the unit is leaking any liquid or if a white powdery residue is found to be present.

- Temperature: The equipment should be operated in an ambient temperature range of 0°C to +45°C or output efficiency may be affected. Air flow to the equipment must not be impeded.
- Reduced air flow: Installation of the equipment should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- Mechanical loading: Mounting of the equipment should be level and balanced on a stable structure.
- Wiring: Adequate input power must be supplied to the equipment for proper use; correct wiring sizes must be respected.
- Grounding: Reliable grounding of equipment should be maintained.

#### Symbols



**PROTECTIVE GROUNDING TERMINAL:** A terminal, which must be connected to earth ground prior to making any other connection to the equipment.



This symbol indicates the word "phase".

### 3. SYSTEM OVERVIEW

#### System Configurations

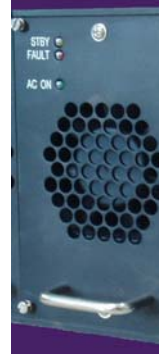
Multiple physical packages are created to provide DC Power support in many applications. The first two packages of the MAJORCHARGE system include a 19 inch rack mount for traditional telecom locations and a robust secure wall mount cabinet for space saving or industrial applications.

The core building blocks of the system are the modular switch-mode rectifiers, integrated controller and support package. This chapter provides a brief description of the WALL Mounted power system package and building blocks.

#### Rectifier Description

The rectifier is rated for full output when operated at high line conditions of typical 208~240 VAC supply circuits. The output current is de-rated to half when low line AC supply is applied to the system.\* De-rating is automatically activated by the controller. The rectifiers can operate on a high line AC supply in a stand-alone operation, if the control unit is turned off, removed or nonfunctional.

The rectifier design provides the flexibility to configure and expand the system as the load demand increases. Each rectifier unit is hot-swappable and accessible for ease of maintenance without a system shutdown. Load sharing is automatically controlled between the installed rectifiers. Each rectifier unit has an active power factor correction of greater than 0.98 for maximum AC supply utilization.



Do not touch edge connections on the rear of the rectifier module. High leakage current may be present after rectifiers have been energized in a system.

Part Number	Output Voltage	Output Current
MCR24/40	27 VDC	40 A
MCR48/25	54 VDC	25 A
MCR130/10	130 VDC	10 A

**\* Warning:** In the absence of the control unit, the automatic output de-rating of the rectifiers at Low Line is not effective. Exceeding the 50% load limit at Low Line may damage the rectifiers. (100 ~ 185 VAC is low line operation)

## Alarm & Control Interface Description (ACI)

The integrated controller monitors critical system conditions and facilitates comprehensive system programming. The controller functions include fault alarms, alarm threshold adjustments, float and equalize voltage adjustments, temperature compensation, overall system status and low voltage disconnect voltage threshold settings, if the LVD option is installed. Additionally, the controller automatically de-rates the system output current for low line applications. This easy to read screen allows the user to program the unit with only a few push buttons. The unit toggles audible alerts, LEDs and Form-C contact closures based on the system's monitored parameters.



The rectifiers will continue to operate in factory default mode if the controller is turned off, removed from the system or otherwise non-functional.

## Wall Mounted Power System

The MAJORCHARGE wall mount DC system is a cabinet package designed to encase a full power system with integrated output distribution. The cabinet is designed for mounting to a structural wall in applications where space is a premium or standard racks are not used. Each cabinet supports the controller, integrated DC distribution and up to 4 rectifier module blocks for power:

- up to four 40 Amp rectifiers for the 24V system; total 160A output.
- up to four 25 Amp output rectifiers for the 48V system; total 100A output.
- up to four 10 Amp rectifiers for the 130V system; total 40A output.

All models include a controller, independent AC/DC isolation and integrated circuit control. Optional battery side Low Voltage Disconnect (LVD; 24V & 48V only) can be factory installed. Circuit breakers are integrated into the cabinet for protection of the battery output and bulk load output. Additional circuit breakers can be ordered and added to the system to meet the various needs of the application.

The exterior and interior panels are shown in figures 1 & 2.

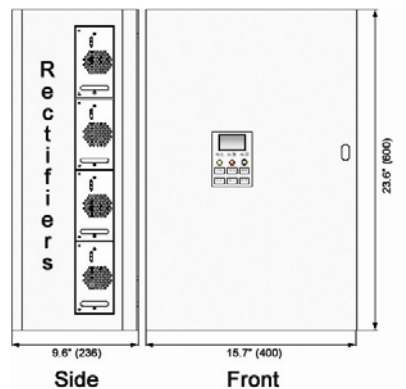


Fig. 1 External View

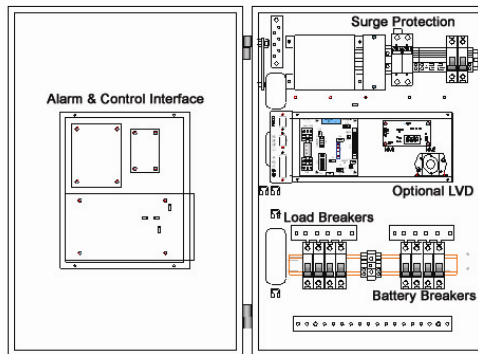


Fig. 2 Internal View

### Main Features

- Secure Wall Mount Cabinet; Locking door and keys provided.
- Integrated DC Distribution bus – expanded to 4 breaker positions
- Surge Protection Device incorporated in AC input circuit.
- Wide AC input voltage range: 185VAC ~ 264VAC for 100% output;  
100VAC ~ 185VAC 50% de-rated output
- Minimal distortion of AC input and a power factor of more than 0.98 with active Power Factor Correction (PFC).
- High reliability design with autonomous current-sharing technique.
- High power density, low electromagnetic interference and high efficiency.
- Hot-swappable rectifier modules.
- Compact “easy-to-use” due to modular and block designed structure.
- Efficient warning and protection measures including circuit breakers.

## 4. INSTALLATION

### Tools Required

The following tools are recommended for installation:

Phillips No.2 screwdriver	Drill and bits for structure mounting
Insulated slotted screwdriver – blade size 1/4"	Metric socket wrenches with extensions
Insulated slotted screwdriver – blade size 3/16"	Structure mounting hardware for 100 lbs rating
Insulated side cutters	Measuring tape

### Preliminary Inspection

Prior to removing the system from the carton, note any damage to the carton. Remove the system from the packaging and inspect the system and components for any dents or damage. If any damage is noted, contact the carrier immediately.

### System Mounting

The MAJORCHARGE Power System is shipped in one carton and the rectifiers are shipped separately in individual cartons. The system is shipped with the control unit and distribution circuit breakers already installed.

The system is designed for airflow from the front to the rear of each rectifier module. This flow is right-to-left if facing the unit. When the rectifiers are installed in the system, operational air flow should be open and clear for 152.4 mm (6 in) on either side of the cabinet. System access to the right side will be required for rectifier installation/ removal, therefore plan for at least 355 – 400 mm (14-16 in) access easement. The front of the system should be clear of all obstruction to allow for proper access to the controller screen, installation, maintenance and hinged door access.

The power system should be mounted to the structure or wall per customer-provided engineering drawings. Mount the power system with the appropriate hardware for the structure and ensure the surface plus hardware has the ability to hold 100 pounds. Cable Route Planning - Allow working room on the top of the system for making AC Mains connection and on the bottom of the system for DC Battery and Load connections.

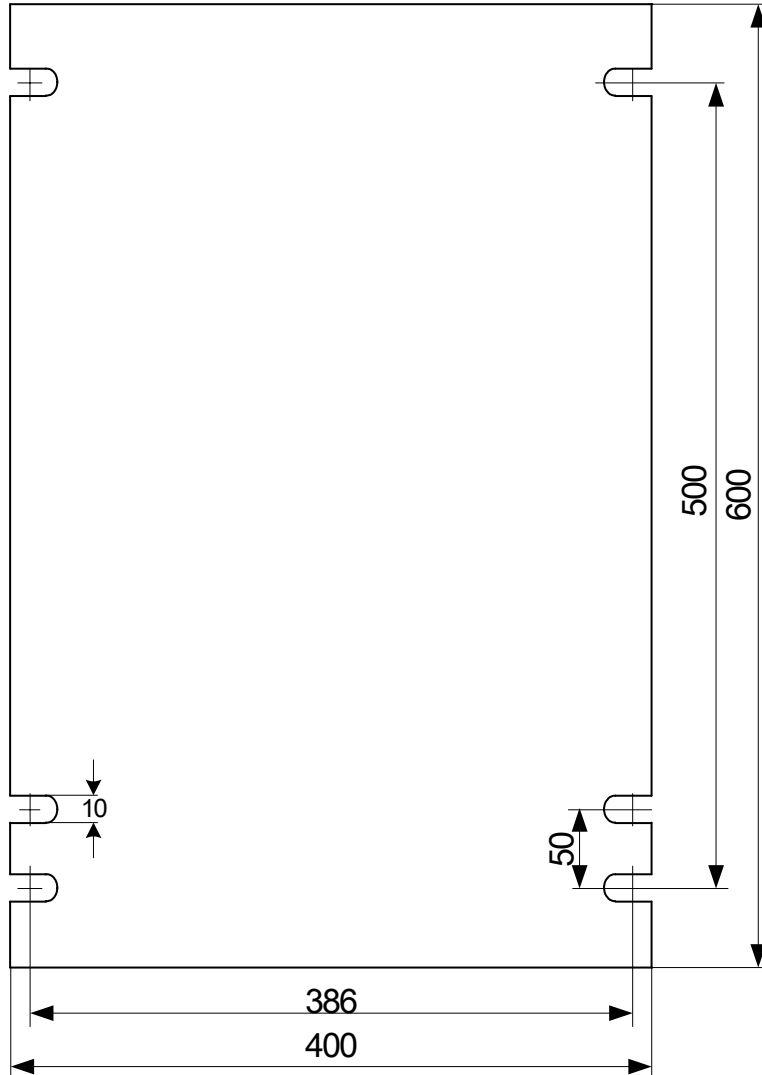


Figure 3 attach point template (mm)  
(1 inch = 25.4 mm)

## System Internal Wiring

The power system comes pre-wired and assembled, equipped with the controller, circuit breakers and input surge protection modules. All internal connections are made at the factory; no internal system or module wiring is required. **Caution** – Do not modify or disturb internal system wiring when making AC and DC installation wire connections.

## AC Input Connections

The power system is equipped with one AC input terminal located inside/top right area of the system. The power system is also provided with an integrated AC MAINS circuit breaker rated for 40 amps. Typical installations are completed with customer supplied wire meeting the 10AWG stranded wire suggested requirements. All AC connections should be performed by a qualified electrician and be in compliance with the latest release of the National Electrical Code or prevailing authority codes for the installation.

The AC source wiring should be configured for One (1) circuit at 40 amp maximum current draw by the power system with 208~240 VAC source. Typical installations include L1-L2-G and some may include L-N-G. The High Line (HL) operations are defined at an AC line input range of 185 VAC - 264 VAC. The Low Line (LL) operations are defined at an AC line input range of 100 VAC – 185 VAC.

## SPD – Surge Protection Devices

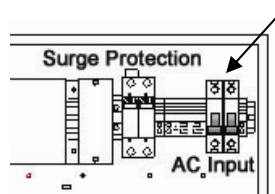
This system is equipped with integrated SPD to suppress surges that might occur on the supply AC circuit. The standard SPD configuration is rated for L1 – L2 circuits ONLY. The source circuit should provide 208~240 volts AC as measured between L1 and L2 and no more than ~120 volts AC from L1 or L2 to ground. If the AC supply is not L1 – L2 then contact Majorpower for alternate configuration equipment

**DO NOT CONNECT L-N-G SUPPLY CIRCUITS. (208~240 VAC as L1-Neutral)  
THE SPD WILL BE DAMAGED.**

**Warning:** The system operates at AC voltages that can produce fatal electrical shock. Installation and maintenance personnel must observe all safety precautions.

**Warning:** Confirm the operating voltage and proper grounding of the incoming line before proceeding.

1. Route cable and strain relief or conduit to the 1.25 inch (31.75mm) entry portal on the power system cabinet. (top-right)
2. Loosen the input terminal screws.
3. Strip 10mm of wire insulation from the end of each wire and insert into the terminal block. Secure each wire and verify strain relief is secure.



4. Insert rectifiers into available slots and press firmly to ensure they are seated. Tighten the retaining screws on the top and bottom of each rectifier module.
5. Switch the AC Mains input breaker to the ON position. The rectifiers will start in 3-5 seconds. (soft start)
6. Press the white on/off button on the controller to check system parameters.
7. Turn off the controller and the AC mains breaker before proceeding to the DC load and Battery connections installation.

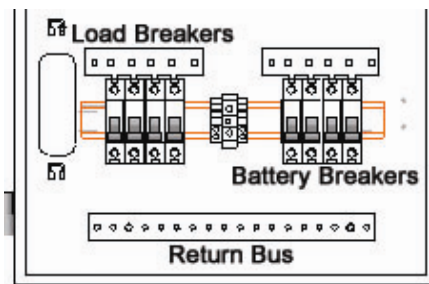
## DC Load/Battery Connections

**Caution:** Basic system functional testing should be completed prior to the load or battery connections being applied.

**Warning:** Ensure the AC circuit breaker and the power switch of the controller is in the "Off" position when inserting the rectifiers and controller unit.

The integrated circuit breakers are shipped in the OFF position. Ensure the load breaker is off before making DC load connections.

1. Strip 10mm of wire insulation and connect the voltage potential load cable to the circuit breaker in the system.
2. Strip 10mm of wire insulation and crimp the appropriate ring terminal to the wire. Fasten the return load cable and crimp terminal to the return bus bar in the system.



After the DC load cables have been attached, turn the equipment on and check the operational parameters of the power system and load equipment.

The Controller is shipped in the OFF position. Ensure the on/off switch is outward before making battery connections. **Use a volt meter to check the polarity and voltage of the system before making battery connections.** Equipment could be damaged if connections are not correct.

Depending on the system voltage, the breaker will be in the circuit on the voltage potential lead. For example, in a 24V system the breaker will interrupt the voltage carrying lead while the 0V return lead connects to the return bus.

3. Connect the positive battery cable to the positive terminal.
4. Connect the negative battery cable to the negative terminal.

5. Engage the battery circuit breaker.

(NOTE: 130V Systems)

The circuit breakers provided in 130VDC systems are two-pole and therefore will open or close both the positive and negative connections simultaneously. Many 130 volt systems effectively float with respect to earth ground. There is no common return bus in a 130 volt system. Match the polarity of the battery to the markings on the circuit breaker.

### Alarm Connections

The shelf alarm block is located on the back panel. These dry contacts allow customer provided alarm systems to be connected to the power system. Alarms that are triggered in the controller will appear on the Form-C terminal block.

After programming parameters, always return the control screen to the main menu view (ESC) for proper indications on the contacts.

Terminal Pins	Status	Alarm
1 & 2	Normal Close	AC Input Voltage Fault
3 & 4	Normal Close	DC Output Voltage Fault
5 & 6	Normal Close	Rectifier Faults
7 & 8	Normal Close	DC LOAD Breaker

#### 1&2) AC Voltage Fault

- AC input source voltage is missing or measured to be out of the parameter trigger range; either high or low.
- SPD fault indication (wall mounted configurations, if equipped)

#### 3&4) DC Output Voltage Fault

- DC **BATT**ery Breaker - Sensor circuit indicates the breaker position - open/closed.
- DC System Voltage High or Low

#### 5&6) Rectifier Faults

- Module Failure, Fan Fail, Internal High-Temp, Auto-protection Shutdown modes

#### 7&8) DC **LOAD** Breaker

- Sensor circuit indicates the breaker position - open/closed

### Temperature Probe Connection

The temperature compensation probe should be connected to the back of the shelf using the supplied connector and cable assembly. Take care not to pinch or crimp the wire assembly when securing it to the installation raceways etc. The square probe should be connected on or near the central part of the battery being charged by the power system. Temperature changes measured by the probe will be used by the controller to facilitate the voltage compensation feature in the system. For example, if the temperature increases, the voltage will decrease therefore helping to prevent excessive heating in the battery.

## 5. SYSTEM OPERATION

### Circuit Breaker Controls

(24V and 48V systems)

The system is equipped with TWO (2) integrated circuit breakers for output protection. One is for battery and the other is for DC load protection. The single-pole breakers are located behind the front access door the system and marked LOAD and BATT.

(130V systems)

The system is equipped with TWO (2) integrated circuit breakers for output circuit protection. One two-pole breaker is marked LOAD and the other BATT. Two-pole breakers are used since many 130V systems float with reference to ground. These breakers will open both leads (+/-) simultaneously.

(ALL systems)

The supplemental AC Mains supply circuit breaker is located on the system as additional protection for the input AC. This is not a replacement for the service panel breaker installed per local codes for AC supply wiring.

### Front Panel Indicators

Rectifier:

There are three LED lights on the each rectifier front panel.

“AC On” ---- LED on when AC input voltage of the rectifier is OK.

“Fault”--- LED lit when the rectifier is in a fault condition.

“STBY”--- LED on when the rectifier is powered off by the controller.

Controller:

There are two LEDs and the on/off switch in addition to the LCD screen and six navigation/selection buttons.

“SYS” --- will be either green or amber indicating either Float or Equalize.

“ALM” --- red indicating alarm condition

### Controller Operation

Functions and features

➤ Electric parameters detection and measurement:

AC input voltage, DC output voltage, rectifiers output current, charge and discharge current of battery units, temperature of battery units.

➤ System failures detection

Problems and failures can be detected from: AC input, DC input, output current limitation of rectifiers, over temperature of rectifiers, cooling fans, lightning protection and surging protection, battery capacity, distribution circuit breaker trip.

➤ Electric parameters Control

Adjusting range of DC output voltage: 21.5V-28.8V (MCR24/40)

Adjusting range of DC output voltage: 43.0V-57.8V (MCR48/25)

➤ Battery management

Floating & Equalize voltage setting

Battery charge mode selection : Equalizing charge mode with limited current, thermal compensation for floating charge, accumulative number indication of ampere-hours of

battery discharge.

Battery Low Voltage Disconnect (LVD) protection (if option is factory installed)  
- product codes include "L" in position nine – i.e. MCS48/100LX-3U

## Controller Navigation

**Caution:** The power of the controller MUST be in "Off" position when inserting the controller into the housing and the system is powered on.

After powered on, the Main Status Menu automatically appears:

System:	OK!
AC vol:	218 V
DC vol:	00.0 V
DC cur:	00.0 A

If everything is OK, then the first line shows "System OK". The next three lines show the AC voltage, system output DC voltage and sum current of all the working rectifiers.

If an alarm is present the System line will show the failure information. Each problem is displayed at 2-second interval in turn if there is more than one problem.

Four kinds of problem information can be displayed:

- DC Output Failure --- tripped circuit breaker.
- Battery Failure --- battery disconnected or battery circuit breaker tripped or battery low voltage--- low battery capacity
- Rectifier Failure --- failures include AC Input, DC Output, module over-voltage, high temp, current limit, low current output, fan fail.
- AC Input Failure ---AC Mains input is in over-voltage or under-voltage.

Press Key Pad functions under the Main Status Menu :

### **F&E**

Manually change between equalizing and floating charge.  
Equalizing → Floating, or Floating → Equalizing.

### **SEL**

circular display "Battery inquiry" or "System setting" menu.

### **RTN or ESC**

Refresh new screen. Used to resume the normal display when display is in sleep mode or return to Home page.

### **ARROWS**

Navigation within the screens and change parameter values up or down..

Press **SEL** key to enter system settings menu and view current system status parameters.

Press **RTN** key to activate a menu for parameter changes. Note the pointer will appear to the right of the parameter to be changed. Make adjustments in the value using the up and down **arrows**. Save changes by pressing the **RTN** key.

When the selection pointer appears, use the **SEL** key to move the selector among different parameters on the same page.

Press **UP** to increase the values. Press **DOWN** to decrease the values.

Press **ESC** and the set values are not stored. The system will return to the previous menu and the pointer will disappear.

#### Controller Display

The Display screen saver will automatically dim after 3 minutes. This will not affect operation, control or alarms. Press the ESC key to view the first menu page.

Press and hold the "up" arrow for 3~5 seconds to increase contrast.

Press and hold the "down" arrow for 3~5 seconds to decrease contrast.

Press and hold the "esc" key for 3~5 seconds for backlight operation.

#### Temperature compensation

When the temperature probe is connected to the system, the controller will perform voltage control based on temperature. The probe should be installed on or near the battery for best results and accurate temperature compensation. Each system ships with the probe pre-assembled on a 10M (~32ft) cable. Secure the cable during installation taking care not to crimp or pinch the wire.

#### Temperature coefficient setting

Obtain the temperature coefficient in mV/°C for floating charge from the battery supplier or input operation parameters manually. Input the coefficient value in mV/°C and reference temperature in °C for the battery parameters under the controller menu.

#### Floating charge value calculation

When the battery temperature or system temperature is higher than the reference (normally 25°C) the float charge voltage should be decreased. The float charge voltage @ system temperature = Float charge voltage @ reference temperature + temperature coefficient \*(system temperature - reference temperature)

For example, if the temperature coefficient is set 50mV/°C and the reference temperature is 25 °C, and the then the Float charge voltage@ reference temperature is 53.8V, then the adjusted float charge voltage @ 45°C system temperature will be 52.8V.

#### DC distribution

Rated voltage: +24V range operation

Rated capacities:

One LOAD circuit breaker = 125 Amp

One BATTERY circuit breaker = 125 Amp

Rated voltage: -48V range operation

Rated capacities:

One LOAD circuit breaker = 125 Amp

One BATTERY circuit breaker = 125 Amp

Rated voltage: 130V range operation

Rated capacities:

One LOAD circuit breaker = 50 Amp

One BATTERY circuit breaker = 50 Amp

Table 2: Controller Specifications

Function	Measurable Output
Parameter measurement and monitoring	AC input voltage, DC output voltage, rectifier output current, charging and discharging current, Battery temperature
Fault detection	AC input faults, DC output faults, Rectifier output current limiting, Module High-Temp, Fan failure, Battery output voltage low, Battery circuit breaker fault, Output circuit breaker fault.
Parameter control	Charging current limit, Auto cycle between equalizing and floating charge, Rectifier current limit.
Battery management	Current limiting for equalizing charge, Temperature compensation for floating charge, Accumulative number of current Amp hours
Interface	64X128LCD, English, 6 key operation
Alarm warning	Sound, light, + Dry contact outputs
Power	0.5A

Table 3: Environmental

Working Environment	Rating
Ambient temperature	0 ~ +45°C
Storage temperature	-40 ~ +70°C
Relative humidity	< 85%
Storage relative humidity@20±5°C	< 90%
Altitude	0 ~ 2000m
Cooling	Fan cooling; variable speed
Noise, Acoustic	≤ 55dB

Insulation Resistance

The insulation resistance between the main flow circuits of AC and DC of the rectifier to ground, and the insulation resistance between AC and DC of the rectifier ≥5MΩ  
 Test conditions: 1) normal atmosphere and 90%relative humidity; 2) 500 DCV test voltage

Isolation

AC to ground, AC to DC can bear 3000VAC voltage for 1min without breakdown and flashover between the live circuits of the AC distributor and the earth or between two not-electrically connected live circuits. The leak current is less than 30mA.

DC to ground can bear 500V voltage for 1min without breakdown and flashover between the live circuits of the AC distributor and the earth or between two not-electrically connected live circuits. The leak current is less than 30mA.

Safety Conformity

This power supply is designed for incorporation within an enclosure. For user safety, the enclosure must protect the user against accidental contact with any electrical hazard, associated with the power supply. The design meets or exceeds UL60950 standard and the rectifier is EN60950 approved for use in the system.