

EPC48120/1800-H90 Outdoor Power Supply System

User Manual

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Safety Precautions

To reduce the chance of accident, please read the safety precautions very carefully before operation. The "Caution, Notice, Warning, Danger" in this book do not represent all the safety points to be observed, and are only supplement to various safety points. Therefore, the installation and operation personnel must be strictly trained and master the correct operations and all the safety points before actual operation.

When operating Emerson products, the safety rules in the industry, the general safety points and special safety instructions specified in this book must be strictly observed.

Electrical Safety

I. Hazardous voltage



Danger

Some components of the power system carry hazardous voltage in operation. Direct contact or indirect contact through moist objects with these components will result in fatal injury.

Safety rules in the industry must be observed when installing the power system. The installation personnel must be licensed to operate high voltage and AC power.

In operation, the installation personnel are not allowed to wear conductive objects such as watches, bracelets, bangles, rings.

When water or moisture is found on the cabinet, turn off the power immediately. In moist environment, precautions must be taken to keep moisture out of the power system.

"Prohibit" warning label must be attached to the switches and buttons that are not permitted to operate during installation.



Danger

High voltage operation may cause fire and electric shock. The connection and wiring of AC cables must be in compliance with the local rules and regulations. Only those who are licensed to operate high voltage and AC power can perform high voltage operations.

II. Tools



Warning

In high voltage and AC operation, special tools must be used. No common or self-carried tools should be used.

III. Thunderstorm



Danger

Never operate on high voltage, AC, iron tower or mast in the thunderstorm.

In thunderstorms, a strong electromagnetic field will be generated in the air. Therefore the equipment should be well earthed in time to avoid damage by lightning strikes.

IV. ESD



Notice

The static electricity generated by the human body will damage the static sensitive elements on PCBs, such as large-scale ICs. Before touching any plug-in board, PCB or IC chip, ESD wrist strap must be worn to prevent body static from damaging the sensitive components. The other end of the ESD wrist strap must be well earthed.

V. Short circuit



Danger

During operation, never short the positive and negative poles of the DC distribution unit of the system or the non-grounding pole and the earth. The power system is a constant voltage DC power equipment, short circuit will result in equipment burning and endanger human safety.

Check carefully the polarity of the cable and connection terminal when performing DC live operations.

As the operation space in the DC distribution unit is very tight, please carefully select the operation space.

Never wear a watch, bracelet, bangle, ring, or other conductive objects during operation.

Insulated tools must be used.

In live operation, keep the arm muscle tense, so that when tool connection is loosened, the free movement of the human body and tool is reduced to a minimum.

Battery



Danger

Before any operation on battery, read carefully the safety precautions for battery transportation and the correct battery connection method.

Non-standard operation on the battery will cause danger. In operation, precautions should be taken to prevent battery short circuit and overflow of electrolyte. The overflow of electrolyte will erode the metal objects and PCBs, thus causing equipment damage and short circuit of PCBs.

Before any operation on battery, pay attention to the following points:

Remove the watch, bracelet, bangle, ring, and other metal objects on the wrist.

Use special insulated tools.

Use eye protection device, and take preventive measures.

Wear rubber gloves and apron to guard against electrolyte overflow.

In battery transportation, the electrode of the battery should always be kept facing upward. Never put the battery upside down or slanted.

LLVD And BLVD

The power supply system has battery low voltage disconnection (BLVD) function and load low voltage disconnection (LLVD) function. LLVD means when the mains fail and batteries supply power, the monitoring module cuts the non-priority load off when the battery voltage drops down to below 46.6V. In this way, the battery remaining capacity can sustain the priority load longer. The LLVD voltage is settable. Refer to **4.7.3 Battery Selection** for setting method.

BLVD means when the mains fail and batteries supply power, the monitoring module cuts the load off when the battery voltage drops down to below 45.6V to prevent over-discharge. The BLVD voltage is settable. Refer to 4.7.3 *Battery Selection* for setting method.

The factory setting is enabling LLVD and BLVD, which means that if power outage lasts for a long time or the power supply system fails, there might be LLVD and BLVD. Users should classify the loads and connect the non-priority loads to LLVD routes, and connect the priority loads to BLVD routes. For vital loads, users can disable BLVD of these loads to insure reliability of the power supply.

The method of disabling BLVD is:

Set "BLVD Enable" item of the monitoring module to "N". Refer to 4.7.2 *Battery Selection* for setting method.



Notice

The advantage of enabling BLVD is protecting the batteries from over-discharge when the battery voltage is low. The disadvantage of enabling BLVD is that when the battery voltage drops down to a certain value, all the loads (including non-priority loads and priority loads) will be cut off due to battery disconnection.

The advantage of disabling BLVD is prolonging the power supply of priority loads. The disadvantage is that software disabling cannot prevent unwanted power failure due to misoperation or power supply system failure.

Others

I. Sharp object



Warning

When moving equipment by hand, protective gloves should be worn to avoid injury by sharp object.

II. Cable connection



Notice

Please verify the compliance of the cable and cable label with the actual installation prior to cable connection.

III. Binding the signal lines



Notice

The signal lines should be bound separately from heavy current and high voltage lines, with binding interval of at least 150mm.

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Chapter 1 Overview

EPC48120/1800-H90 outdoor power supply system (outdoor cabinet for short) can be used directly outdoors. It can supply as much as 120A current. There are two models of this system: south model and north model. The north model has an extra heater and an extra heating unit compared with the south model.

1.1 Model Information

The model information of the outdoor cabinet is given in Figure 1-1.

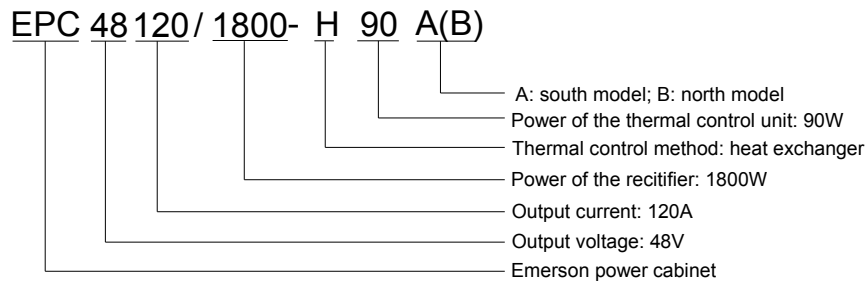


Figure 1-1 Model information

1.2 Operating Theory

The schematic diagram of the outdoor cabinet is shown in Figure 1-2.

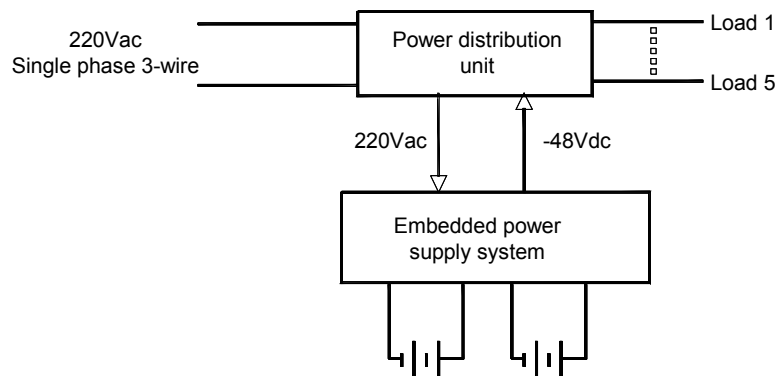


Figure 1-2 Schematic diagram

The embedded power supply system rectifies the 220Vac into -48Vdc and delivers it to the power distribution unit. It has functions of battery management, load low voltage disconnection (LLVD), battery low voltage disconnection (BLVD), data acquisition, alarm and communication with the host.

The power distribution unit connects to the AC mains and feeds the AC power supply to the embedded power system. In addition, it outputs -48V DC power to the loads through different routes.

1.3 Composition And Configuration

Composition

The outdoor cabinet is composed of equipment compartment and battery compartment. The equipment compartment consists of rectifier, monitoring module, heat exchanger, external fan and power distribution unit.

The battery compartment has two layers, and each layer can be placed with one battery string that provides backup power supply to the outdoor cabinet.

The structure of the EPC48120/1800-H90A south model outdoor cabinet is shown in Figure 1-3.

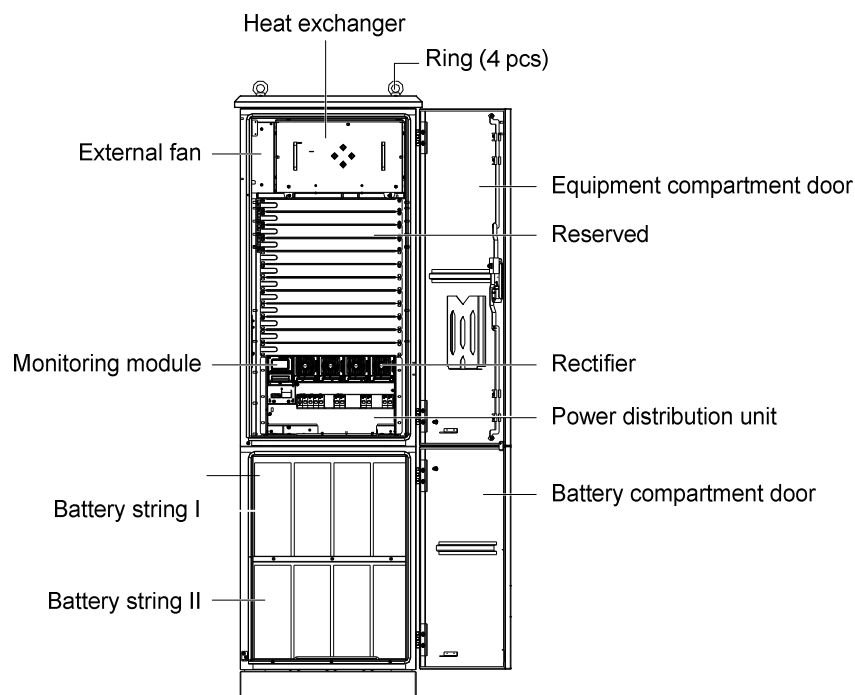


Figure 1-3 Structure of EPC48120/1800-H90A south model outdoor cabinet

The structure of the EPC48120/1800-H90B north model outdoor cabinet is shown in Figure 1-4. There is one heater in the equipment compartment and one heating unit in the battery compartment. They will start to work when the ambient temperature is low to ensure the normal operation of EPC48120/1800-H90B system in low temperature environment.

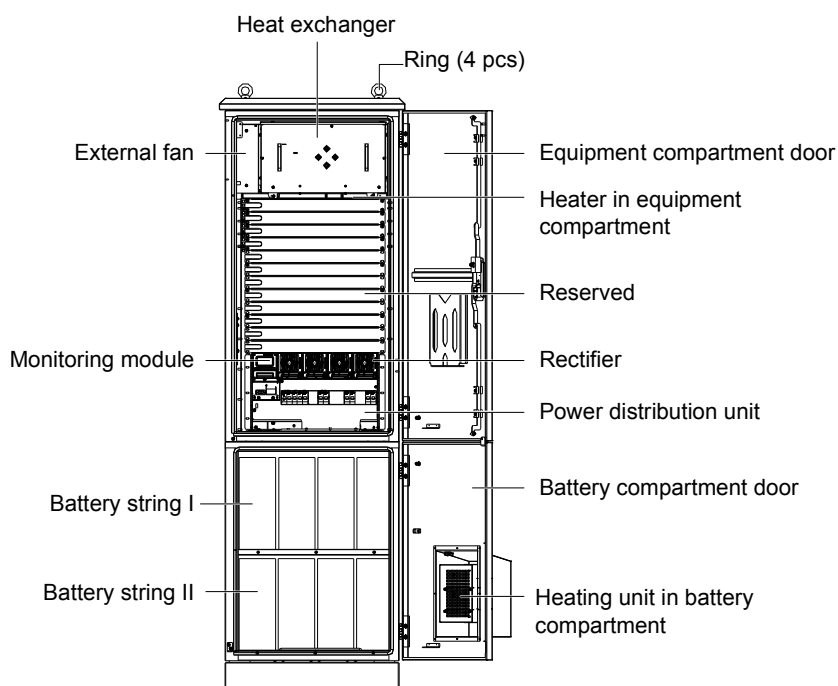


Figure 1-4 Structure of EPC48120/1800-H90B north model outdoor cabinet

Configuration

The configuration list of outdoor cabinet is given in Table 1-1.

Table 1-1 Configuration list

Component	Configuration
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Component		Configuration	
Embedded power supply system	Monitoring module PSM-D21	1 pcs	
	Rectifier R48-1800	Standard configuration: 4 pcs. Optional configuration: 2 pcs ~ 4 pcs	
Power distribution unit	AC power distribution	SPD	SPD at AC side
		AC input	One route of MCB input: 1 × 63A/2P One route of socket output: 10A socket with +10A breaker protection One heater control output (for north model): heater in equipment compartment, heating unit in battery compartment, +16A breaker protection
	DC power distribution	SPD	SPD at DC side
		Battery	Two routes of battery MCBs: 2 × 63A/1P
		Load output	Five routes normally. Total output current ≤ 120A. Among which, Three LLVD routes: 2 × 50A/1P, 1 × 32A/1P Two BLVD routes: 2 × 16A/1P (Maximum eleven routes for model A,and maximum ten routes for model B, optional)
Reserved space		Height: 12U; width: 19-inch	
Thermal control unit		One heat control board and one heat exchanger	
Other		Door status sensor: 1 pcs	

1.4 Features

Rectifier

- Power factor up to 0.99, efficiency over 91%.
- Wide AC input voltage range from 85V to 300V. When the input voltage is between 85Vac and 175Vac, the rectifier will derate the output power. The rectifier outputs 800W power upon 85Vac input.
- Hot pluggable. It takes less than 1min to replace a rectifier.

System

- Perfect battery management. The system has BLVD function, and can perform functions such as temperature compensation, auto voltage regulation, stepless current limiting, battery capacity calculation, and online battery test.
- Network design. Providing multiple communication ports, which enable flexible networking, remote monitoring and unattended operation.
- Perfect lightning protection at both AC side and DC side. AC side: Class C SPD. DC side: capable of withstanding surge current of 15kA.
- Complete fault protection and fault alarm functions.
- Front-accessible system components.
- Safety guideline: The equipment compartment satisfies IP*5 waterproof requirement and works normally under IP5* dustproof requirement test; the battery compartment complies with IP34.
- Patent ventilation duct isolation technology in the equipment compartment and battery compartment, which enhances the operation security of the system and users' equipments.
- High system efficiency: above 88%.

Chapter 2 Installation

This chapter introduces installation and cable connection. Before installation, please read through safety regulations, and then follow the instructions to carry out the installation and cable connection step by step.

2.1 Safety Regulations

Certain components in this outdoor cabinet have hazardous voltage and current. Always follow the instructions below:

1. Only the adequately trained personnel with adequate knowledge of the outdoor cabinet shall carry out the installation. The *Safety Precautions* listed before the contents of this manual and local safety rules in force shall be adhered to during the installation.
2. All external circuits that are below -48V and connected to the outdoor cabinet must comply with the requirements of SELV as defined in IEC 60950.
3. Make sure that the power (mains and battery) to the system is cut off before any operations can be carried out within the outdoor cabinet.
4. The wiring of the power distribution cables should be arranged carefully so that the cables are kept away from the maintenance personnel.

2.2 Preparation

Unpacking inspection

The equipment should be unpacked and inspected after it arrives at the installation site. The inspection shall be done by representatives of both the user and Emerson Network Power Co., Ltd.

To inspect the equipment, you should:

1. Open the packing case with a packing list in it.
2. Take out the packing list.
3. Check against the packing label one by one.
4. Check the quantity and serial No. marked on the packing cases.
5. Check the correctness of the equipment.
6. Check the quantity and model of the accessories.
7. Check the integrity of the goods.

Preparing cables

The cable selection should meet relevant industry standards.

It is recommended to use the RVVZ cables as AC cables. The cable should reach at least +70°C temperature durability. With cable length shorter than 30 meters, the Cross-Sectional Area (CSA) calculation should be based on the current density of 2.5A/mm². The suggested CSA value is not less than 16mm². If the AC input cable is longer than 30m, confirm the cable specification according to the electrician manual and make sure that the voltage drop on the cable is within requirement of system operation.

The CSA of DC cable depends on the current flowing through the cable and the allowable voltage drop.

Select the DC load cable CSA according to Table 2-1.

Table 2-1 DC load cable selection

Load route rated current	Max. output current	Min. cable CSA	Max. cable length (volt drop: 0.5V, with min. CSA)	Max. cable CSA	Max. cable length (volt drop: 0.5V, with max. CSA)
50A	32A	16mm ²	7m	25mm ²	11m
32A	16A	16mm ²	14m	25mm ²	22m
16A	10A	6mm ²	17m	25mm ²	71m

Note: The specification are applicable at ambient temperature of 25°C. If the temperature is different, the CSA should be increased

The MCB capacity should be strictly limited so that it can function properly upon load over-current. The recommended MCB capacity is 1.5 ~ 2 times larger than the load peak capacity.

The CSA of the system earth cable should be consistent with that of the maximum power distribution cable and not less than 25mm².

Select the AC input cable CSA according to Table 2-2.

Table 2-2 AC input cable selection

Connector	Specification		Remarks
	Capacity	Connector specification	
AC input MCB	63A/2P MCB connected to live line and neutral line	Cable CSA \leq 25mm ²	The live line and neutral line of AC power supply (note the polarities)
PE busbar	Two M8 bolts	Cable CSA \leq 35mm ²	Connected to the PE bar of the room

Preparing tools

The installation tools are given in Table 2-3. The tools must be insulated and ESD-proof processed before they are used.

Table 2-3 Installation tools

Tool	Specification	Tool	Specification
Combination wrench (hatch, club)	Wrench set (10#, 13#, 16#, 18#, 21#)	Box wrench	16mm
Adjustable wrench	200mm	Cross screwdriver	100mm, 200mm
Electrician diagonal pliers	150mm	Slotted screwdriver	100mm, 200mm
Electrician sharp nose pliers	150mm	Wire cutters	Maximum 300mm ²
Steel tape	5m	Hydraulic- pressure compaction pincher	Maximum 300mm ²
Electric knife	Normal type	Digital multimeter	Three and a half bit digital display
Gradienter	Normal type	Impact electric drill	With Φ 14 impact aiguille
Blinkers	To prevent splash	Power socket	With 5m cable
Fireproof mud	Configured in the accessories	Safety shoes	To prevent puncture and for insulation
Antirust paint	Configured in the accessories	Hammer	

Preparing shielding metal pipes

It is recommended to use metal pipes to shield and protect the AC input cables and other cables. Plastic coated metal hoses are recommended. Prepare the metal pipes according to the amount and size of cables.

2.3 Mechanical Installation

2.3.1 Installing The Outdoor Cabinet

The outdoor cabinet must be installed directly onto cement floor. Follow the steps below to install it:

1. Mark the specific installation position of the outdoor cabinet.

It is recommended to determine the installation position in compliance with the clearance requirements given in Table 2-4.

Table 2-4 Installation clearances

	Front	Top	Left	Right	Back
Clearances	750mm	700mm	100mm	100mm	100mm

2. Install expansion bolts

By referring to Figure 2-1, determine the exact central points of the installation holes on the floor, and mark them with a pencil or oil pen. Use the electric drill (aiguille: Φ 14) to dig holes (depth: 70mm) at the marked points. Clean the drilled holes of dust. Put the expansion bolts into the holes and knock them with a hammer till they are totally in.

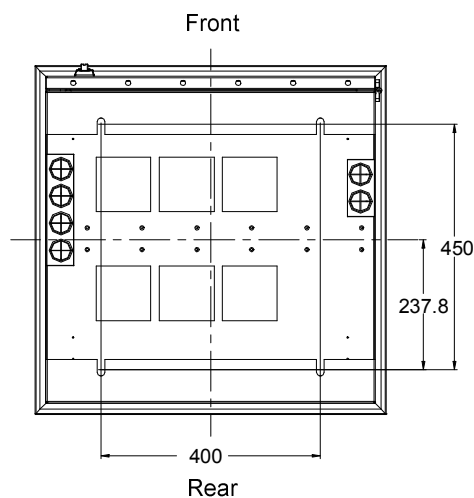


Figure 2-1 Installation size of the cabinet base (unit: mm)

3. Fix the cabinet

Connect the cabinet to installation bracket with the fixing screws. Move the cabinet to the installation position marked on the floor. Make the installation holes on the cabinet base coincide with those dug on the floor. Screw the M10 bolt down into the expansion pipe in the floor, as shown in Figure 2-2.

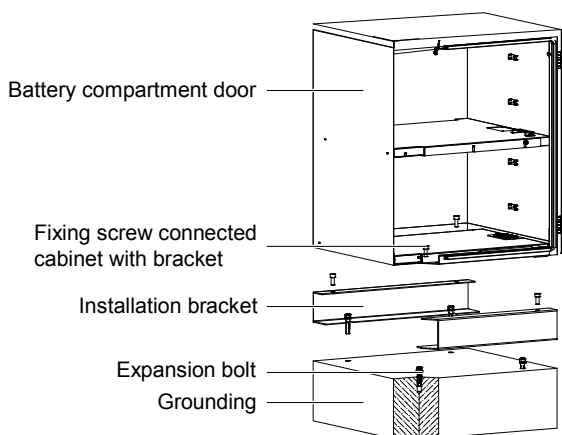


Figure 2-2 Fixing the cabinet

After installation, the cabinet should stand firmly no matter how it is shaken.

2.3.2 Opening And Closing Cabinet Door

Procedures for opening and closing the cabinet door are as follows:

Opening and closing equipment compartment door

1. Insert the key into the keyhole, and turn the key clockwise until the door handle pops out.
2. Turn the handle counter-clockwise 90°, as shown in Figure 2-3. Pull the handle until the equipment compartment door opens.

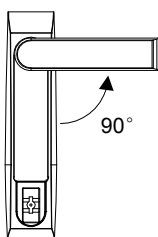


Figure 2-3 Turn the handle

3. Adjust the door stay bar to the position shown in Figure 2-4 to prevent the equipment compartment door from closing automatically.

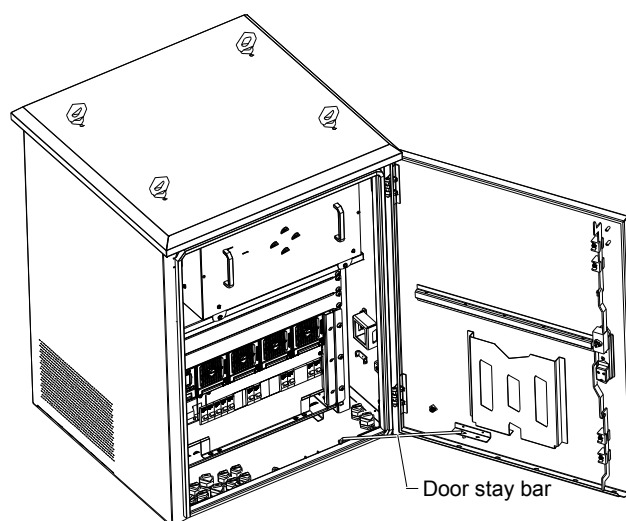


Figure 2-4 Door stay bar of the equipment compartment

4. To close the door, restore the door stay bar to its original position and close the door; finally, turn the handle to its original position and press it down until a click is heard.

Opening and closing battery compartment door

1. Open the battery compartment door before opening the equipment compartment door, according to the previous method of opening and closing equipment compartment door.
2. Loosen the fixing screw of the pole with the cross point screwdriver, as shown in Figure 2-5.

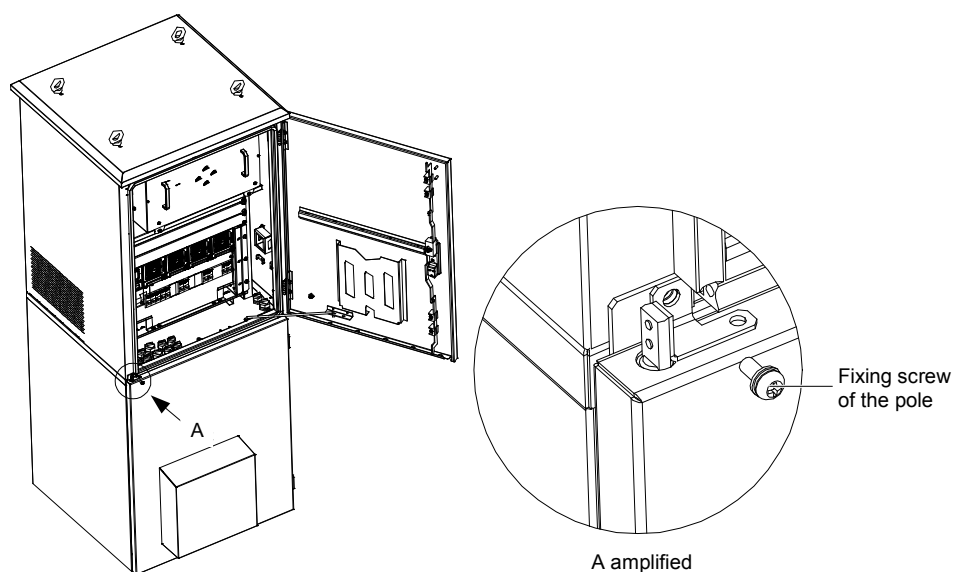


Figure 2-5 Fixing screw of the pole

3. Turn the pole clockwise 180° and pull it up, as shown in Figure 2-6. The battery compartment door is open.

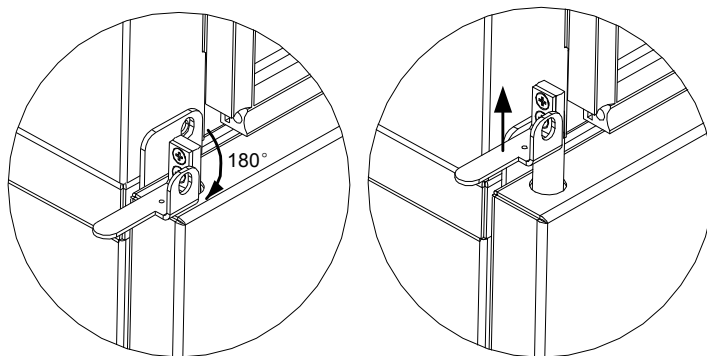


Figure 2-6 Opening battery compartment door

4. Adjust the door stay bar to the position to prevent the battery compartment door from closing automatically. The method is the same as that of the equipment compartment door.
5. To close the door, restore the door stay bar and the pole to their original positions and close the door; finally, tighten the fixing screw of the pole.

2.3.3 Installing Rectifiers And Monitoring Module

Note

1. When installing the rectifier, hold the handle and push the rectifier into the slot gently, otherwise the slot might be damaged.
2. When the rectifier amount is less than four, insert the rectifiers into the slots from left to right (except the slot for the monitoring module).

Installing rectifiers

1. Loosen the fixing screw of the handle with the cross point screwdriver, as shown in Figure 2-7. The handle will pop out automatically and the positioning pin under the rectifier will retract into the rectifier.

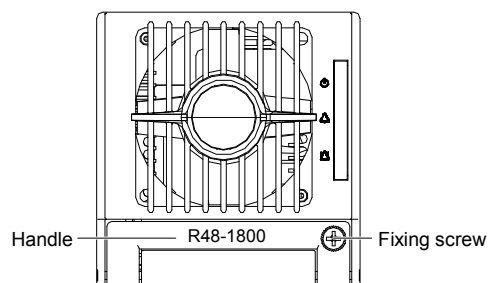


Figure 2-7 Handle position

2. Put the rectifier onto the guide rail (see Figure 2-8 for installation positions).
3. Push the rectifier completely into the cabinet.
4. Push the handle into the front panel to pop out the positioning pin and lock the rectifier to the cabinet.
5. Fasten the fixing screw of the handle with the cross screwdriver.

The mounted rectifiers are shown in Figure 2-8.

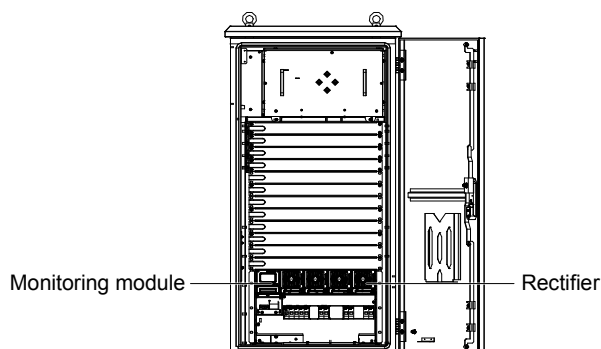


Figure 2-8 Mounted modules

Installing monitoring module

Press the handle of the monitoring module to pop it out, and refer to the installation steps listed above to push the monitoring module into the correct slot, as shown in Figure 2-8. Close the handle to lock the monitoring module to the cabinet.

2.4 Electrical Installation

The AC/ DC cables and the communication cables must be put into the metal pipe for protection. The metal pipe should be connected to the PE bar reliably. Plastic coated metal hoses are recommended.

Note

1. Grounding cables and AC input cables enter into the cabinet from right side of the bottom.
2. Signal cables, user equipment cables and load cables enter into the cabinet from left side of the bottom.

2.4.1 Connecting Power Cables

Connecting grounding cables

The procedures of connecting grounding cables are as follows:

1. Remove the power distribution unit cover. The cover is shown in Figure 2-9.

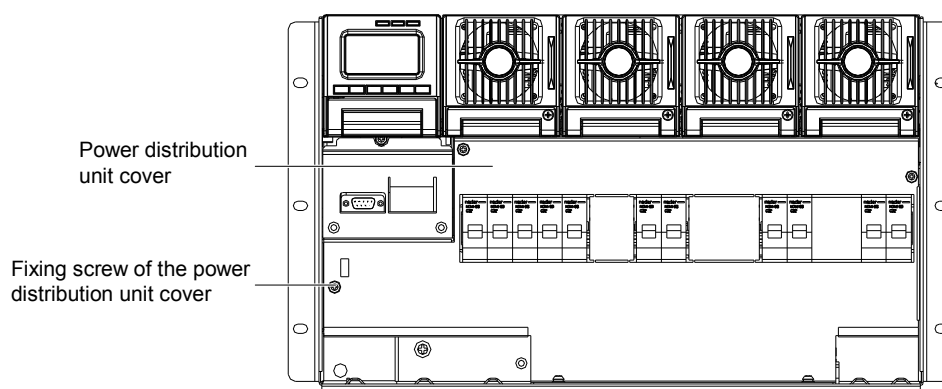


Figure 2-9 Position of the power distribution unit cover

2. Cut the cable bushing over the entry hole with an electrician knife to lead in cables, as shown in Figure 2-10.
3. Put the grounding cable through the entry hole on the right side of cabinet bottom. Route the cable along the frames. Lead the cable through the cable connector, as shown in Figure 2-11.

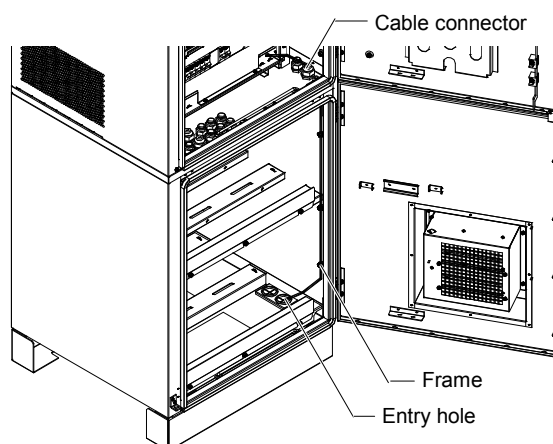


Figure 2-10 Routing grounding cable

4. Connect one end of the grounding cable to the grounding terminal and solder the other end to the metal base reliably, as shown in Figure 2-11.

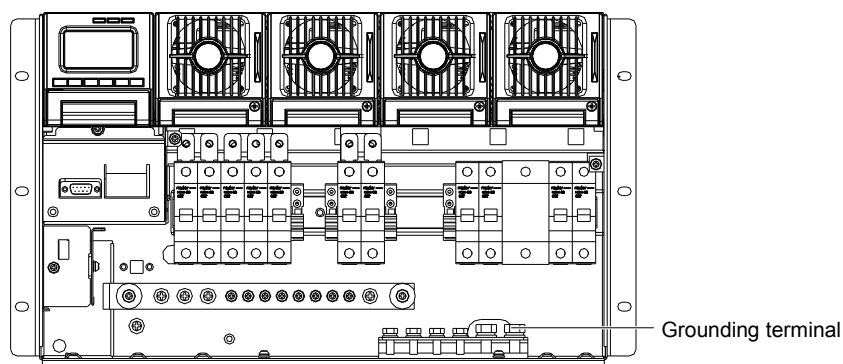


Figure 2-11 Position of the grounding terminal

5. Fix the grounding cable to the cable frame with nylon ties, as shown in Figure 2-11.

Connecting AC input cables



Danger

1. Switch off all MCBs before the electrical connection.
2. Only the qualified personnel can connect the mains cable.

1. The AC input cables routing method is the same as that of the grounding cables, as shown in Figure 2-11.
2. Connect the live line and neutral line of the AC input phase cables respectively to the lower terminals of the AC input MCB L and AC input MCB N, as shown in Figure 2-12.



Note

Make sure that the connections of live line (L) and neutral line (N) are correct, or else the power supply system will be damaged.

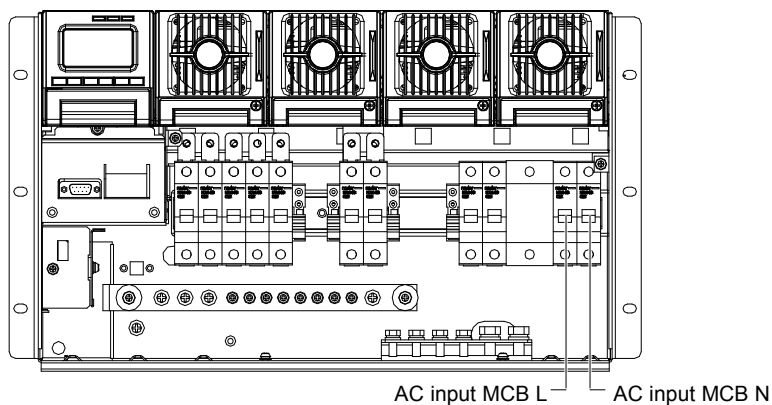


Figure 2-12 Position of the AC input terminals

Connecting load cables

1. Load distribution scheme

The outdoor cabinet can sustain five routes of load that are controlled by five load MCBs, as shown in Figure 2-13. The load MCBs in the power distribution unit are defined as load MCB 1 to load MCB 5 from left to right.

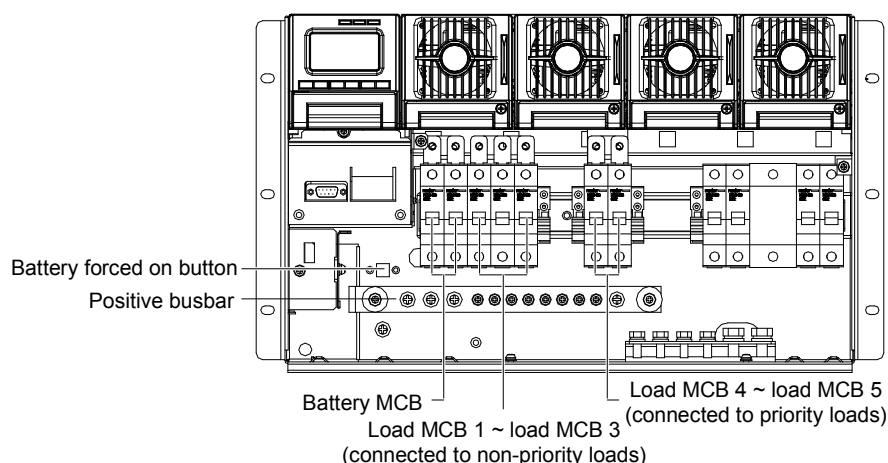


Figure 2-13 Load cable connection terminals

The specifications of the load MCBs and load cables are given in Table 2-5.

Table 2-5 Load MCBs and load cables specifications

Load MCB	MCB cap. in distr. unit	Cable size in distr. unit	Remark
Load MCB 1, load MCB 2	50A	$\leq 25\text{mm}^2$	Total output capacity is no larger than 50A
Load MCB 3	32A	$\leq 25\text{mm}^2$	Total output capacity is no larger than 32A
Load MCB 4, load MCB 5	16A	$\leq 25\text{mm}^2$	Total output capacity is no larger than 16A

Upon mains failure, the battery sustains the power system. When the battery voltage drops down to 46.6V (default), the system will disconnect the loads connected to load MCB 1 to load MCB 3. When the battery voltage drops down to 45.6V (default), the system will disconnect the loads connected to load MCB 4 and load MCB 5 to avoid battery overdischarge. At this time, all the loads are disconnected.

To test the system upon mains failure, you can push the battery forced on button (see Figure 2-13) to power the external connection equipments through batteries. Meanwhile, the monitoring module will work normally and provide BLVD function.

The priority loads should be connected to load MCB 4 and load MCB 5. The non-priority loads should be connected to load MCB 1 to load MCB 3.

2. Load cable connection method

- 1) The load cables routing method is similar to that of the grounding cables. The difference is that the load cables are introduced into the cabinet from the entry holes on the left side of bottom.
- 2) Connect the negative load cables to the underpart of the load MCB. Connect the positive load cables to the positive busbar, as shown in Figure 2-13.

2.4.2 Connecting Signal Cables

Ports of signal transfer board

All the signal cables are connected to the P144309X1 signal transfer board in the distribution unit, as shown in Figure 2-14.

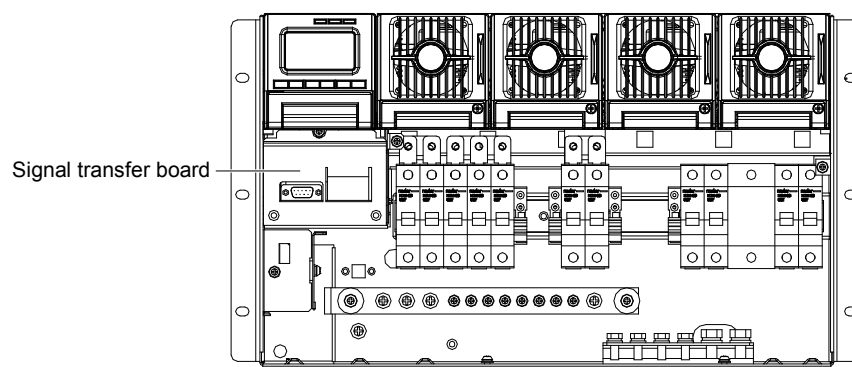


Figure 2-14 Position of the signal transfer board

The ports of the signal transfer board are shown in Figure 2-15, of which RS232 port (silk print: J_232) and dry contact alarm ports (silk print: J_RLY) are used by users. The functions of the ports are given in Table 2-6.

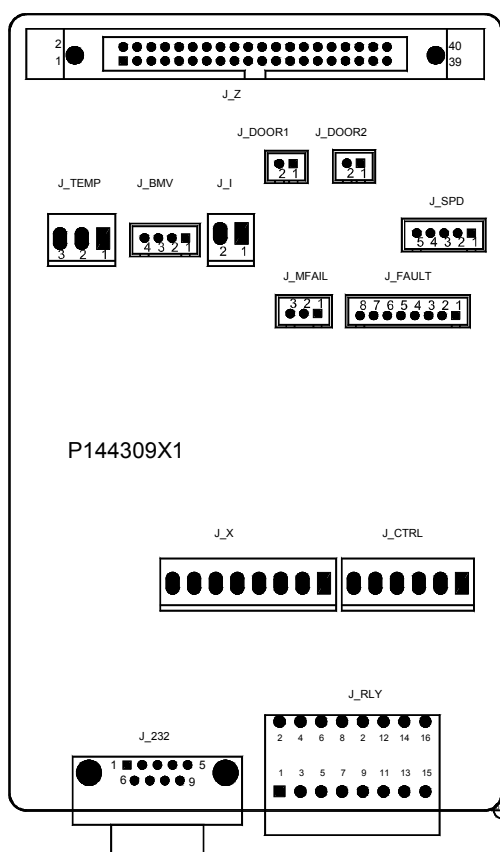


Figure 2-15 P144309X1 ports

Table 2-6 Port functions

Port	Function	Port	Function
J_BMV	Mid-voltage sampling port	J_CTRL	Contactor operation port
J_TEMP	Temperature sampling port	J_232	Background communication port (male socket)
J_I	Current sampling port	J_X, J_Z	Connection cable of P144309X1, P144309X2
J_SPD	Lightning alarm port	J_RLY	Dry contact port
J_MFAIL	Connection cable of P144309X1, P144309U1	J_DOOR1	Signal sampling port of door sensor 1
J_FAULT	Connection cable of P144309X1, P144309U1	J_DOOR2	Signal sampling port of door sensor 2 (connected to battery cabinet)

Connecting dry contacts

PSM-D21 monitoring module provides seven pairs of dry contacts.

Peel one end of the signal cable and insert it into the J_RLY (pin number: 1 and 2), J_RLY (pin number: 3 and 4), J_RLY (pin number: 5 and 6), J_RLY (pin number: 7 and 8), J_RLY (pin number: 9 and 10), J_RLY (pin number: 11 and 12) and J_RLY (pin number: 13 and 14) dry contacts. Fasten the connection by tightening the screw on the terminal.

The functions of dry contacts are given in Table 2-7.

Table 2-7 Dry contact functions

Pin number	Definition	Interface	Function
1	Mains failure	J_RLY (1, 2)	Default value. Reconfigurable
2	Rectifier failure	J_RLY (3, 4)	Default value. Reconfigurable
3	Battery low voltage	J_RLY (5, 6)	Default value. Reconfigurable
4	Door status sensor alarm	J_RLY (7, 8)	Default value. Reconfigurable
5	Heater failure	J_RLY (9, 10)	Default value. Reconfigurable

Pin number	Definition	Interface	Function
6	AC/DC SPD fault	J_RLY (11, 12)	Default value. Reconfigurable
7	Fan fault	J_RLY (13, 14)	Default value. Reconfigurable
Note: Users can choose normally-closed type or normally-open type (default) dry contacts. Refer to the screen prints on the board for detailed connection			

2.4.3 Sealing The Entry Holes

After finishing the cable connections, replace the power distribution unit cover (see Figure 2-9) and seal the entry holes (see Figure 2-10) with fireproof mud.

2.5 Battery Installation

Note

1. The batteries may have dangerous current. Before connecting the battery cables, make sure all the battery input MCBs are off.
2. Be careful not to reverse connect the battery. Otherwise, both the battery and the outdoor cabinet system will be damaged!
3. The installation tools must be insulated. Do not damage the plastic cover of the battery and their output terminals during the installation.

The battery compartment can accommodate two battery strings.

Installation check

1. Check that the battery shells are in good condition.
2. Check that the polarities of the terminals are in accordance with the polarity marks on the battery shell.
3. Check that the terminal bolts are fastened.

Installation procedures

Note

When installing two battery strings, install battery string II first. While disassembling them, disassemble battery string I first. Battery I and battery string II positions are shown in Figure 2-16.

1. Switch off the AC input MCB and battery MCB. The MCB positions are in Figure 2-12 and Figure 2-13.
2. Remove the two fixing screws of the battery baffle (optional) and take off the baffle. The baffles are shown in Figure 2-16.

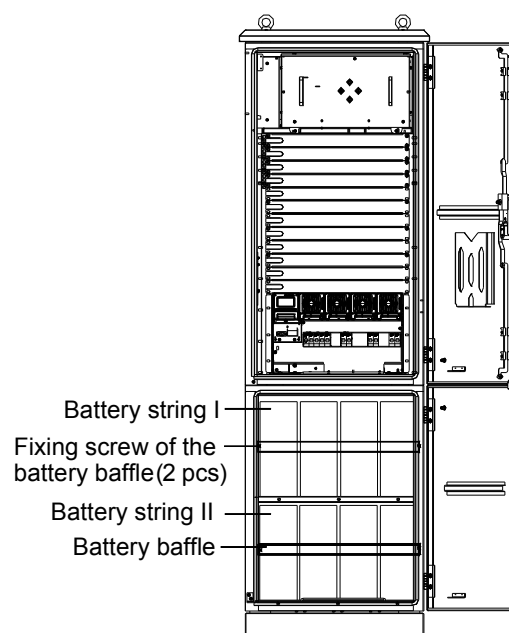


Figure 2-16 Position of the battery baffle

3. Push the batteries into the battery compartment from right to left. The clearance between adjacent batteries should be at least 10mm.
4. Remove the cover of the battery terminals and connect the plate electrodes between the batteries. Note that the mid-voltage sampling cable should be connected to the plate electrode between the second and the third batteries.
5. Connect the positive battery cables to the positive pole of the batteries. Connect the negative battery cables to the negative pole of the batteries. Attach the acid and alkali integration box (battery accessory) on the right side panel of the cabinet.
6. After installing the battery strings, use the 3M double side adhesive tape pasted on the battery temperature sensor to paste the sensor onto the center of the upper-layer battery string.
7. Measure the voltage of the battery strings. If the voltage value is correct, put the baffle (if configured) back and fasten the screws, so that the battery strings are blocked off.
8. Replace the battery covers.

2.6 Installation Inspection

After installation, you should carry out the inspection procedures given in Table 2-8.

Table 2-8 Installation inspection list

Check item	No.	Check content
Cabinet installation	1	Check that the cabinet is horizontally, vertically and steadily fixed
	2	Check if all the screws are tightened, especially those in electrical connections. Check that the bolts have plain washers and spring washers and are not reversed
	3	Check that there are no unwanted materials inside the cabinet and clear up the unwanted materials
	4	Check that the cabinet paint is intact. If there are scratches, paint them immediately with antirust paint to prevent corrosion
	5	Clean up the cabinet
	6	Check that the door can move freely, the lock is in good condition and the door stay bar is fixed
	7	Check that the dummies are installed at the reserved space where no customer device is installed. Check that the battery baffles (if configured) are installed
Electrical connection	1	Measure the resistance value between the positive terminal and negative terminal and phase- to - phase resistance value in the AC loop. Make sure there is no shortcircuit
	2	Check the AC input and distribution. Check that the color of the AC cables is normative, the cables are laid fast, and the safety labels are complete. Refer to <i>Appendix 4 Wiring Diagram</i> for the AC cable routing and connection
	3	Check the connection point, line sequence and polarities of DC cables. Check the connection polarities of the batteries. Check that the connection points are fixed and the cable connections are correct and reliable
	4	Check that the SPD PE cable and grounding cable are correctly connected and the contacts are reliable
	5	Check the communication cables of the monitoring module. Check that the rectifiers are fastened down
	6	Check that the SPD MCB is switched on and other MCBs are switched off
	7	Check that the cables are tidy, and the cable binding is normative

Chapter 3 Testing

This chapter introduces procedures of testing. The corresponding safety rules shall be adhered to in the testing.

3.1 Installation Check And Startup



Note

Before the test, inform the chief manufacturer representative. Only the trained electrical engineer can maintain and operate this equipment. In operation, the installation personnel are not allowed to wear conductive objects such as watches, bracelets, bangles and rings.

During operation, parts of this equipment carry hazardous voltage. Misoperation can result in severe or fatal injuries and property damage. Before the test, check the equipment to ensure the proper earthing. Installation check must be done before testing. Then the batteries can be charged for the first time.

Make sure that the AC input MCBs, load MCBs are switched off. Make sure that all the devices are properly installed.

Installation check

Check item	OK	Comments
Check the correctness of all the MCBs and cables specifications.	<input type="checkbox"/>	
Check the correctness of bus bar connections, input and output cable connection, and connection between the power system and the system grounding.	<input type="checkbox"/>	
Check the correctness of the batteries number and connection, and battery strings polarities.	<input type="checkbox"/>	
Make sure all the cable connections are firm and reliable.	<input type="checkbox"/>	

Startup preparations

Check item	OK	Comments
Make sure that all the MCBs are switched off.	<input type="checkbox"/>	
Measure the AC input voltage. Make sure the input voltage is within the allowable range.	<input type="checkbox"/>	Umin=___V
Check that the communication and alarm cables are connected to the signal transfer board.	<input type="checkbox"/>	
Check that the temperature sensor has been installed.	<input type="checkbox"/>	
Check that the battery string circuit is not closed.	<input type="checkbox"/>	
Connect the disconnected batteries to the battery string circuit.	<input type="checkbox"/>	
Measure with a voltmeter across the connection points of each battery and make sure that the polarity is right. For a lead-acid battery with 24 cells, the voltmeter should read 2.0-2.1V/cell or 48-51V/battery. If the voltage of certain cell is lower than 2.0V, that cell must be replaced.	<input type="checkbox"/>	Umin=___V
Check with an ohmmeter that there is no short circuit between the positive & negative distribution bus bars, or between the positive & negative battery poles.	<input type="checkbox"/>	
(Note: Pull out all modules before the check and restore them after the check)		

Startup

Check item	OK	Comments
Switch on the system AC input MCB. The green LED on the rectifier will be on and the fan will start running after a certain delay. The monitoring module will show that the power supply voltage is 54.0V.	<input type="checkbox"/>	
Check the system voltage and busbar polarity with a voltmeter. The voltage difference between the measured value and displayed value should be less than $\pm 0.2V$.	<input type="checkbox"/>	
Startup and close each rectifier of the system by unplugging and inserting the rectifier one by one. Check their output voltages.	<input type="checkbox"/>	

3.2 Basic Settings

When the system is put into service for the first time, the parameters of monitoring module must be set based on the actual system configuration, such as battery number, capacity, user's charge current limit and other functional requirements. Only after that can the monitoring module display system operation information and control the output.

For monitoring module parameter setting method, see 4.7 *Setting System Parameters*.

Check item	OK	Comments
The system model has been set correctly in factory before delivery, check that the setting agrees with the actual system (48V/30A/200/NONE).	<input type="checkbox"/>	
The battery string number set at the monitoring module should be the same as the number actually connected. (By default: 2)	<input type="checkbox"/>	
Set the battery capacity according to the actual capacity of the battery connected to the system. Default: 200Ah.	<input type="checkbox"/>	
Configure the temperature coefficient according to the battery manufacturer's requirement. Setting range: 0-500mV/°C. By default: 72mV/°C/str. (if no temperature sensor is installed, do not set this parameter)	<input type="checkbox"/>	
Set the charge current limit according to your needs. Setting range: 0.1C ₁₀ ~ 0.15C ₁₀ . (By default: 0.1C ₁₀)	<input type="checkbox"/>	
Set the monitoring module according to the voltage suggested by the battery supplier.	<input type="checkbox"/>	
Floating Charge (FC) voltage range: 42V ~ Boost Charge (BC) voltage. Default: 54.0V.		
BC voltage range: FC voltage ~ 58V. By default: 56.4V.		
For batteries that do not need BC, set the BC voltage to FC voltage plus 0.1V.		
Switch on the battery MCBs and connect the batteries.	<input type="checkbox"/>	

3.3 Alarm Check And System Operation Status Check

Alarm check

Check that all functional units can trigger alarms that can be displayed on the monitoring module.

Check item	OK	Comments
Pull out one rectifier. The 'Rect N Com Failure' alarm should be triggered. Insert the rectifier in. The alarm should disappear. Repeat the same procedures on other rectifiers. Note: Plug different modules for a certain interval of time, in order to avoid 'Rect Lost' alarm	<input type="checkbox"/>	
Switch off battery MCB 1. The 'Batt1 Failure' alarm should be triggered. Switch on the MCB. The alarm should be cleared. Repeat the same on other battery MCBs.	<input type="checkbox"/>	
Switch off a load MCB connected to a load route. The alarm 'Load N Failure' should be triggered.	<input type="checkbox"/>	
Switch on the MCB, and the alarm should be cleared. Repeat the same on the other load MCBs.	<input type="checkbox"/>	
Switch off all the battery MCBs. Keep only one rectifier in operation. Through the monitoring module, adjust the rectifier FC voltage to make it lower than the alarm point. The alarm 'DC Voltage Low' should be triggered.	<input type="checkbox"/>	
Keep the rectifiers in operation. Set through the monitoring module the battery management parameter to 'Manual'. Enter the maintenance menu at the monitoring module. Select 'Disconnect' and confirm it. The battery protection contactor should be open, and the 'BLVD' alarm should be displayed at the monitoring module.	<input type="checkbox"/>	
Unplug one AC SPD module. The 'AC SPD fault' alarm should be triggered. Insert the AC SPD module, the alarm should be cleared.	<input type="checkbox"/>	
Note: when the preceding alarms are generated, the monitoring module will give alarms after approximately 3s. Refer to 4.5 <i>Querying Alarms</i> for methods of querying alarms.		

System operation status check

There should be no alarms during normal system operation. The system operation status check can be conducted through the monitoring module.

For the parameter query method, refer to 4.3 *Querying System Main Information* and 4.4 *Querying Rectifier*.

Check item	OK	Comments
The system model is 48V/30A/200/NONE.	<input type="checkbox"/>	
The monitoring module should display the correct AC voltage.	<input type="checkbox"/>	
The monitoring module should be able to display the DC voltage. The difference between the displayed voltage and that measured at the bus bar with should be less than $\pm 0.2V$.	<input type="checkbox"/>	
The monitoring module should display the battery current. The difference between the displayed and measured battery current should be less than 1%.	<input type="checkbox"/>	
Check the number of the rectifier through the monitoring module. The number should be consistent with the actual number.	<input type="checkbox"/>	
Check the voltage, current, current limiting point of rectifiers through the monitoring module. They should agree with the actual parameters.	<input type="checkbox"/>	
For the system configured with temperature sensor, the monitoring module should be able to display	<input type="checkbox"/>	

Check item	OK	Comments
the battery ambient temperature. Hold the probe of the temperature sensor with hand and watch the monitoring module, which should display the change of temperature.		

3.4 Final Steps

Check item	OK	Comments
Disconnect all test equipments from the system and make sure that materials irrelevant to the equipment have been all removed.	<input type="checkbox"/>	
Restore the outdoor cabinet to its original condition and close the cabinet door.	<input type="checkbox"/>	
Check and handover the equipment that the user has purchased.	<input type="checkbox"/>	
Note down all the operations taken, including time of the operation and name of the operator.	<input type="checkbox"/>	

If any defect is found in this equipment, inform the personnel responsible for the contract.

If repairing is needed, please fill in the FAILURE REPORT and send the report together with the defective unit to the repairing center for fault analysis.

Chapter 4 Use Of Monitoring Module

This chapter gives a brief introduction to the front panel and functional keys and detailed introduction to LCD display, access approach, system control, information querying and parameter setting.

For the factory setting of the monitoring module values and the menu structure of the monitoring module, refer to *Appendix 2 Parameter Setting Of The Monitoring Module* and *Appendix 3 Menu Structure Of The Monitoring Module*.

4.1 Front Panel

The front panel of PSM-D21 monitoring module is shown in Figure 4-1.

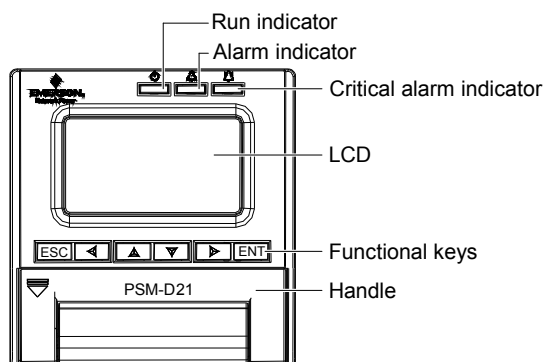


Figure 4-1 Front panel of the monitoring module

Description of the indicators on the front panel is given in Table 4-1.

Table 4-1 Monitoring module indicator description

Indicator	Indicator color	Normal state	Fault state	Fault cause
RUN	Green	On	Off	No power supply to the monitoring module
Alarm	Yellow	Off	On	Observation alarms
Critical alarm	Red	Off	On	Major or critical alarm

PSM-D21 monitoring module uses a 128 × 64 LCD, a keypad with 6 keys (see Table 4-2). The interface language is Chinese/English optional. The front panel of the monitoring module is easy to disassemble and replace.

Table 4-2 Description of monitoring module keypad

Key	Function
ESC	Return to the upper level menu
ENT	Enter the main menu or confirm the menu operation
▲ and ▼	Shift among parallel menus. For a character string, these 2 keys can be used to shift among different options
◀ and ▶	Change values at a value setting interface. For a character string, these 2 keys can move the cursor left or right

4.2 Main LCD Pages

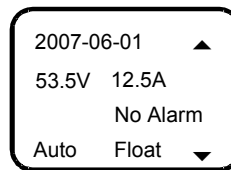
This chapter will refer to the following LCD pages for many times. And this section introduces the contents of these LCD pages and how to access them.

4.2.1 System Information Page

When the monitoring module is powered on, the language selection page will appear and the monitoring module will be initialized. The default language is English. After initialization, the first page of system information will appear.

The system information page shows the main information; you can press ▲ or ▼ repeatedly to select different system information pages. At this page, you may use ◀ and ▶ to adjust the LCD contrast (7-level).

The first system information page appears the following page. There will be a difference for the displayed actual value.



1. After initialization, the first system information page appears.
2. At the Main Menu page, press ESC to return to the first system information page.
3. If no operation is conducted on the monitoring module keypad for 8 minutes, the LCD will return to the first system information page. The time of that return will be recorded automatically, and can be queried through the host.
4. At any system information page, press ESC to display the serial No. of the monitoring module and the software version.

4.2.2 Enter Password Page

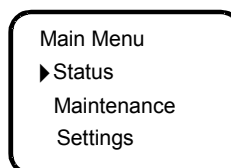
During the operation, the system will prompt you to enter password, as shown in the following page. Only the correct operation password will allow you to enter the page you need.



1. To input the password, use ▲ or ▼ to modify numbers, and use ◀ or ▶ to move the cursor. After the input, press ENT to confirm.
2. If the password is incorrect, system will prompt "Password incorrect". If the password is less than 6 digits, end it with a #.
3. Press ESC to return to Main Menu page.
4. The system has three different password levels: user level (default: 1), operator level (default: 2) and administrator (default: 640275).

4.2.3 Main Menu Page

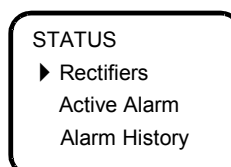
Main Menu page is the highest menu, which contains 3 sub-menus: Status, Maintenance and Settings.



1. At any system information page, press ENT to enter the Main Menu page.
2. At any sub-menu of the Main Menu page, press ESC repeatedly to return to the higher-level menu, and ultimately to the Main Menu page.

4.2.4 STATUS Page

The STATUS page is a sub-menu of the Main Menu. It contains three sub-menus, including Rectifiers, Active Alarm and Alarm History.

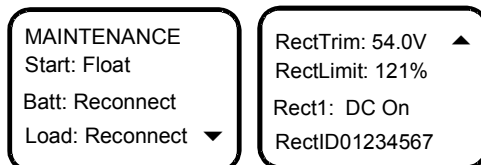


1. At the Main Menu page, press ▲ or ▼ to select the Status menu, and press ENT to confirm.
2. At any sub-menu of the STATUS page, press ESC repeatedly to return to the higher-level menu, and ultimately to Main Menu page.

4.2.5 MAINTENANCE Page

Displayed in two pages, the MAINTENANCE page is a sub-menu of the Main Menu. The system will enter the MAINTENANCE page when the Battery Management is set to Manual (see 4.7.2 *Battery Settings*). It is used to control the system in real time. When you want to enter the MAINTENANCE page, input the correct password and press ENT again to enter the Maintenance menu. You can choose to enter the Maintenance menu by using the user, operator or administrator password, for this menu, all users have the same authority.

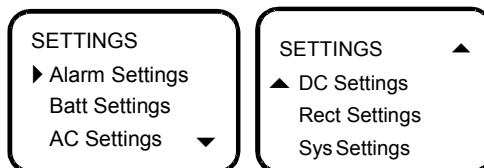
The two pages of MAINTENANCE are shown as follows.



1. At the Main Menu page, press ▲ or ▼ to select the Maintenance menu, and press ENT to confirm.
2. Input the correct operation password and press ENT to enter the MAINTENANCE page. Press ▲ or ▼ to scroll to the operation page you need.

4.2.6 SETTINGS Page

Displayed in two pages, the SETTINGS page is a sub-menu of the Main Menu. It is used to set system parameters. Input correct operation password to enter the SETTINGS page.



1. At the Main Menu page, press ▲ or ▼ to select the Settings menu and press ENT to confirm. System will then prompt you to input the password.
2. Input the correct operation password and press ENT to enter the SETTINGS page. Press ▲ or ▼ to scroll to the operation page you need.

Users with different password level have different authorities. See Table 4-3.

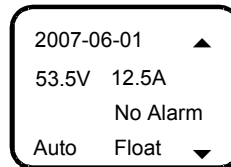
Table 4-3 Different password levels and relevant different authorities

Level	Authority	Default password
User	Configuration of general parameters	1
Operator	User's authority, plus resetting system, resetting password and modifying system type	2
Administrator	Operator's authority, plus modifying password of all levels	640275

4.3 Querying System Main Information

DC, system operation state, battery state and battery management mode information.

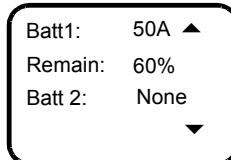
At any system information page, press ▲ or ▼ repeatedly to select the first system information page. At the other pages, press ESC repeatedly to return to the first system information page. DC voltage and current, system operation state, battery state and battery management mode are displayed in the first system information page, as shown in the following page.



The date is displayed at the interval of 2s. System operation state contains No Alarm and Alarm. Battery management mode includes Auto and Manual. Battery state includes Float charge, Temp Comp, Boost charge, Cyclic Boost, Batt. Test, ShortTest and TimeTest.

Battery information

At the first system information page, press ▼ to query the battery information, as shown in the following page.

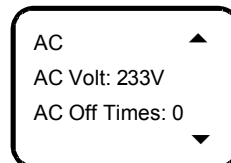


As shown in the above page, they represent respectively the current of the battery that battery shunt 1 and shunt 2 is connected to. Because the Shunt Coeff of battery group is set to No, the battery information page of Batt 2 is Not connected and no actual capacity will be displayed.

The remaining battery capacity can be displayed in the mode of percentage, remaining Ah or remaining time. The default is the percentage.

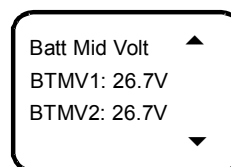
AC information

At the battery information page, press ▼ to display AC information page, as shown in the following page. The system will display AC voltage inspected by the rectifiers.



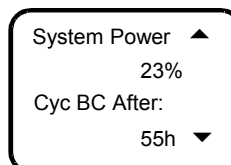
Batt Mid Volt information

Press ▼ at the AC information page, the Batt Mid Volt page will appear. The monitoring module will display the battery middle voltage of all the batteries, as shown in the following page.



System power and Cyc BC After information

Press ▼ at the Batt Mid Volt page, the System power and Cyc BC After information will appear, as shown in the following page.



The first line of the information page displays the System Power and percentage of the rated power. The next line displays BC prompts. They will be different with different systems, including:

1. Prompt the time of the next Cyclic BC according to the battery state.
2. If BC is going on, the Charging will be prompted.
3. If BC is disabled, this row will be empty.

Bat Charge Time information

Press ▼ at the System Power system page, the Bat Charge Time information will appear, as shown in the following page.

Bat Charge Time▲ 0—0.5Hour: 0 0.5—1Hour: 0 1—2Hour: 0 ▼	2—3Hour: 0 ▲ 3—4Hour: 0 4—5Hour: 0 5—6Hour: 0 ▼	6—7Hour: 0 ▲ 7—8Hour: 0 More than 8Hour: 0 ▼
--	--	--

Bat Discharge Time information

Press ▼ at the Bat Charge Time page, the Bat Discharge Time information will appear, as shown in the following page.

Bat Discharge Time▲ 0—0.5Hour: 0 0.5—1Hour: 0 1—2Hour: 0 ▼	2—3Hour: 0 ▲ 3—4Hour: 0 4—5Hour: 0 5—6Hour: 0 ▼	6—7Hour: 0 ▲ 7—8Hour: 0 More than 8Hour: 0 ▼
---	--	--

System temperature information

Press ▼ at the Bat Discharge Time page, the Bat. Temp will appear, as shown in the following page.

Bat.Temp : ▲ 25℃ ▼

This temperature sensor is specially used to detect the temperature of the battery compartment and performs functions, such as battery temperature compensation, BC and FC. If the temperature sensor is not connected or is faulty, system will prompt that the temperature sensor is invalid. Meanwhile, alarm information page will display Temperature sensor 1 not connected or Temperature sensor 1 failures. If the monitoring module bans BC and no temperature sensor is configured, this page will not be displayed.

4.4 Querying Rectifier Status

The rectifier information includes the rectifier serial No., voltage, current, current limit, mains situation, rectifier power limit and temperature power limit.

Use ▲ or ▼ to select the Rectifiers sub-menu, as shown in the following pages. Press ENT to confirm.

Rect 1: 01234567 54.1V 30.2A AC On DC On 220V	Rect 1: 01234567 CurrLimit : 34% AC Derated: N Temp. Derated: N
--	--

The information of every rectifier is displayed in two pages. Press ► to scroll to the next page, or ◀ to return to the last.

At most 24 pieces of rectifier information can be displayed. When selecting one rectifier, the Run indicator of the corresponding rectifier will blink. If the rectifier communication is interrupted, the information will be displayed in high light.

4.5 Querying Alarms

You can query historical alarms and active alarms through the LCD of the monitoring module.

4.5.1 Querying Active Alarm

When a new alarm is raised, and there is no operation on monitoring module keypad with 2min, the LCD of the monitoring module will prompt automatically the active alarm.

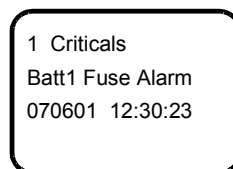
If there are multiple alarms in the current system, you can query alarms through the following steps.

Press ▲ or ▼ to select Active Alarm menu. Press ENT to confirm.

1. If there is no active alarm, ACTIVE ALARM: None will be displayed.
2. If there is any alarm, the display will be like the following page.



As shown in the above page, the system exists three active alarms. Press ENT to display detailed alarm information, as shown in the following page.



The information in the active alarm information page includes alarm serial No., alarm level, alarm name and time. The alarm raising time determines the sequence it is displayed, with the latest alarm displayed first. Use ▲ or ▼ to view all active alarms.

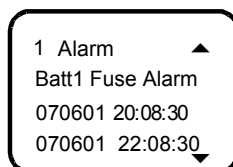
While querying rectifier alarms, press ►, and the rectifier ID will be displayed, and the Run indicator of the corresponding rectifier will blink. In the case of battery test alarm or maintenance time alarm, press ► to display the prompt information. Press ENT to confirm the alarm.

4.5.2 Querying Alarm History

1. At Status page, press ▲ or ▼ to select Alarm History menu. Press ENT to confirm.

1) If there is no historical alarm, ALARM HISTORY: None will be displayed.

2) If there is historical alarm, the display will be like the following page.



If it is a rectifier that raised the alarm, the ID of that rectifier will be displayed

The historical alarms of the monitoring module are stored in cyclic order. Up to 200 alarms will be recorded. Above that, the earliest alarm will be cleared automatically.

2. Use ▲ or ▼ to view other historical alarms.

3. At any ALARM HISTORY page, press ESC repeatedly to return to the first system information page.

4.6 Maintenance

Note

Be careful! BLVD operations may result in power interruption.

After operation under the Manual mode, please change the battery management mode from Manual to Auto. Or else, the battery may over-discharge.

1. At battery parameter setting page, change the battery management mode from Auto to Manual. Press ENT to confirm. The detailed procedures can see *Basic parameters* in 4.7.2 *Battery Settings*.
2. At the Main Menu page, press ▲ or ▼ to select the Maintenance menu. Press ENT and the system will prompt you to enter the password.
3. To input the password, press ENT to enter the MAINTENANCE page.

There are two pages:

MAINTENANC Start: Float Batt: Reconnect Load: Reconnect	RectTrim: 54.0V RectLimit: 121% Rect1: DC On Rect ID01234567
--	---

4. Use ◀ or ▶ to select the needed action. After the input, press ENT to confirm or ESC to cancel.
 - 1) Start: The options include FC, BC and Test. Press ◀ or ▶ to select the needed action. If there is AC power off alarm, or the busbar voltage is too low, the BC and battery test control will not be executed by the system. No battery test control can be conducted when the rectifier communication is interrupted. Finally, after the battery test, the battery management mode will be changed from Manual to Auto automatically.
 - 2) Battery: The options include Reconnect and Disconnect. If there is a battery alarm, the battery operations will be invalid.
 - 3) Load: The options include Reconnect and Disconnect.
 - 4) RectTrim: Range: 42V ~ 58V. If the value of this parameter cannot exceed the over-voltage alarm point, otherwise, the parameter will be invalid.
 - 5) RectLimit: Range: 10% ~ 121%.
 - 6) Rect N: The maintenance operations over a single rectifier include: DC ON/OFF, AC ON/OFF and Reset.

The Operation method:

- 1) Use ▲ or ▼ to select the rectifier parameter, and ◀ or ▶ to change the rectifier serial No. Then press ENT to confirm. The bottom line of the page displays the rectifier ID.
- 2) Use ▲ or ▼ to move the cursor to the maintenance operation area, and ◀ or ▶ to select the value.

If the rectifier voltage is too high, you can select Reset to restore the output voltage of that rectifier to normal.

5. Press ESC to return to the Main Menu page and change the battery management mode from Manual to Auto. And then press ESC to return to the system information page.

4.7 Setting System Parameters

The system parameters are divided into six kinds: alarm, battery, AC, DC, rectifier and system parameters. Without any special needs, you only need to reset the battery group and battery capacity according to system configuration and battery actual instance, and accept the defaults for other parameters.

4.7.1 Alarm Settings

At the SETTINGS page, press ▲ or ▼ to select Alarm Settings menu. Then press ENT to confirm.

ALARM SETTINGS
► Alarm Type
Alarm Mode
Alarm Control

There are three sub-menus as follows.

Setting alarm type

At the ALARM SETTINGS page, press ▲ or ▼ to select Alarm Type menu. Then press ENT to confirm.

Alarm Type:
Alarm Block
Level: Observation
Out Relay: NC

Press ▲ or ▼ to move the cursor to the needed option. Press ◀ or ▶ to select the corresponding content and press ENT to confirm.

The alarm default value of the monitoring module is listed in Table 4-4. The alarm type description can see 5.2 *Handling Alarms And Fault*.

Table 4-4 Alarm setting parameter description

Serial No.	Alarm	Description	Default alarm level	Default related relay	Related parameter configuration
1	Alarm Block	To block the alarms sent to the main computer. It functions in the EEM protocol	Observation	None	Alarm blocked
2	AC Voltage High	AC input voltage higher than the setting of "AC input over- voltage alarm point"	Observation	None	AC input under-voltage alarm point
3	AC Voltage Low	AC input voltage lower than the setting of "AC input under- voltage alarm point"	Observation	None	AC input over-voltage alarm point
4	Mains Failure	All the AC input voltages from the rectifier are less than 80V	Major	1	
5	DC Volt High	DC output voltage higher than the setting of "DC output over- voltage alarm point"	Critical	None	DC output under-voltage alarm point
6	DC Volt Low	DC output voltage lower than the setting of "DC output over- voltage alarm point"	Critical	None	DC output under-voltage alarm point
7	DC Volt Low	DC output voltage lower than the setting of "DC output under- voltage alarm point"	Critical	3	DC output over-voltage alarm point
8	LVD1	Load low voltage disconnects	Critical	None	LLVD enabled
9	LVD2	Battery low voltage disconnects	Critical	3	BLVD enabled
10	Load Fuse Alarm 1 ~ 9	Load failure caused by overload, short circuit, manual disconnect, and alarm circuit failure	Critical	None	
11	Batt Fuse Alarm 1 ~ 4	Batt Failure caused by overload, short circuit, manual disconnect, and alarm circuit failure	Critical	None	
12	Batt Curr High	Charging current of battery higher than the setting of "Over" (Charging over current limit)	Observation	None	Over (over current point)
13	Rect AC Fail	AC input voltage of this rectifier lower than 80V	Major	2	
14	Rect Over Temp	The internal temperature of the rectifier is higher than 90°	Observation	2	
15	Rect Failure	Serious load sharing alarm (the output current of the rectifier is lower than 1A and the average load is greater than 6A). Or rectifier's ID repetition	Critical	2	
16	Rect Protect	Rectifier performs self- protection and has no output	Observation	2	
17	Rect Fan Fails	Rectifier fan fails	Major	2	
18	Rect Derated	Rectifier limit its output power	Observation	2	
19	Rect Not Respond	Rectifier does not communicate with PSM-D21	Major	2	

Serial No.	Alarm	Description	Default alarm level	Default related relay	Related parameter configuration
20	Rectifier Lost	The controller has detected a reduction in the number of running rectifiers	Critical	2	
21	Multi-Rect Alarm	More than two rectifiers alarm	Critical	2	
22	Self-detect Err	Hardware Self-detect Error	Observation	None	
23	Manual Mode	Battery management is in manual control mode	Observation	None	
24	Non Float Status	Including auto boost charge, cyclic boost charge, constant current test, and short test	No Alarm	None	
25	Batt Discharge	Battery being discharging	Observation	None	
26	Load share Alarm	In the system with load current shunt, the sampled load current plus battery current differs greatly from rectifier current	Observation	None	
27	Batt Test Fail	Battery discharging time shorter than expected	Observation	None	
28	Short Test Fail	Short Test Fault, In short test, difference in discharging current of two batteries is bigger than setting value	Observation	None	
29	Volt Discrepancy	Actual output voltage is different from both the measured DC bus voltage and different from the voltage reported by the rectifier to monitoring module. The error is bigger than 1V	Observation	None	
30	Maintain Alarm	Time to maintain system	No alarm	None	
31	Batt Imbalance	Upon battery discharge, the error between battery route voltage and busbar voltage is bigger than 0.6V			
32	Temp Low Alarm	Temperature lower than the setting of Temp, including ambient temp and battery temp	Observation	None	
33	Temp High Alarm	Temperature higher than the setting of Temp, including ambient temp and battery temp	Major	None	
34	Heater Fault	Heater fault or disconnected	Observation	5	
35	Fan Fault	Fan fault or disconnected	Observation	7	
36	Over Temp Fault	Over Temp alarm	Critical	None	
37	AC SPD Fault	AC SPD failure	Observation	6	
38	DC SPD Fault	DC SPD failure	Observation	6	
39	Door Status Sensor Alarm	Door open alarm	Critical	4	
40	Amb. T Sensor Err	Temperature sensor fault	observation	None	
41	Digital8 Fault	Reserved	No alarm	None	

Setting alarm mode

At the ALARM SETTINGS page, press ▲ or ▼ to select Alarm Mode menu. Then press ENT to confirm.

ALARM MODE:
Digital 8
Active: HIGH
Name DI : 8

Press ▲ or ▼ to select the needed option. Press ◀ or ▶ to select the parameter value and press ENT to confirm. After setting the Set DI Name and confirming it, the system will prompt you to name the DI, as shown in the following page.

Digital Name:
▶ Digital8

Use ▲ or ▼ to change the number, and ◀ or ▶ to move the cursor left or right. Press ENT to confirm.

The value description of the parameter is listed in Table 4-5.

Table 4-5 Alarm setting parameter description

Parameter	Range	Factory setting	Value description
DI No.	No. 8	8	The eighth corresponding connecting terminals, queued up in the order that the hardware switches are put
Alarm Mode	High, Low	High	High: alarm upon high level; Low: alarm upon low level. Set according to the actual situation
Set DI Name	8	8	Serial No. of the connecting terminal for DI input
DI Name	Figures or letters, 10 at most	Digital8	When there are DI alarms, this parameter shows the alarm name you have actually defined.

Alarm control

At the ALARM SETTINGS page, press ▲ or ▼ to select Alarm Control menu. Then press ENT to confirm.

ALARM CONTROL Voice Sign: Off Block Alarm: N ▼	ALARM CONTROL Clear Hist: N Dry Contact: Open
---	--

Select Y in the Clear Hist. option. All the historical alarms stored in the monitoring module will be cleared.

Select Y in the Block Alarm option. The recent alarm will not be set to the host. The Block Alarm will be available when the CommMode is EEM-M.

Select Open in the Dry Contact option. The recent alarm will be sent out with open through dry contact.

4.7.2 Battery Settings

Battery parameters are very important, for they are related to the life of battery.

At the SETTINGS page, press ▲ or ▼ to select Battery Settings menu. Then press ENT to confirm.

BATT. SETTINGS ► Batt Selection LVD Setting Charge ▼	BATT. SETTINGS ▲ Battery Test Temp.Comp
--	---

The battery parameters are divided into 5 kinds: basic, LVD, charging management, battery test and temperature coefficient.

Basic parameters

1. At the BATT SETTINGS page, press ▲ or ▼ to select Batt. Selection menu. Then press ENT to confirm.

Bat. Mode: Manual Bat. Fuse: 2 Capacity: 200Ah Type: 1 ▼	Batt Shunt 1: ▲ Yes Batt Shunt 2: None
--	---

2. Press ▲ or ▼ to select one page or one of the parameters, and ◀ or ▶ to select the parameter value. Then press ENT to confirm and save.

The value description of the basic battery parameters is listed in Table 4-6.

Table 4-6 Basic battery parameters descriptions

Parameter	Range	Factory setting	Value description
Mgmt Mode (Management mode)	Auto, Manual	Auto	In normal situation, it should be in the Auto mode, which enables the monitoring module manage the whole power system automatically, including: Automatic FC/BC switchover, LLVD and BLVD. In the manual mode, you can do operations like BC, FC, test and battery on/off, as well as enabling automatic battery BC time protection and capacity calculation. Upon the system DC under-voltage alarm and mains normal, system can automatically switch to the Auto mode, lest wrong manual operation should damage the system
Batt String (number of battery strings)	0 ~ 4	2	You should set this parameter according to the actual battery configuration. If Batt Shunt is set as Y, there should be batteries actually configured
Rated Ah (rated capacity)	50Ah ~ 5000Ah	200Ah	The capacity of the total battery strings. You should set this parameter according to the actual battery configuration
Battery Type	1 ~ 11	1	
Batt Shunt1	Y, N	Y	Select 'Y' when a corresponding shunt is configured, otherwise, select 'N'.
Batt Shunt2		N	Battery management aims at only the batteries connected to the shunt

LVD parameters

At the BATT SETTINGS page, press ▲ or ▼ to select LVD Setting menu. Then press ENT to confirm.

There are three pages, as shown below.

LLVD Enable: Y
BLVD Enable: Y
LVD Mode:
Voltage ▼

LVD VOLTAGE ▲
LLVD: 46.6V
BLVD: 45.6 V ▼

LVD TIME ▲
LLVD: 300min
BLVD: 600min ▼

Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm.

LLVD means the monitoring module opens the LLVD contactor, so that the non-priority load will be powered off. In this way, the battery remaining capacity can sustain the priority load longer.

BLVD means the monitoring module opens the BLVD contactor. In this way, the battery will stop powering the load, preventing over-discharge.

The value description of the LVD parameters is listed in Table 4-7.

Table 4-7 LVD parameters description

Parameter	Range	Factory setting	Value description
LLVD Enable	Y, N	Y	Select 'Y' to enable LLVD/ BLVD function
BLVD Enable		Y	Select 'N' to disable the LLVD/ BLVD function
LVD Mode	Time, voltage	Voltage	Select Voltage, when the monitoring module detects that the battery voltage is lower than the preset LLVD Volt, the load will be disconnected, and so is the battery when the battery voltage is lower than the preset BLVD Volt.
LLVD Volt	40V ~ 60V	46.6V	Select Time, when the discharge time reaches the preset LLVD Time, the monitoring module will disconnect the load; when the discharge time reaches the preset BLVD Time, it will disconnect the battery
BLVD Volt		45.6V	
LLVD Time	3min ~ 1,000min	300min	
BLVD Time		600min	

Charge management parameters

At the BATT SETTINGS page, press ▲ or ▼ to select Charge menu. Then press ENT to confirm.

There are eight pages, as shown below.

Float: 54.0V ▲ Boost : 56.4V Limit : 0.100C ₁₀ Over : 0.300C ₁₀ ▼	START Boost ▲ Automatic: Y Cyclic: Y ▼	AUTOMATIC BOOST ▲ Curr : 0.06C ₁₀ Capacity : 80% ▼	CONSTANTBOOST ▲ Current : 0.02C ₁₀ Duration: 180min ▼
CYCLIC BOOST ▲ Interval: 2400h Duration: 720min ▼	BOOST LIMIT ▲ Time: 1440min ▼	OverTemp to FC: ▲ Enable Temp of OverTemp to FC: 40°C ▼	Batt Set Date: ▲ 2007-06-01 Clear Chg/DisChg Times: N

Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm.

The charging management parameter value description is listed in Table 4-8.

Table 4-8 Charging management parameter value description

Parameter	Range	Factory setting	Value description	
Float	42V ~ 58V	54.0V	In the FC state, all rectifiers output voltage according to the set Float	The Boost must be higher than the Float
Boost		56.4V	In the BC state, all rectifiers output voltage according to the set Boost	
Limit (current limit)	0.1C ₁₀ ~ 0.15C ₁₀	0.1C ₁₀	When the monitoring module detects that the battery charging current is higher than the Limit, it will control the current of the rectifiers, through which it can limit the battery charging current. C ₁₀ is the battery rated capacity, generally set to 10 ~ 20% of the rated capacity of one battery string	
Over (over current point)	0.3C ₁₀ ~ 1.0C ₁₀	0.3C ₁₀	When the monitoring module detects that the battery charging current is higher than the Over, it will raise the battery charge over-current alarm	
Automatic Boost	Y, N	Y	Select 'Y', and BC will be conducted when conditions allow	
Cyclic Boost			Select 'Y', and the monitoring module will control the system to enter the	
Cyclic Boost Interval	48h ~ 8760h	2400h	Cyclic Boost when the FC time reaches the Cyclic Boost Interval. The battery charging voltage is the preset Boost, and the time is the preset	
Cyclic Boost Time	30min ~ 2880min	720min	Cyclic Boost Time	
To Boost Current	0.040 ~ 0.080C ₁₀	0.06C ₁₀	The monitoring module will control the system enter the BC state when the battery capacity decreases to the value of To Boost Capacity, or	
To Boost Capacity	10% ~ 99%	80%	when the charge current reaches the To Boost Current. The charge voltage will be the Boost	
Constant BC Current	0.002C ₁₀ ~ 0.02C ₁₀	0.02C ₁₀	The system in the BC state will enter the FC state when the charge current decreases to the Constant BC Curr and after the Duration. The	
Duration (of constant BC)	30min ~ 1440min	180min	battery charge voltage then will be the Float	
Boost Limit	60min ~ 2880min	1440min	To ensure safety, the monitoring module will forcefully control the system to enter the FC state if during the BC state, the BC time reaches the Boost Limit, or abnormalities occur (such as AC failure, battery route faulty, and rectifier communication failure)	
OverTemp To FC	Enable, disable	Enable	Enable: use this function Disable: don not use this function	
Temp Of Over Temp To FC	35°C ~ 50°C	40°C	if enable the OverTemp To FC, when the battery temperature will reach to the value of FC to BC temperature point during the BC process, the monitoring module will force the system to FC in order to ensure the system safety	
Batt Set Date	-	2007-06-01	If the battery set date is modified, the battery charge and discharge time will be cleared	
Clear Chg/DisChg Times	Y, N	N	Select 'Y', and press ENT to clear the mains failure times and battery charge & discharge times	

The BC/FC switchover diagram is shown in Figure 4-2.

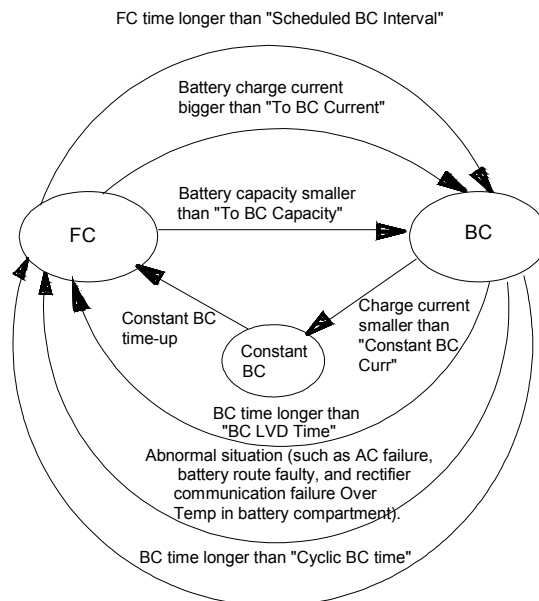
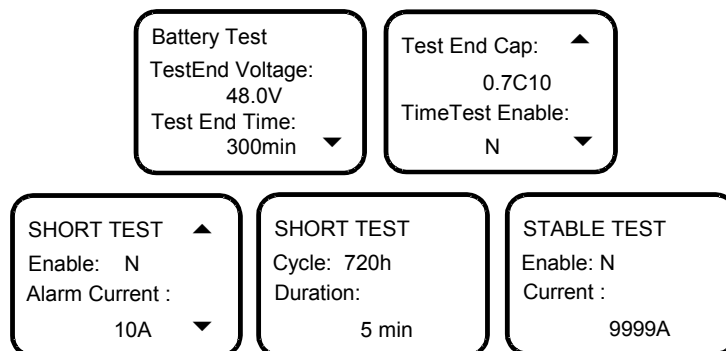


Figure 4-2 BC/FC switchover diagram

Battery test parameters

1. At the BATT SETTINGS page, press ▲ or ▼ to select Battery Test menu. Then press ENT to confirm.

There are five pages, as shown below.



2. Press ▲ or ▼ to select one page or one of the parameters, and ◀ or ▶ to select the parameter value. Then press ENT to confirm and save.

The monitoring module can do battery test, and record 10 sets of test data (accessible only through the host). The battery test has to be started manually, then the monitoring module will control the rectifier output voltage, make it lower than the battery voltage, and the battery discharge will begin. The monitoring module will stop the test if the battery voltage reaches the Battery Test Voltage, or the discharge time reaches Battery Test Time, or the battery capacity reaches Test End Cap. Afterwards, it will restore the rectifier output voltage to the normal FC voltage, begin the battery charge and switch the system to battery auto-management.

Meanwhile the test start time/voltage and end time/voltage and battery remaining capacity will be recorded. The records can be queried through the host. During the battery test, if abnormalities occur, the monitoring module will stop the battery test automatically.

The value description of the parameters is listed in Table 4-9.

Table 4-9 Battery test parameters description

Parameter	Range	Factory setting	Value description
Battery Test Voltage	43.1V ~ 57.9V	48.2V	The monitoring module will stop the test and change to FC if the battery voltage reaches the Battery Test Voltage, or the discharge time reaches Battery Test Time, or the battery capacity reaches Test End Cap
Battery Test Time	5min ~ 1440min	300min	
Test End Cap	0 ~ 1C ₁₀	0.7C ₁₀	
TimeTest Enable	Y, N	N	When the parameter Planned Test is set to Y, the monitoring module will test the battery according to the 4 sets of test time. You can set at most 12 sets of test time through the host

Parameter	Range	Factory setting	Value description
Short Test	Y, N	N	Whether using Short Test function
Alarm Current	1A ~ 100A	10A	If the battery has not discharged within the ShortTest Cycle, the monitoring module will start a short test, whose operation time is set by the parameter ShortTest Duration. By the end of the test, if the difference in the discharge currents of batteries is bigger than the Alarm Current, the battery discharge imbalance alarm will be raised. This alarm will automatically end after 5min of delay. Also you can end it by confirming it
ShortTest Cycle	24h ~ 8,760h	720h	
ShortTest Duration	1min ~ 60min	5min	
StableTest Enable	Y, N	N	The stable test is conducted with constant battery current, whose value is set through the parameter StableTest Current. If the parameter StableTest Enable is set to Y, and the test will be started once the battery satisfies the test condition
StableTest Current	1A ~ 9999A	9999A	

3. The schematic diagram of the test function is shown below:

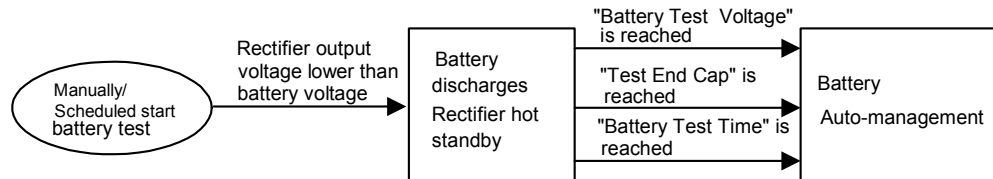
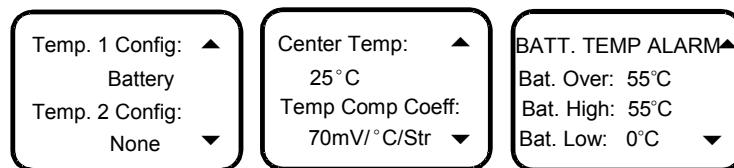


Figure 4-3 Schematic diagram of the test function

Temperature coefficient

1. At the BATT SETTINGS page, press ▲ or ▼ to select Temp. Com menu. Then press ENT to confirm.

There are three pages, as shown below.



2. Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm and save.

The value description of the parameters is listed below:

Table 4-10 Temperature compensation coefficient parameters description

Parameter	Range	Factory setting	Value description	
Temp. 1	None, Battery Temp	Battery Temp	Battery Temp refer to the measurement of the battery temperature sensor at the local power system. None means there is no measurement input	
Temp. 2	None, Ambient Temp	None	Ambient Temp refer to the measurement of the ambinet temperature sensor at the local power system. None means there is no measurement input	
Center Temp	10°C ~ 40°C	25°C	<FC = BattTemp – Center Temp) * Temp Comp Upon alarms such as Rect Com Failure, DC Under-volt and DC Voltage High, the monitoring module will not do temperature compensation to the battery FC voltage	
Temp. Comp Coeff	0 ~ 500mV/°C	72mV/°C/str		
Over	10°C ~ 100°C	55°C	When the detected battery temperature is higher than the Over, the monitoring module will raise an alarm	The High must not be higher than the Over
High	10°C ~ 100°C	55°C	When the detected battery temperature is higher than the High, the monitoring module will raise an alarm	
Low	-40°C ~ 10°C	0°C	The monitoring module will raise an alarm when the detected battery temperature is lower than the Low	

3. The system will prompt Temperature sensor 1 not connected or Temperature sensor 1 fault when the temperature sensor used in battery compartment for temperature compensation (It is used to distinguish the temperature sensor fault alarm on the heat control board. The two temperature sensors in the heat control board display 'Amb. T Sensor Err'.)

4.7.3 AC Settings

At the Settings page, press ▲ or ▼ to select AC Settings menu. Then press ENT to confirm.

OverVolt: 280V
 LowVolt: 180V
 UnderVolt: 80V
 AC Input: 1-PH

Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm.

The value description of the parameters is listed in Table 4-11.

Table 4-11 DC setting parameter description

Parameter	Range	Factory setting	Value description
OverVolt	50V ~ 300V	280V	The monitoring module will raise an alarm when the AC input voltage is higher than the OverVolt
LowVolt	50V ~ 300V	180V	The monitoring module will raise an alarm when the AC input voltage is lower than the LowVolt. The value of the UnderVolt must lower than that of the OverVolt
UnderVolt	50V ~ 300V	80V	The monitoring module will not raise an alarm when the AC input is single phase
AC Input	1-PH, 3-PH	1-PH	Setting according to the connected AC input

4.7.4 DC Settings

At the SETTINGS page, press ▲ or ▼ to select DC Settings menu. Then press ENT to confirm.

DC VOLTALARM
 Over: 58.5V
 Low: 48.0V
 Under: 48.0V

Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm.

The value description of the parameters is listed in Table 4-12.

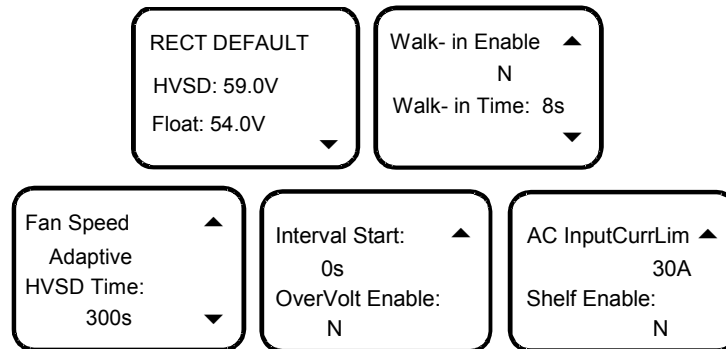
Table 4-12 DC setting parameter description

Parameter	Range	Factory setting	Value description	
Over (over-voltage)	40V ~ 60V	58.5V	The DC Over Voltage alarm will be raised when the system DC output voltage is higher than the value of Over	The values of these three parameters should be: Over > Low > Under
Low (low-voltage)		48.0V	The DC low voltage alarm will be raised when the system DC output voltage is lower than the value of Low	
Under (under-voltage)		48.0V	The DC under voltage alarm will be raised when the system DC output voltage is lower than the value of Under	

4.7.5 Rectifier Settings

At the SETTINGS page, press ▲ or ▼ to select Rect Settings menu. Then press ENT to confirm.

There are five pages, as shown below.



Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm.

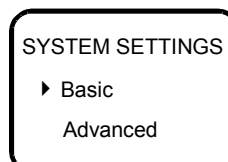
The value description of the parameters is listed in Table 4-13.

Table 4-13 DC rectifier parameter description

Parameter	Range	Factory setting	Value description
Rect Over Volt	56V ~ 59V	59V	The rectifier over voltage alarm will be raised when the rectifier output voltage is higher than the Rect Over Volt
Default Volt	48V ~ 58V	54.0V	Default output voltage when communication interrupted. Must be lower than the Rect Over Volt
Walkin Enabled	Y, N	N	The output soft start function means the rectifier voltage will rise from 0V to the Default Volt after the Walkin Time
Walkin Time	8s ~ 128s	8s	
Fan Speed	Full Speed, Half Speed	Half speed	When set to Half Speed, the rectifier will regulate the fan speed according to the temperature. When set to Full Speed, the fan will operate at full speed
HVSD Time	50s ~ 300s	300s	The rectifier will shut off automatically upon over-voltage, and restart after a certain delay to see whether it is still over-voltage then. That delay is set through the parameter HVSD Time. If the rectifier's output voltage is normal within the delay, the rectifier is regarded normal; otherwise, the rectifier will be locked out and auto-restart function will be disabled
Interval Start	0~10s	0s	The monitoring module can set the DCDC Interval Start of the modules. Start time = module adress * interval time
OverVolt Enable	Y, N	N	The monitoring module can set the module to OverVolt Enable, meanwhile, the module can start forcely. The monitoring module will set automatically the module with least address to have this function. If the module always exceeds the normal voltage for 60s, the function will be canceled automatically.
AC InputCurrLim	1A ~ 50A	30A	
Shelf Enable	Y, N	N	

4.7.6 System Settings

At the SETTINGS page, press ▲ or ▼ to select Sys Settings menu. Then press ENT to confirm.



There are two sub-menus as follows.

Basic

At the SYSTEM SETTINGS page, press ▲ or ▼ to select Basic menu. Then press ENT to confirm. Users with different password levels have different authorities.

1. User level password

For the user level password (by default: 1), there are two related pages, as shown below.

Language: Chinese Adrees: 1 CommMode: RS232 Baud: 9600	Set Date: ▲ 2007-06-01 Set Time: 00:00:00
---	--

Press ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. Then press ENT to confirm.

When the CommMode is modem, the CallBack Number and CallBack Num (how many times should callback be made) should be set.

CallBack Time: ▲ 5 CallBack Set: Code 1 ▼	CallBack Phone : ▲ ▶ 012345678901234 56789 ▼
--	--

Use ◀ or ▶ to change the number or move the cursor left or right. And then press ENT to confirm.

2. Operator level password

For the operator level password (by fault: 2), you can press ▲ or ▼ to select the following page, besides all those above, as shown below.

Init PWD: N Init Param: N System Type: 48V/30A/200/NONE
--

There will be a prompt when resetting the system, as shown below.

Notice: All param lost! ENT Continue, ESC Quit.
--

Press ESC to cancel the resetting, or ENT to confirm. All the parameters will resume the default value but not the factory setting. Some default values disaccord with actual value, so you should reset all the parameters after system resetting according to the actual instance. For the factory setting and default value, please see *Appendix 2 Parameter Setting Of The Monitoring Module*. It is recommended to power off or reset to perform system resetting when the monitoring module cannot work normally.

3. Administrator level password

For the administrator level password (by fault 640275), you can press ▲ or ▼ to select the following page, besides all those above, as shown below.

Change Password: Code 1

Use ▲ or ▼ to select the parameter, and ◀ or ▶ to select the parameter value. You can change the value of the parameter Change Password and press ENT to confirm.

Enter New PWD: ▶ 000000 Input Again!
--

Use ▲ or ▼ to change the number, and ◀ or ▶ to move the cursor left or right. Press ENT to confirm. You should input the same number twice to complete the setting.

Advanced

At the SYSTEM SETTINGS page, press ▲ or ▼ to select Advanced menu. Then press ENT to confirm.

Save Enable: N	HuaWei Comm: ▲
Cycle Duration: 48h ▼	N

The value description of the parameters is listed in Table 4-14.

Table 4-14 System setting parameter description

Level	Parameter	Range	Factory setting	Value description
User	Language	Chinese, English	Chinese	Set according to your need
	Address	1 ~ 254	1	The addresses of power systems that are at the same monitored office should be different
	CommMode	RS232, MODEM	RS232	The system only supports RS232 mode communication
	BaudRate	1200bps ~ 9600bps	9600bps	Make sure the baud rates of both the sending and receiving parties are the same
	Set Date	2,000 ~ 2,099	2007-06-01	Set the time according to the current actual time, regardless of whether it is a leap year or not
	Set Time	Hour, min, sec	00:00:00	
Operator	Init PWD (Initialize password)	Y, N	N	Selecting Y can reset the user level and administrator level passwords to the defaults
	Init Param (Initialize parameters)	Y, N	N	Selecting Y can reset all the parameter to the defaults
	System Type	-	48V/30A/200/NONE	The system type can not be changed
Administrator	Change Password		User	The password can be 6 digits long at most. If it is shorter than 6 digits, end it with a #
Advanced	Save Enable	Y, N	N	
	Cycle Duration	1h ~ 8760h	48h	
	HuaWei Comm	Y, N	N	

Chapter 5 Alarm Handling

This chapter describes the alarm handling and maintenance of the system.



Note

1. The maintenance must be conducted under the guidance of the related safety regulations.
2. Only the trained personnel with adequate knowledge about the outdoor cabinet shall maintain the inner part of the cabinet.

5.1 Routine Maintenance

Inspect the outdoor cabinet periodically and shoot the trouble in time. The routine maintenance items are given in Table 5-1.

Table 5-1 Routine maintenance items

Maintenance item	Frequency	Inspecting method	Guide
DC output	Once half a year	Multimeter	Measure the voltage between the load MCB and the positive busbar. Check that the voltage is normal
Fans	Once half a year	Visual inspection	The check method is given in 3.3 <i>Alarm Check And System Operation Status Check</i> . If the fans run abnormally, refer to 5.3.3 <i>Replacing Heat Exchanger</i> and 5.3.4 <i>Replacing External Fan</i> to maintain or replace the fan
Indicators of the rectifier and the monitoring module	Once half a year	Visual inspection	Refer to 5.2.1 <i>Handling Monitoring Module Alarms</i> and 5.2.2 <i>Handling Rectifier Fault</i>
Paint, galvanization layer	Once half a year	Visual inspection	If there are scratches, paint them immediately
Dust filter	Once half a year	Visual inspection	If dust accumulated on the battery compartment dust filter, clean it with a brush. If the dust filter is damaged, replace it. See Figure 5-1 for the position of the dust filter.

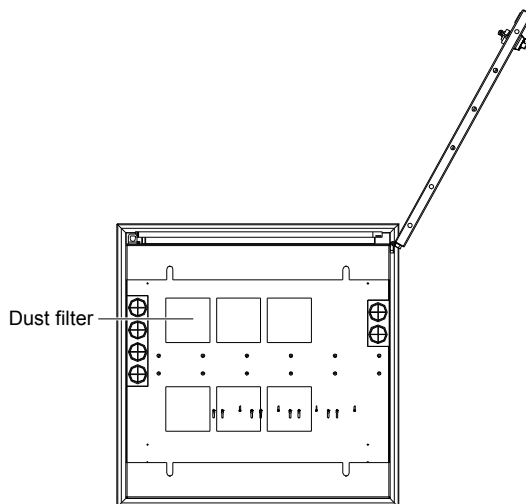


Figure 5-1 Dust filter (upward view)

5.2 Handling Alarms And Fault

5.2.1 Handling Monitoring Module Alarms

The monitoring module alarms are classified into four types: critical alarm, major alarm, observation and no alarm. Critical alarm, major alarm: These two types of alarms have strong impacts on the system performance. Whenever

these alarms are generated, users are supposed to handle them immediately. The alarm indicators will be on and audible indication will be given.

Observation: When this type of alarm is raised, the system maintains normal output for a while. If the alarm occurs during watch time, it should be handled immediately. If the alarm occurs during non- watch- time, handle it during watch time. The alarm indicators will be on when observation alarm occurs.

No alarm: Alarms set as 'no alarm' by the users, will generate no visible or audible indication and the system works normally.

The handling methods of normal alarms are given in Table 5-2.

Table 5-2 Handling methods of normal alarms

No.	Alarm	Handling method
1	Mains Failure	If the failure does not last long, the battery will power the load. If the cause is unknown or the failure lasts too long, a diesel generator is needed. Before using the generator power, it is suggested to run the generator 5 minutes to stabilize the power output
2	AC Voltage High	Check if the AC over-voltage point is too low. If yes, reset the value. A mild over-voltage does not affect the system operation. However, the rectifier will stop operation when the mains voltage is more than 305V. Therefore, if the power supply is constantly over-voltage, the mains power network should be improved
3	AC Voltage Low	Check if the AC Under- voltage point is too high. If yes, reset the value. When the mains voltage is lower than 176V, the output power of the rectifiers will be derated. If the power supply is constantly under-voltage, the main power network should be improved
4	AC SPD Fault	Check the AC SPD status. If the AC SPD is damaged, replace the damaged AC SPD. See 5.3.7 <i>Replacing AC SPD</i>
5	DC SPD Fault	Check the DC SPD status. If the DC SPD is damaged, replace it. See 5.3.8 <i>Replacing DC SPD</i>
6	DC Volt High	1. Check the system DC output voltage and value of Over set through the monitoring module. If the set value is improper, correct it. 2. Find out the rectifier that has caused the alarm. First of all, ensure that the batteries can operate normally. Then switch off the AC input of all rectifiers. Power on the rectifiers one by one. If the over-voltage protection is triggered when a certain rectifier is powered on, that rectifier is the faulty one. Replace the fault rectifier
7	DC Volt Low	1. Check the system DC output voltage and value of OverVolt set through the monitoring module. If the set value is improper, correct it 2. If the alarm is caused by mains failure, check if certain loads can be disconnected to prolong the operation of the whole system 3. If the alarm is due to rectifier fault, find out the faulty rectifier and replace it 4. Compare the total load current with the rectifier current, and the former should not be bigger than the later at FC voltage, otherwise partial loads must be disconnected to ensure the safe operation of the whole system. Add several rectifiers to make the total rectifier current bigger than 120% of the total load current. In addition, there must be at least 1 rectifier for redundancy standby
8	Load Fuse Alarm/ Batt Fuse Alarm	Check if the MCB of the route is switched off. If the MCB is open, find out the fault and remove it. Otherwise, the alarm loop is faulty. Please contact Emerson
9	LVD2	1. Check if there is mains failure, or the battery voltage is lower than the BLVD value, or the battery discharge time is more than the BLVD Time 2. The battery is disconnected from the system manually
10	Rect Fault	The red LED on the rectifier will turn on. 1. Reset the rectifier by powering it off and then on again. 2. If the rectifier still causes this alarm, replace it
11	Rect Protect	Check if the mains is outside the range of 80V ~ 295V (between the AC under-voltage point and over-voltage point) If the power supply is constantly over/under-voltage, the mains power network should be improved
12	Rect Fan Fails	1. Check whether the rectifier fan is still working. 2. If the fan stands still, pull out the rectifier to check whether the fan is blocked or not. If yes, clean it and push the rectifier back. However, if the fan still does not move after the rectifier is powered on, replace it (see 5.2.2 <i>Handling Rectifier Fault</i>)
13	Rect Not Respond	Check if the communication cable is connected properly between rectifier and monitoring module. If yes, reset the rectifier by pulling it out and back in. If the alarm persists, replace the rectifier
14	Batt Over Temp	1. Check if there is battery internal fault. If yes, replace the fault battery 2. Check if the battery room temperature is too high. If yes, cool down the battery room
15	Fan 1 Fault	Check if the fan is faulty. Refer to 5.3.3 <i>Replacing Heat Exchanger</i> and 5.3.4 <i>Replacing External Fan</i> for checking and maintaining fan method

5.2.2 Handling Rectifier Fault

The symptoms of usual rectifier faults include: Run indicator (green) off, Protection indicator (yellow) on, Protection indicator blink, Fault indicator (red) on and Fault indicator blink.

The indicators are shown in Figure 5-2 and the indicator descriptions are given in Table 5-3.

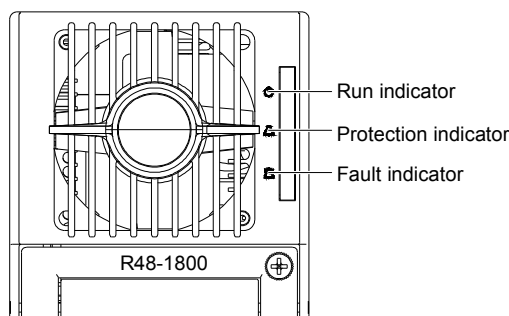


Figure 5-2 Rectifier indicators

Table 5-3 Indicator fault description

Symptom	Monitoring module alarms	Causes	Handling method
Run indicator off (green)	No alarm	No input/output voltage	Make sure there is input/output voltage
		Assistant power supply of the rectifier fails	Put the rectifier into the slot in which another rectifier works normally. If the rectifier still works abnormally, replace it
Run indicator blinks (green)	No alarm	The monitoring module performs operations upon the rectifier	
Protection indicator on	Rect over temp	Fan blocked	Remove the object that blocks the fan
		Ventilation path blocked at the inlet or vent	Remove the object at the inlet or vent
		Ambient temperature too high or the inlet too close to a heat source	Decrease the ambient temperature or remove the heat source
	Rect protect	Current sharing imbalance	Check whether the rectifier communicates normally. If not, check whether the communication cable is normal. If the communication is normal while the protection indicator is on, replace the rectifier
		PFC output OverVolt/LowVolt protection	Change the position of the faulty module with normal module. If the faulty module cannot work normally, replace it with a new one
		AC input overvoltage	Ensure AC input voltage normally
Protection indicator blinks (yellow)	Rect Not Respond	Rectifier communication interrupted	Check whether the communication cable is properly connected
Fault indicator on (red)	Rect Fault	Rectifier over-voltage	Reset the rectifier. If the protection is triggered again, replace the rectifier
	Rect Fault	Two or more rectifiers have the same ID number	Contact the local service center of Emerson for maintenance
	System current sharing imbalance	Serious current sharing imbalance (the output current of the rectifier is lower than 1A and the average load current is greater than 3A)	Check whether the rectifier communication is normal. If not, check whether the communication cable is in normal connection. If the communication is normal while the protection indicator is on, replace the rectifier
Fault indicator blinks (red)	Rect Fan Fails	Fan fault	Replace the fan

5.3 Replacing Parts

5.3.1 Replacing Rectifier

Except replacing the fan, it is recommended not to repair any other parts of the rectifier. When faulty, the module should be replaced, not repaired. See the following procedures to replace the rectifier.

1. Take a new rectifier and check it for any damage from transport.
2. Pull out the faulty rectifier from the rack grabbing its handle.

Be careful with the rectifier just pulled out from the system, as it could be very hot due to long-term operation. Do not let it slip away and get damaged.

3. Hold the rectifier handle and push the new rectifier into the slot just vacated and make sure the connection is good. After a brief delay, the rectifier Run indicator will turn on and the fan will start running.

4. Check whether the new rectifier works normally.

You should make sure that:

- 1) The monitoring module recognizes the new rectifier.
- 2) The new rectifier shares current with other rectifiers.
- 3) When this new rectifier is pulled out, there is a corresponding alarm and the monitoring module displays the alarm.

If the new rectifier passes all the above tests, the replacement is a success.

5. Push the handle back into the front panel to fix the rectifier with the positioning pin.

5.3.2 Replacing Rectifier Fan

If the rectifier fan is faulty and does not work, it should be replaced. See the following procedures:

1. Use a cross screwdriver to remove the three screws from the fixing holes and pull out the front panel.
2. Disconnect the power cable of the fan and remove the fan. Replace a new fan.
3. Plug the fan power cable into the fan power socket.
4. Turn the new fan in order that the wind direction faces to the label in the cabinet. Install the new fan.
5. Put the front panel back and fasten it with the three screws, as shown in Figure 5-3.

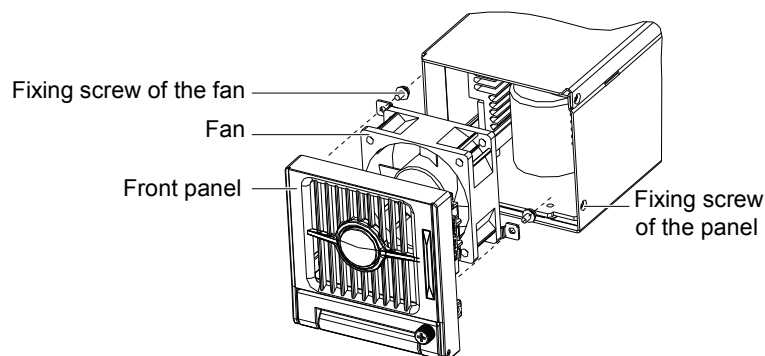


Figure 5-3 Disassembling the front panel

5.3.3 Replacing Heat Exchanger

The heat exchanger consists of an internal fan and a heat-exchanging unit. Its position is shown in Figure 5-4.



Figure 5-4 Position of heat exchanger

The internal fan speed is settable. The temperature of the equipment compartment is higher; the internal fan speed is larger. Replace the internal fan or adjust the fan position if it stops running or there is an abnormal noise in it. Clean the heat-exchanging unit. The procedures are as follows.

Step 1: Disconnect the cable connector at the left side of the heat exchanger, as shown in Figure 5-5. Do not disconnect the cable frequently when power is on.

Step 2: Loosen the fixing screws shown in Figure 5-5 and then remove the heat exchanger from the cabinet. For the north model outdoor cabinet, take out of the heater from the equipment compartment (refer to 5.3.5 *Replacing Heater And Heating Unit* for detail method) first, and then remove the heat exchanger from the cabinet.

Step 3: Loosen the screws that fix the top cover and the internal fan baffle and then remove the top cover and the internal fan baffle, as shown in Figure 5-5.

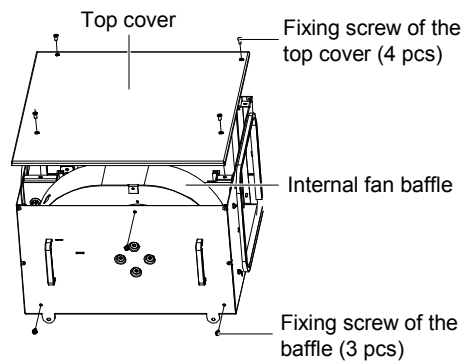


Figure 5-5 Removing the top cover and internal fan baffle

Step 4: Loosen the fixing screws of the internal fan shown in Figure 5-6. Adjust the internal fan position or replace it with a new fan. Take out the heat-exchanging unit to clean it if there is much dust on it.

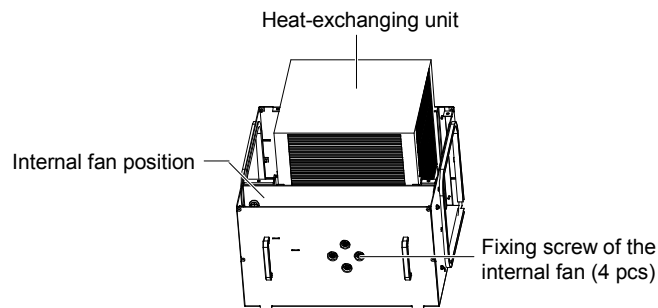


Figure 5-6 Removing the internal fan and heat-exchanging unit

5. Reverse previous step 4 to step 1 to install the new internal fan and the clean heat-exchanging unit into the cabinet. Take care when installing the heat-exchanging unit to avoid damaging the waterproof bar on it.

5.3.4 Replacing External Fan

The external fan speed is settable. The temperature of the equipment compartment is higher; the internal fan speed is larger. Replace the external fan or adjust the external fan position if it stops running or there is an abnormal noise in it. The procedures are as follows.

Step 1: Disconnect the cable connectors of the heat exchanger and the external fan, as shown in Figure 5-7. Do not disconnect the cable connector frequently when power is on.



Figure 5-7 Positions of heat exchanger and external fan

Step 2: Loosen the fixing screws of the heat exchanger shown in Figure 5-7 and remove the heat exchanger.

Step 3: Loosen the fixing screws of the external fan box shown in Figure 5-7 and remove the external fan box.

Step 4: Loosen the fixing screws of the external fan shown in Figure 5-8. Adjust the external fan position or replace it with a new one.

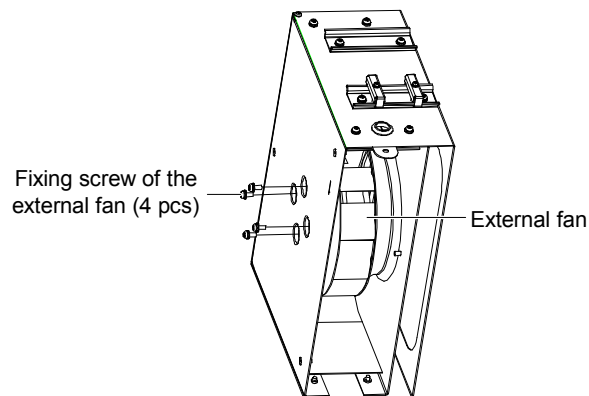


Figure 5-8 Removing the external fan

Step 5: Reverse previous step 4 to step 1 to install the new external fan into the cabinet. And then install the heat exchanger into the cabinet. Take care when installing the heat exchanger to avoid damaging the waterproof bar on it.

5.3.5 Replacing Heater And Heating Unit

The heater and heating unit in the north model outdoor cabinet requires no particular maintenance. The heater in the equipment compartment will heat when the ambient temperature is below -5°C , and stop heating above 5°C . The heating unit in the battery compartment will heat when the ambient temperature is below 5°C , and stop heating above 15°C . If they operate abnormally, check the heat control board. If it operates normally, replace the heater or heating unit.

Replacing heater

The heater position is shown in Figure 5-9. The replacing procedures are as follows.

Step 1: Switch off the heater MCB, as shown in Figure 5-9.

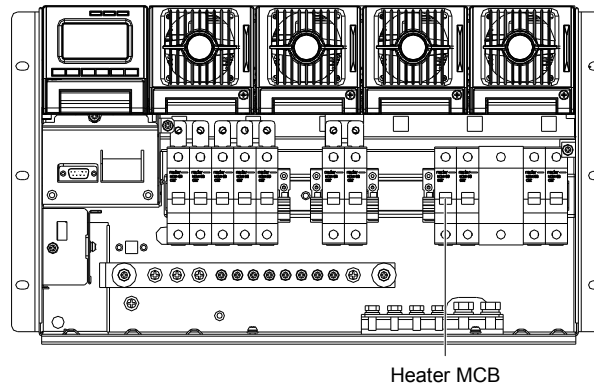


Figure 5-9 Position of heater MCB

Step 2: Loosen the six fixing screws of the heater cover shown in Figure 5-10 and then remove the heater cover.

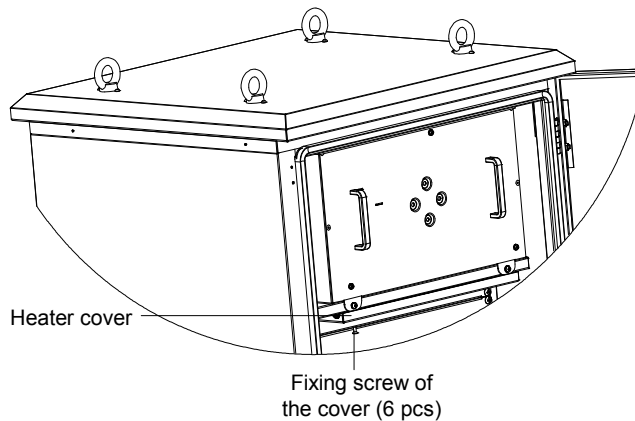


Figure 5-10 Fixing screws of heater cover

Step 3: Loosen the screws of the heater fixed on the heater cover and disconnect the cable connector. Remove the heater.

Step 4: Replace the heater with a new one. Reverse step 3 to step 1 to install the new heater.

Step 5: Check that each cable connector is tight and the connection is reliable. Switch on the heater MCB after making sure every thing is OK.

Replacing heating unit



Note

Users only need to replace the fan if the heating unit fan is faulty.

The procedures are as follows.

Step1: Switch off the heater MCB, as shown in Figure 5-9.

Step 2: Loosen the screws of the heating unit and disconnect the correlative cable connectors from the heating unit. Take off the heating unit. The heating unit position is shown in Figure 1-4.

Step 3: Replace the heating unit with a new one. Reverse steps to install the new heating unit.

Step 4: Check that each cable connector is tight and the connection is reliable. Switch on the heater MCB after making sure every thing is OK.

5.3.6 Replacing Door Status Sensor

There is a door status sensor installed in equipment compartment for detecting the close or open status of the equipment compartment door. Open the equipment compartment door before opening the battery compartment door, so the monitoring module will generate an alarm when one of the doors is open. The alarm will be eliminated only when both doors are closed.

The door status sensor requires no particular maintenance; just replace it when it is damaged. If the doors are closed, when the door status sensor alarm occurs, the sensor must have been damaged. The position of the sensor is shown in Figure 5-11.

Remove the sensor top cover and then the two screws. Replace the old sensor with a new one and finally fix the sensor and the signal cables with the screws.



Figure 5-11 Position of the door status sensor

5.3.7 Replacing AC SPD

The AC SPD is located in the power distribution unit, as shown in Figure 5-12.

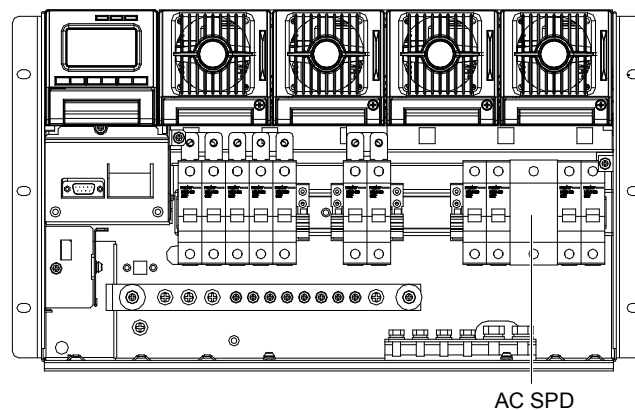


Figure 5-12 AC SPD

When the AC SPD works normally, the indication window, which is a rectangle small window located on the AC SPD module, is green. When the AC SPD is damaged, the indication window is red.

Users only need to replace the damaged AC SPD. The procedures of replacing the AC SPD are:

Step 1: Switch off all the MCBs.

Step 2: Disconnect the cable of the AC SPD.

Step 3: Remove the damaged AC SPD.

Step 4: Replace it with a new one and connect back the cable.

5.3.8 Replacing DC SPD

The DC SPD is located at the left side of the power distribution unit. The procedures of replacing the DC SPD are:

Step 1: Switch off the AC input MCBs and the battery MCBs, as shown in Figure 2-12 and Figure 2-13.

Step 2: Remove the one screw and the DC SPD cover, as shown in Figure 5-13.

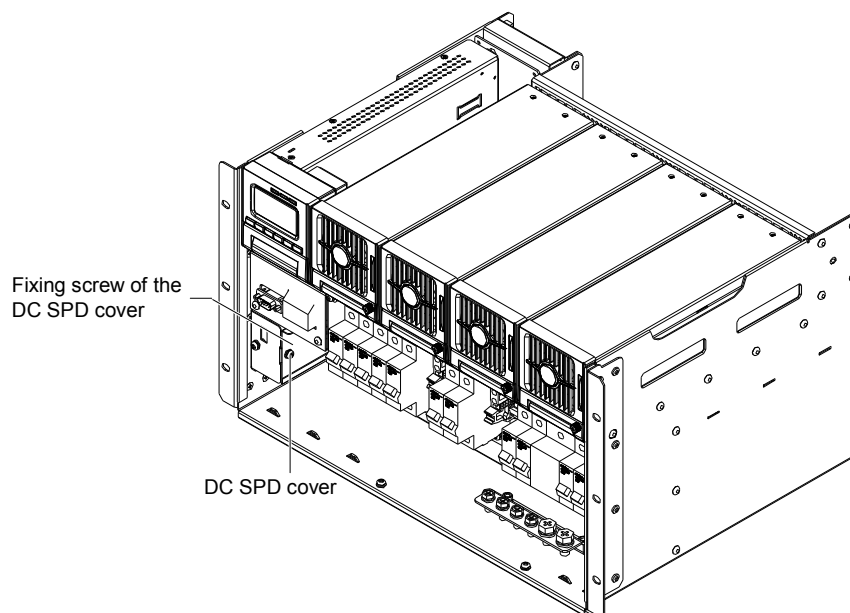


Figure 5-13 Removing the DC SPD cover

Step 3: Remove the fixing screws that are used to connect fixing board of the DC SPD and subrack.

Step 4: Remove the two fixing screws that are used to connect DC SPD and fixing board. Disconnect all the cables that are connected to the DC SPD and take off the DC SPD, as shown in Figure 5-14.

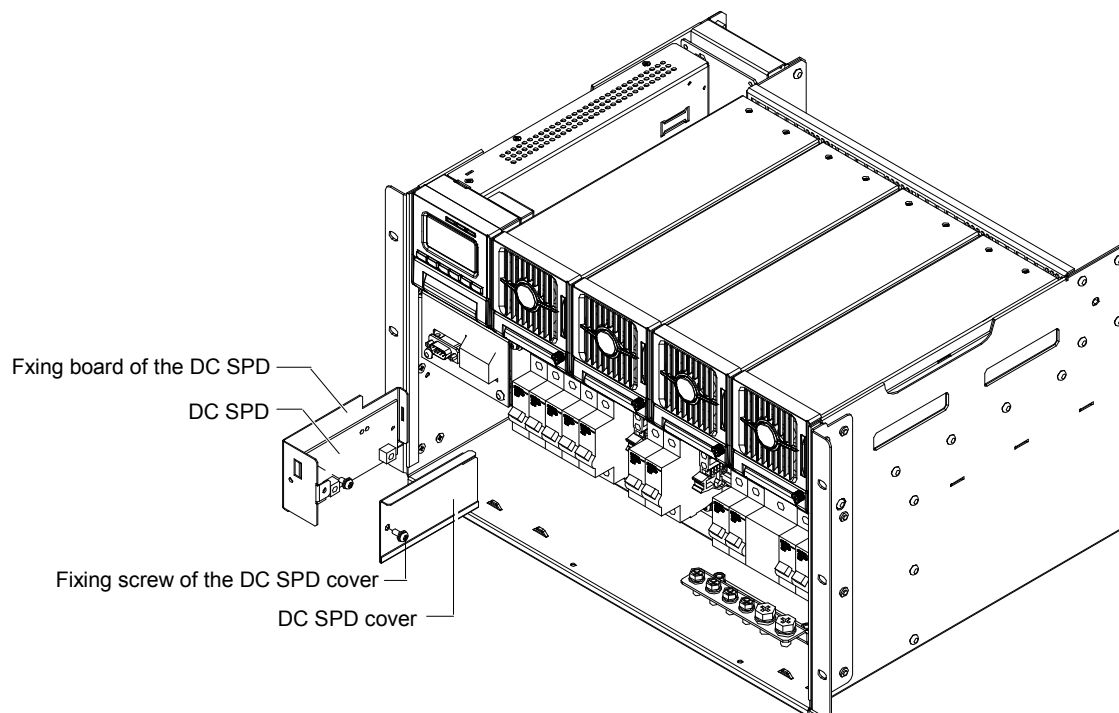


Figure 5-14 Removing the DC SPD

Step 5: Replace the DC SPD with a new one. Reverse step 4 to step 1 to install the new DC SPD. Switch on the AC input MCBs and battery MCBs.

5.3.9 Replacing Monitoring Back Board

If error occurs to the SPD signal, rectifier voltage sampling-signal or load route signal, or if the monitoring module reports false alarms, examine the related circuits and components first. If the circuits and components are normal, the monitoring back board is damaged and needs replacement.

The procedures of replacing the monitoring back board are as follows.

Step 1: Pull out the monitoring module according to 2.3.3 *Installing Rectifiers And Monitoring Module*. The position is shown in Figure 1-3 and Figure 1-4.

Step 2: Loosen the one fixing screw of the monitoring back board cover and remove the monitoring back board cover, as shown in Figure 5-15.

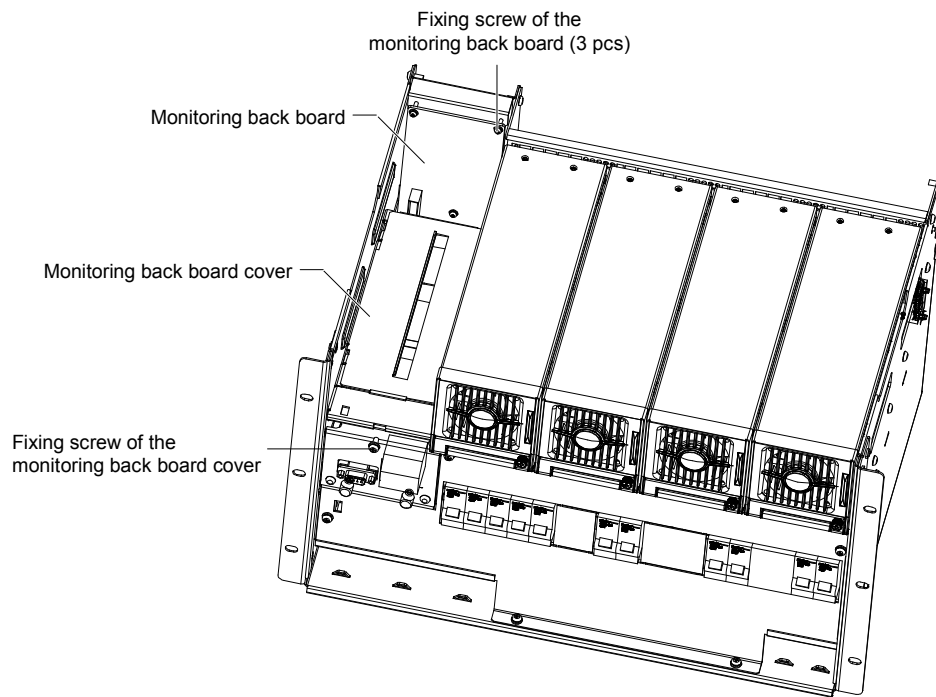


Figure 5-15 Monitoring back board

Step 3: Remove the three fixing screws of the monitoring back board and remove the monitoring back board, as shown in Figure 5-15.

Step 4: Replace the monitoring back board with a new one. Reverse step 3 to step 1 to install the new monitoring back board. Fasten the fixing screws, especially the grounding (fixing) screw.

Step 5: Reinstall the monitoring module according to 2.3.3 *Installing Rectifiers And Monitoring Module*.

5.3.10 Replacing Signal Transfer Board

The procedures of replacing the signal transfer board are as follows.

Step 1: Loosen the two fixing screws of the signal transfer board, as shown in Figure 5-16.

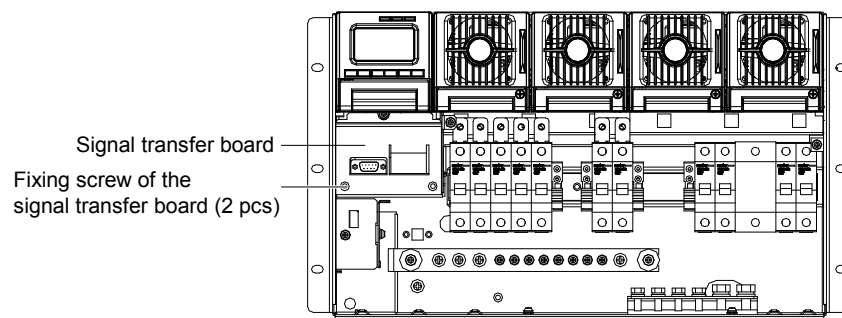


Figure 5-16 Fixing screws positions of the signal transfer board

Step 2: Disconnect all the cables of the signal transfer board and remove the signal transfer board.

Step 3: Replace the signal transfer board with a new one. Reverse the preceding steps to install the new signal transfer board.

5.3.11 Replacing Heat Control Board

The procedures of replacing heat control board are as follows.

Step 1: Loosen the four fixing screws to remove the plastic cover of the heat control board, as shown in Figure 5-17.

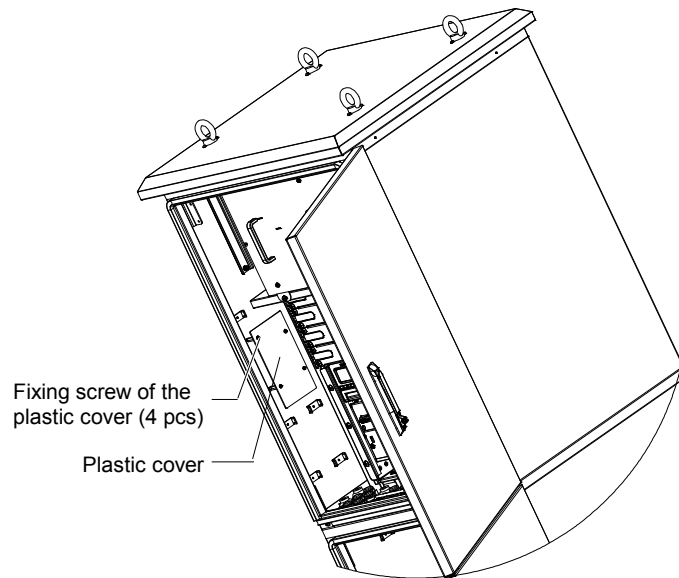


Figure 5-17 Position of the plastic cover

Step 2: Loosen the fixing studs of the heat control board and disconnect the cables from it. Remove the heat control board.

Step 3: Replace the heat control board with a new one. Reverse the preceding steps to install the new heat control board.

Appendix 1 Technical And Engineering Parameters

Table 1 Technical parameters

Parameter category	Parameter	Description
Environmental	Operating temperature	-10°C ~ +45°C (for south mode); -40°C ~ +45°C (for north mode)
	Storage temperature	-40°C ~ 70°C
	Relative humidity	5%RH ~ 100%RH
	Altitude	≤ 2,000m (derating is necessary above 2,000m)
	Others	No conductive dust or erosive gases. No possibility of explosion
AC input	AC input system	Single phase 3-wire
	Rated input phase voltage	220Vac
	Input voltage range	85Vac ~ 300Vac
	Input AC voltage frequency	40Hz ~ 65Hz
	Max input current	≤ 55A
	Power factor	≥ 0.99
DC output	Output DC voltage range	45.6Vdc ~ 57.6Vdc
	Output DC voltage	54.0V
	Output DC current	0 ~ 120A
	Voltage set-point accuracy	-1% ~ 1%
	Efficiency	≥ 88%
	Noise (peak-peak)	≤ 200mV (0~20MHz)
	Weighted noise	≤ 2mV (300~3400Hz)
	Wide frequency noise	≤ 100mV (3.4kHz ~ 150kHz) ≤ 30mV (150 kHz ~ 30MHz)
	Discrete noise	≤ 5mV (3.4 kHz ~ 150kHz) ≤ 3mV (150 kHz ~ 200kHz) ≤ 2mV (200 kHz ~ 500kHz) ≤ 1mV (0.5 MHz ~ 30MHz)
AC input alarm and protection	AC input over-voltage alarm point	Default: 280 ± 5Vac, configurable through monitoring module
	AC input over-voltage recovery point	Default: 270 ± 5Vac, 10Vac lower than the AC input over-voltage alarm point
	AC input under-voltage alarm point	Default: 180 ± 5Vac, configurable through monitoring module
	AC input under-voltage recovery point	Default: 190 ± 5Vac, 10Vac higher than the AC input under-voltage alarm point
DC output alarm and protection	DC output over-voltage protection point	Default: 59.0 ± 0.2Vdc
	DC output over-voltage alarm point	Default: 58.5 ± 0.2Vdc, configurable through monitoring module
	DC output over-voltage recovery point	Default: 58.0 ± 0.2Vdc, 0.5Vdc lower than the over-voltage alarm point
	DC output under-voltage alarm point	Default: 48.0 ± 0.2Vdc, configurable through monitoring module
	DC output under-voltage recovery point	Default: 48.5 ± 0.2Vdc, 0.5Vdc higher than the under-voltage alarm point
	LLVD	Default: 46.6 ± 0.2Vdc, configurable through monitoring module
	BLVD	Default: 45.6 ± 0.2Vdc, configurable through monitoring module

Parameter category	Parameter	Description
Rectifier	Current sharing	The rectifiers can work in parallel and share the current. The current imbalance is better than $\pm 3\%$ rated output current. Test current range: 10% ~ 100% rated current
	Derate by input (at 45°C)	The rectifier can output max. power of 1700W with input voltage of 176Vac. Rectifiers output 800W power with input voltage of 85Vac
	Over-voltage protection	The rectifier provides over-voltage hardware and software protection. The hardware protection point is $59.5V \pm 0.5V$, and it requires manual resetting to restore operation. The software protection point is between 56V and 59V (0.5V above output voltage, 59V by default), and can be set through the monitoring module There are two software protection modes, which can be selected through the software at the host: 1. Lock out at the first over-voltage Once the output voltage reaches protection point, the rectifier will shut off and hold that state. It requires manual resetting to restore the operation 2. Lock out at the second over-voltage When the output voltage reaches the software protection point, the rectifier will shutdown, and restart automatically after 5 seconds. If the over-voltage happens again within a set time (default: 5min. Configurable through monitoring module), the rectifier will shut off and hold that state. It requires manual resetting to restore the operation Manual resetting: Resetting can be done manually through the monitoring module, or by removing the rectifier from system
	Output delay	Output voltage can rise slowly upon rectifier start up. The rise time is configurable
	Fan speed adjustable	Rectifier fan speed can be set to half or full speed
	Temperature derating	Temperature below 45°C, outputs full power: 1,700W Temperature above 45°C, there will be linear derating, that is: At 55°C, output power is 1,600W At 65°C, output power is 1,500W At 75°C, output power is 800W At 80°C, output power is 0W
EMC	Conducted emission	Class B EN55022
	Radiated emission	
	Immunity to EFT	Level 3 EN61000-4-4
	Immunity to ESD	Level 3 EN61000-4-2
	Immunity to Surges	Level 4 EN61000-4-5
	Immunity to radiation	Level 3 EN61000-4-3
	Immunity to conduction	Level 3 EN61000-4-6
Lightning protection features	At AC side	The AC input side can withstand five times of simulated lightning voltage of 5kV at 10/700 μ s, for the positive and negative polarities respectively. It can withstand five times of simulated lightning surge current of 20kA at 8/20 μ s, for the positive and negative polarities respectively. The test interval is not smaller than 1 minute. It can also withstand one event of simulated lightning surge current of 40kA at 8/20 μ s
	At DC side	The DC side can withstand five times of simulated lightning current of 15kA at 8/20 μ s for the positive and negative polarities respectively

Parameter category	Parameter		Description
Others	Safety regulation		Compliant with IEC60950-1, IEC60950-22
	Acoustic noise		□ 65dB (A)
	Insulation resistance		At temperature of 15°C ~ 35°C and relative humidity not bigger than 90%RH, apply a test voltage of 500Vdc. The insulation resistances between AC circuit and earth, DC circuit and earth, and AC and DC circuits are all not less than 10MΩ
	Insulation strength		(Remove the SPD, monitoring module and rectifiers from the system before the test.) AC circuit to earth: 50Hz, 2,500Vac DC circuit to earth: 50Hz, 1,000Vac Assistant circuit (not directly connected to the host circuit): 50Hz, 500Vac AC to DC circuits: 50Hz, 3,000Vac For all the three tests above, there should be no breakdown or flashover within 1min, with leakage current not bigger than 10mA
	MTBF		100,000hr
	ROHS		Compliant with R5 requirement
Mechanical	Dimensions (mm)	Cabinet	600 (W) × 600 (D) × 2070 (H)
		Internal space of the equipment compartment	450 (W) × 448 (D) × 550 (H)
		Internal space of each layer of the battery compartment	534 (W) × 558 (D) × 330 (H)
		Monitoring module PSM-D21	85 (W) × 287 (D) × 87 (H)
		Rectifier R48-1800	85.3 (W) × 272 (D) × 87.9 (H)
	Weight (kg)	Cabinet	≤ 170 (excluding rectifiers, monitoring module and batteries)
		Monitoring module PSM-D21	0.76
		Rectifier R48-1800	≤ 2.0

Table 2 Relation between output power and temperature

Parameter	Description
-10°C ~ +45°C	Normally operating for south model. Output power: 6800W
-40°C ~ +45°C	Normally operating for north model. Output power: 6800W
45°C ~ 50°C	Derating linearly for south model and north model. Output power: 5600W
50°C ~ 55°C	Derating linearly for south model and north model. Output power: 4500W

Table 3 Input and output connector specification

Connector		Specification		Remarks
		Capacity	Connector specification	
AC Power distribution	AC input MCB	63A/2P	H cable terminals, 2pcs (cable CSA ≤ 25mm ²)	The live line and neutral line of AC power supply
	PE busbar	Two M8 bolts	Cable CSA ≤ 35mm ²	Connected to the PE bar of the room
	Three-core AC output sockets for users	Controlled by one 16A/ 1P MCB	Configuration corresponding sockets for users in different areas	Connected with socket to serve other equipments
DC power distribution	Positive busbar	20 × 3		
	Battery MCB	2 × 63A/1P		
	Output route	See Table 2-2 of 2.2 Preparation		

Table 4 Spare part list

Component	Description	BOM
Monitoring module	PSM-D21	02311458
Rectifier	R48-1800	02130547
Signal transfer board	P144309X1	03027395
Monitoring back board	P144309X2	03027396
Heat control board	P144309U11	03027375
DC SPD	P146317P1	03027022
AC SPD	Class C	02470074
Fan	&175×69	32010089

Appendix 2 Parameter Setting Of The Monitoring Module

This appendix gives a brief explanation of the monitoring module parameter setting. The detailed content and operation methods can see *Chapter 4 Use Of Monitoring Module*. And the alarm setting can see *4.7.1 Alarm Settings*.

Table 5 Parameter setting of the monitoring module

Item	Parameter		Range	Factory settings	Default	Value description
System parameter	User level	Language	Chinese, English	Chinese	Chinese	Set according to customer need
		Address	1 ~ 254	1	1	The addresses of power systems that are at the same monitored office should be different
		CommMode	RS232, MODEM	RS232	RS232	The system only supports RS232 mode communication
		BaudRate	1200bps, 2400bps, 4800bps, 9600bps	9600bps	9600bps	Make sure the baud rates of both the sending and receiving parties are the same
		Set Date	2,000 ~ 2,099	2007-06-01	2007-06-01	Set the time according to the current actual time, regardless of whether it is a leap year or not
		Set Time	Hour, min, sec	00:00:00	00:00:00	
	Operator level	Init PWD (Initialize password)	Y, N	N	N	Whether resetting the user level and administrator level passwords to the defaults
		Init Param (Initialize parameter)	Y, N	N	N	Whether resetting the system parameters to defaults
		System Type	--	48V/30A/200/NONE	48V/30A/200/NONE	The system type cannot be changed
	Administrator level	Change Password	User level, operator level, administrator level	User level	User level	The password can be 6 digits long at most. If it is shorter than 6 digits, end it with a #
	Advanced	Save Enable	Y, N	N		
		Cycle Duration	1h ~ 8760h	48h		
		HuaWei Comm	Y, N	N		
Basic parameter	Mgmt Mode (Management mode)		Auto, Manual	Auto	Auto	Choose Auto management mode or Manual management mode
	Batt String (number of battery strings)		0 ~ 4	2	2	Configure according to actual situation
	Rated Ah (rated capacity)		50Ah ~ 5000Ah	200Ah	200Ah	The capacity of the total battery strings. You should set this parameter according to the actual battery configuration
	TYPE		1 ~ 11	1	1	
	Battery Name		10 characters			Name different types of batteries for identification
	Batt Shunt1		Y, N	Y	Y	Select 'Y' in this system. Battery management aims at only the batteries connected to the shunt
	Batt Shunt2			N	N	

Item	Parameter	Range	Factory settings	Default	Value description
LVD parameter	LLVD Enable	Y, N	Y	Y	Select 'Y' to enable LLVD function
	BLVD Enable		Y	Y	Select 'N' to disable the BLVD function
	LVD Mode	Time, voltage	Voltage	Voltage	Disconnect load according to Time or Voltage
	LLVD Volt	40V ~ 60V	46.6V	46.6V	When the monitoring module detects that the battery voltage is lower than the preset LLVD Volt, the load will be disconnected, and so is the battery when the battery voltage is lower than the preset BLVD Volt
	BLVD Volt		45.6V	45.6V	
	LLVD Time	3min ~ 1,000min	300min	300min	When the discharge time reaches the preset LLVD Time, the monitoring module will disconnect the load; when the discharge time reaches the preset BLVD Time, it will disconnect the battery
	BLVD Time		600min	600min	
Charging management	Float	42V ~ 58V	54.0V	54.0V	Battery float charging voltage
	Boost		56.4V	56.4V	Battery boost charging voltage, and the Boost must be higher than the Float
	Limit (current limit)	0.1C ₁₀ ~ 0.15C ₁₀	0.1C ₁₀	0.1C ₁₀	Maximum battery charging current
	Over (over current point)	0.3C ₁₀ ~ 1.0C ₁₀	0.3C ₁₀	0.3C ₁₀	Battery charge over-current alarm point
	Automatic Boost	Y, N	Y	Y	Y: enable the function N: disable the function
	Cyclic Boost				
	Cyclic Boost Interval	48h ~ 8760h	2400h	2400h	Interval between two cyclic boost chargings
	Cyclic Boost Time	30min ~ 2880min	720min	720min	The time Cyclic Boost lasts
	To Boost Current	0.040 ~ 0.080C ₁₀	0.06C ₁₀	0.06C ₁₀	To boost charging current criterion
	To Boost Capacity	10% ~ 99%	80%	80%	To boost charging capacity criterion
	Constant BC Current	0.002 ~ 0.02 C ₁₀	0.02C ₁₀	0.02C ₁₀	Beginning of constant BC current charging timing
	Duration (of constant BC)	30min ~ 1440min	180min	180min	The duration that the constant BC current charging lasts
	Boost Limit	60min ~ 2880min	1440min	1440min	Maximum BC duration
	OverTemp To FC	Enable, disable	Enable	Enable	Enable: use this function Disable: do not use this function
	Temp Of Over Temp To FC	35°C ~ 50°C	40°C	40°C	Temperature point of battery compartment OverTemp BC TO FC
	Batt Set Date	-	2007-06-01	2007-06-01	If the battery set date is modified, the battery charge and discharge time will be cleared
	Clear Chg/DisChg Times	Y, N	N	N	Select 'Y', and press ENT to clear the mains failure times and battery charge & discharge times

Item	Parameter	Range	Factory settings	Default	Value description
Battery test parameter	Battery Test Voltage	43.1V ~ 57.9V	48.2V	48.2V	Monitoring module will stop the test if the battery voltage reaches the Battery Test Voltage, or the discharge time reaches Battery Test Time, or the battery capacity reaches Test End Cap
	Battery Test Time	5min ~ 1440min	300min	300min	
	Test End Cap	0 ~ 1C ₁₀	0.7C ₁₀	0.7C ₁₀	
	TimeTest Enable	Y, N	N	N	Enable or disable Scheduled Test
	Short Test	Y, N	N	N	Whether using Short Test function
	Alarm Current	1A ~ 100A	10A	10A	If the battery have not discharged within the ShortTest Cycle, the monitoring module will start a short test, whose operation time is set by the parameter ShortTest Duration. By the end of the test, if the difference in the discharge currents of batteries is bigger than the Alarm Current, the battery discharge imbalance alarm will be raised
	ShortTest Cycle	24h ~ 8,760h	720h	720h	
	ShortTest Duration	1min ~ 60min	5min	5min	
	StableTest Enable	Y, N	N	N	Enable or disable Stable Test
	StableTest Current	1A ~ 9999A	9999A	9999A	Constant battery discharging current in Stable Test
Temperature compensation coefficient	Temp. 1	None, Battery Temp	Battery Temp	Battery Temp	Measurement of the battery temperature or no temperature measurement input
	Temp. 2	None, Ambient Temp	None	None	Measurement of the ambient temperature or no temperature measurement input
	Center Temp	10°C ~ 40°C	25°C	25°C	Temperature compensation center
	Temp. Comp Coeff	0 ~ 500mV/°C/str	72mV/°C/str	72mV/°C/str	Temperature compensation coefficient
	Over	10°C ~ 100°C	55°C	55°C	When the battery temperature is higher than the setting value, the monitoring module will raise an alarm. The High must not be higher than the Over
	High	10°C ~ 100°C	55°C	55°C	
	Low	-40°C ~ 10°C	0°C	0°C	When the battery temperature is lower than the setting value, the monitoring module will raise an alarm

Item	Parameter	Range	Factory settings	Default	Value description
AC parameter	OverVolt	50V ~ 300V	280V	280V	AC input over voltage alarm point
	LowVolt	50V ~ 300V	180V	180V	AC input low voltage alarm point, must be lower than OverVolt
	UnderVolt	50V ~ 300V	80V	80V	The monitoring module will not raise an alarm when the AC input is single phase
	AC Input	1-PH, 3-PH	1-PH	1-PH	Setting according to the connected AC input
DC parameter	Over (over-voltage)	40V ~ 60V	58.5V	58.5V	DC Over Voltage alarm point
	Low (low-voltage)		48.0V	48.0V	DC Low Voltage alarm point, must be lower than DC Over Voltage alarm point
	Under (under-voltage)		48.0V	48.0V	DC Under Voltage alarm point, must be lower than DC Low Voltage alarm point
Rectifier parameter	Rect Over Volt	56V ~ 59V	59V	59V	Rectifier over voltage alarm point
	Default Volt	48V ~ 58V	54.0V	54.0V	Default output voltage when communication interrupted. Must be lower than the Rect Over Volt
	Walkin Enabled	Y, N	N	N	The output soft start function means the rectifier voltage will rise from 0V to the Default Volt after the Walkin Time
	Walkin Time	8s ~ 128s	8s	8s	
	Fan Speed	Full Speed, Half Speed	Half speed	Half speed	Half Speed: the rectifier will regulate the fan speed according to the temperature. Full Speed: the fan will operate at full speed
	HVSD Time	50s ~ 300s	300s	300s	Restart delay after HVSD
	Interval Start	0 ~ 10s	0s	0s	The monitoring module can set the DCDC Interval Start of the modules. Start time = module address * interval time
	OverVolt Enable	Y, N	N	N	The monitoring module can set the module to OverVolt Enable, meanwhile, the module can start forcibly. The monitoring module will set automatically the module with least address to have this function. If the module always exceeds the normal voltage for 60s, the function will be canceled automatically.
	AC InputCurrLim	1A ~ 50A	30A	30A	
	Shelf Enable	Y, N	N	N	

Item	Parameter		Range	Factory settings	Default	Value description
Alarm parameter	Alarm control	Voice Sign	On, Off, 3min, 10min, 1h, 4h	Off	Off	
		Clear Hist.	Y, N	N	N	
		Block Alarm	Y, N	N	N	
		Dry Contact	Open, close	Open	Open	
	Alarm mode	DI No.	No. 8	8	8	The eighth corresponding connecting terminals, queued up in the order that the hardware switches are put
		Alarm Mode	High, Low	High	High	8: Alarm upon high level or upon low level
		Set DI Name	8	8	8	Serial No. of the connecting terminal for DI input
		DI Name	--	Digital8	Digital8	8: Digital8 figures or letters, 10 at most

Appendix 3 Menu Structure Of The Monitoring Module

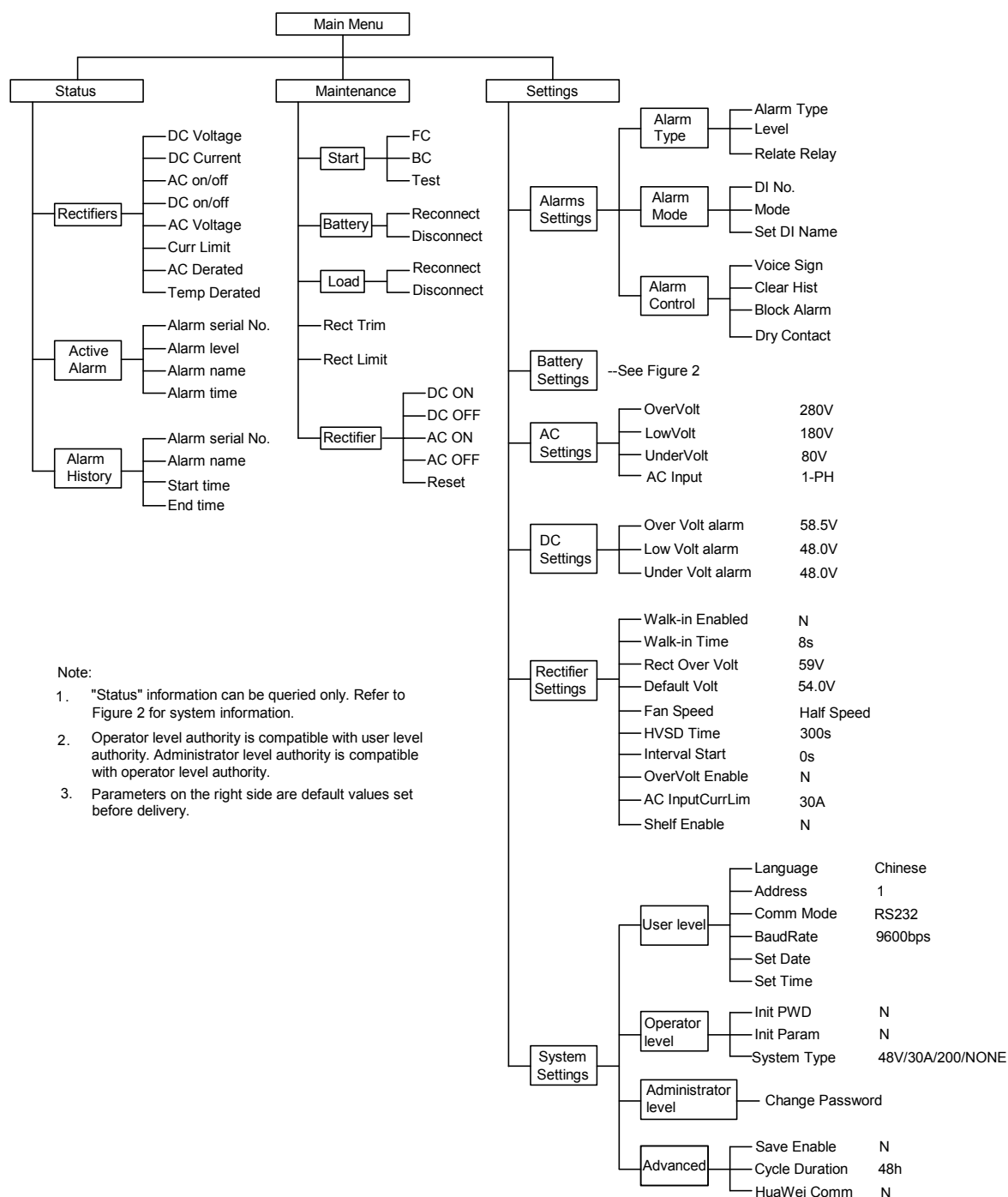


Figure 1 Menu structure of the monitoring module (1)

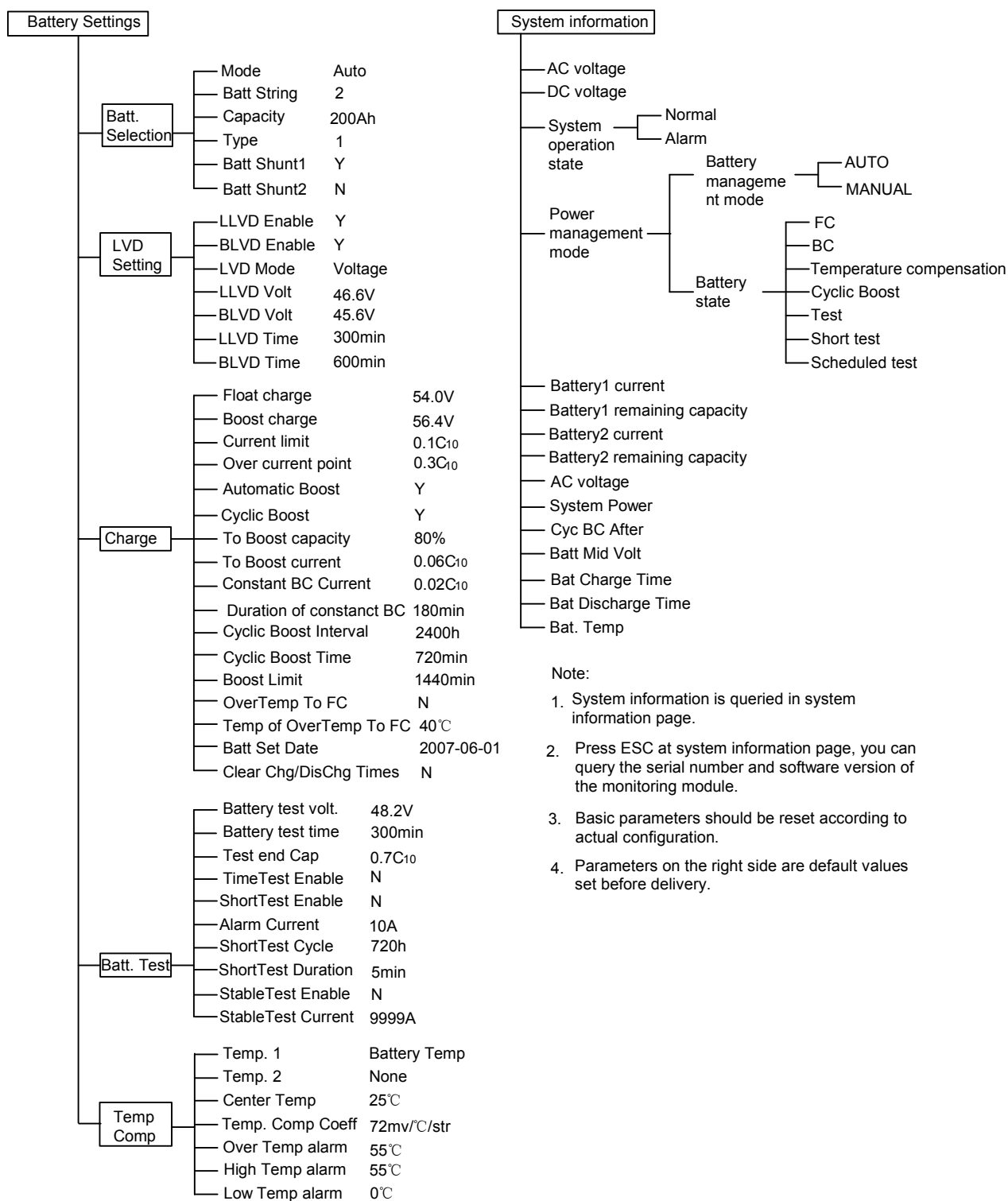


Figure 2 Menu structure of the monitoring module (2)

Appendix 4 Wiring Diagram

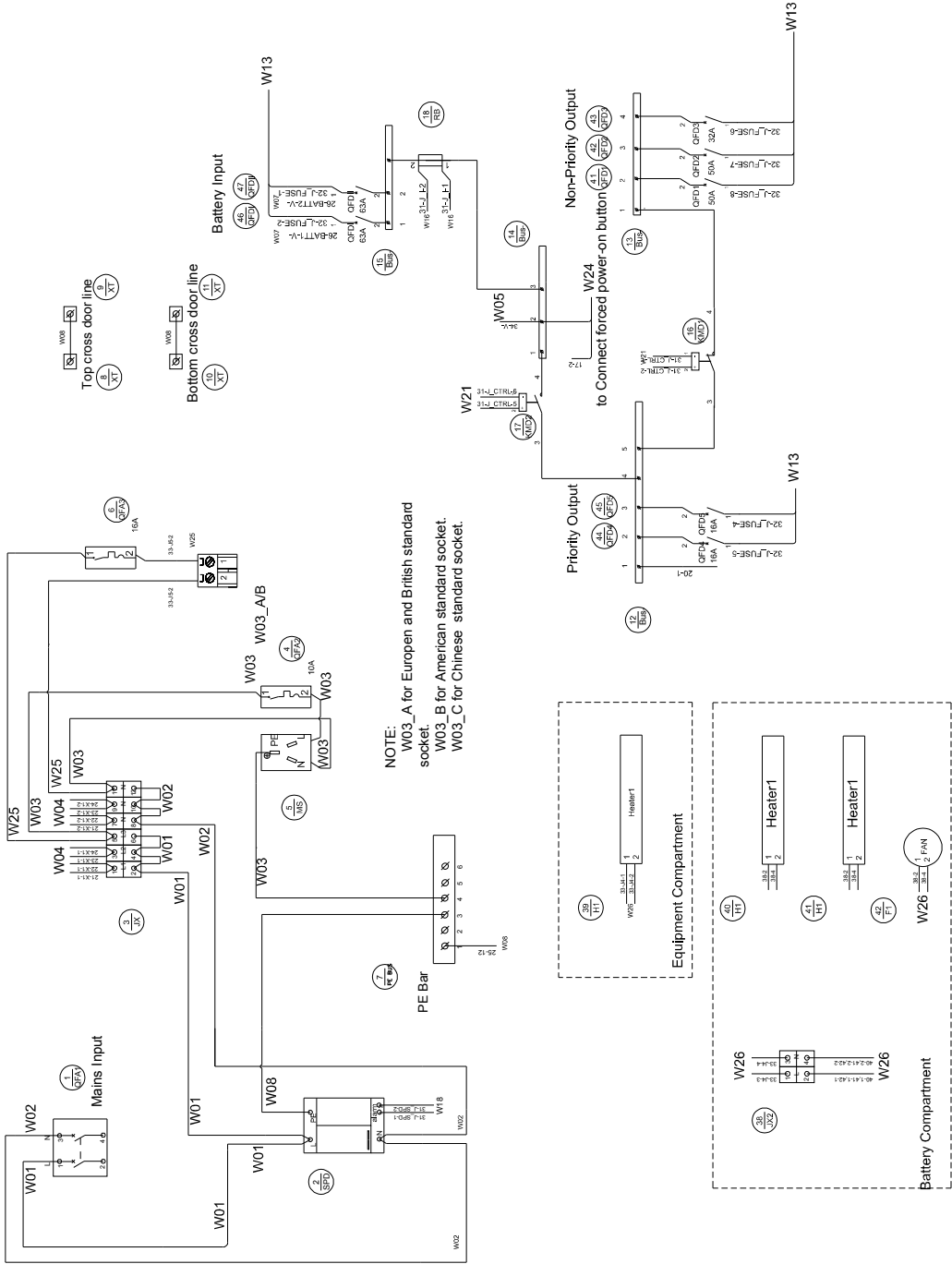


Figure 3 EPC48120/1800-H90B wiring diagram (1)

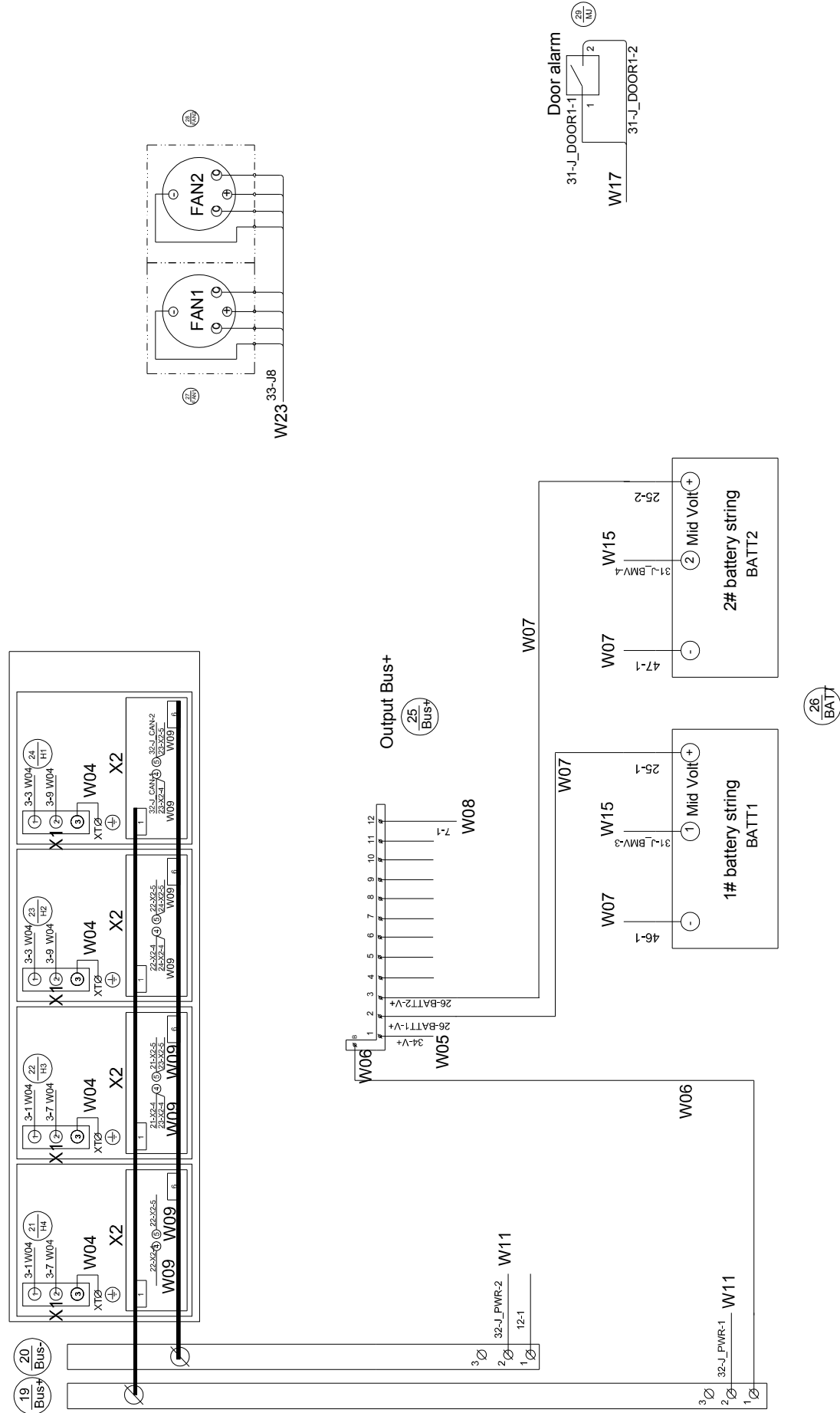


Figure 4 EPC48120/1800-H90B wiring diagram (2)

Appendix 5 Schematic Diagram

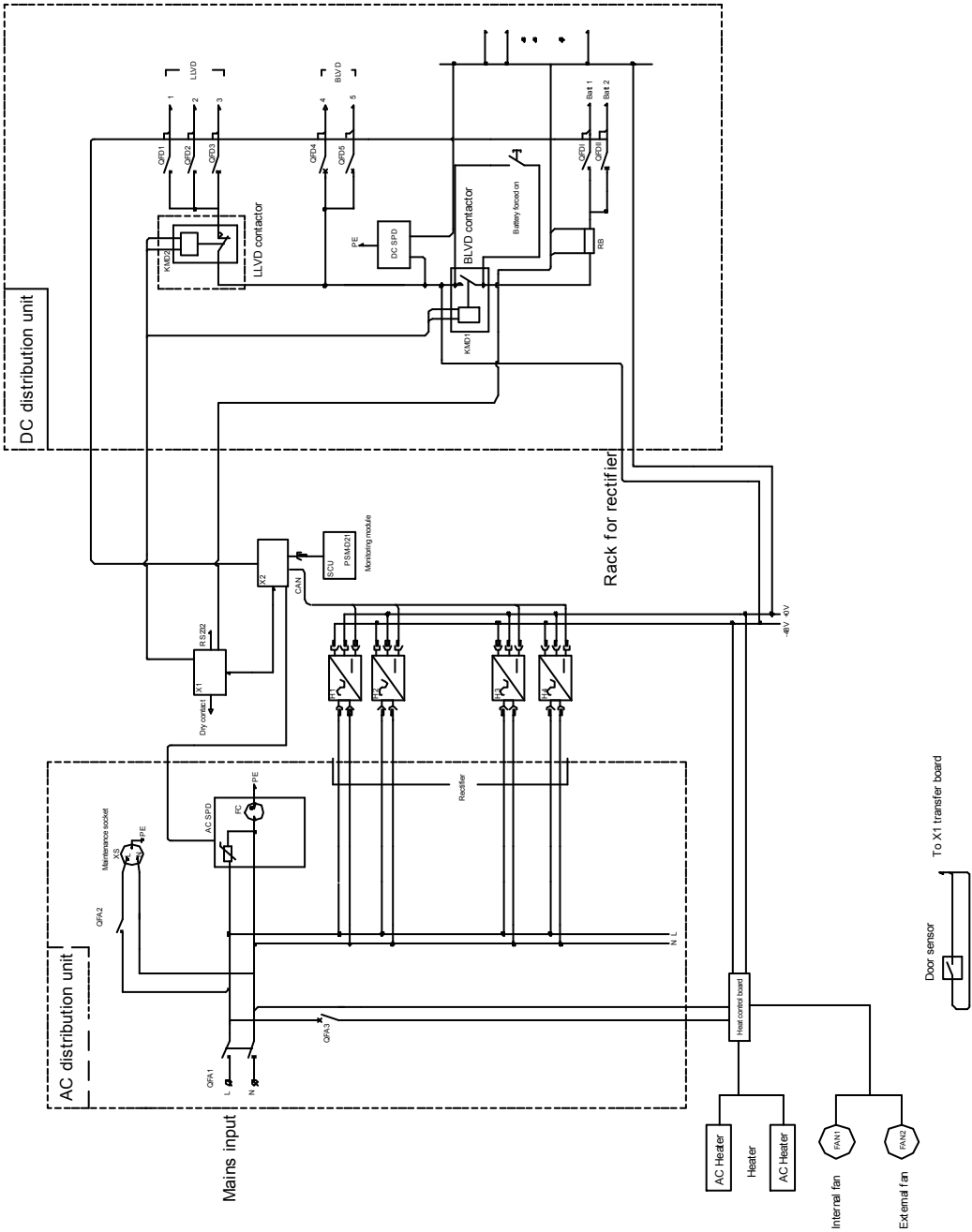


Figure 6 EPC48120/1800-H90A schematic diagram

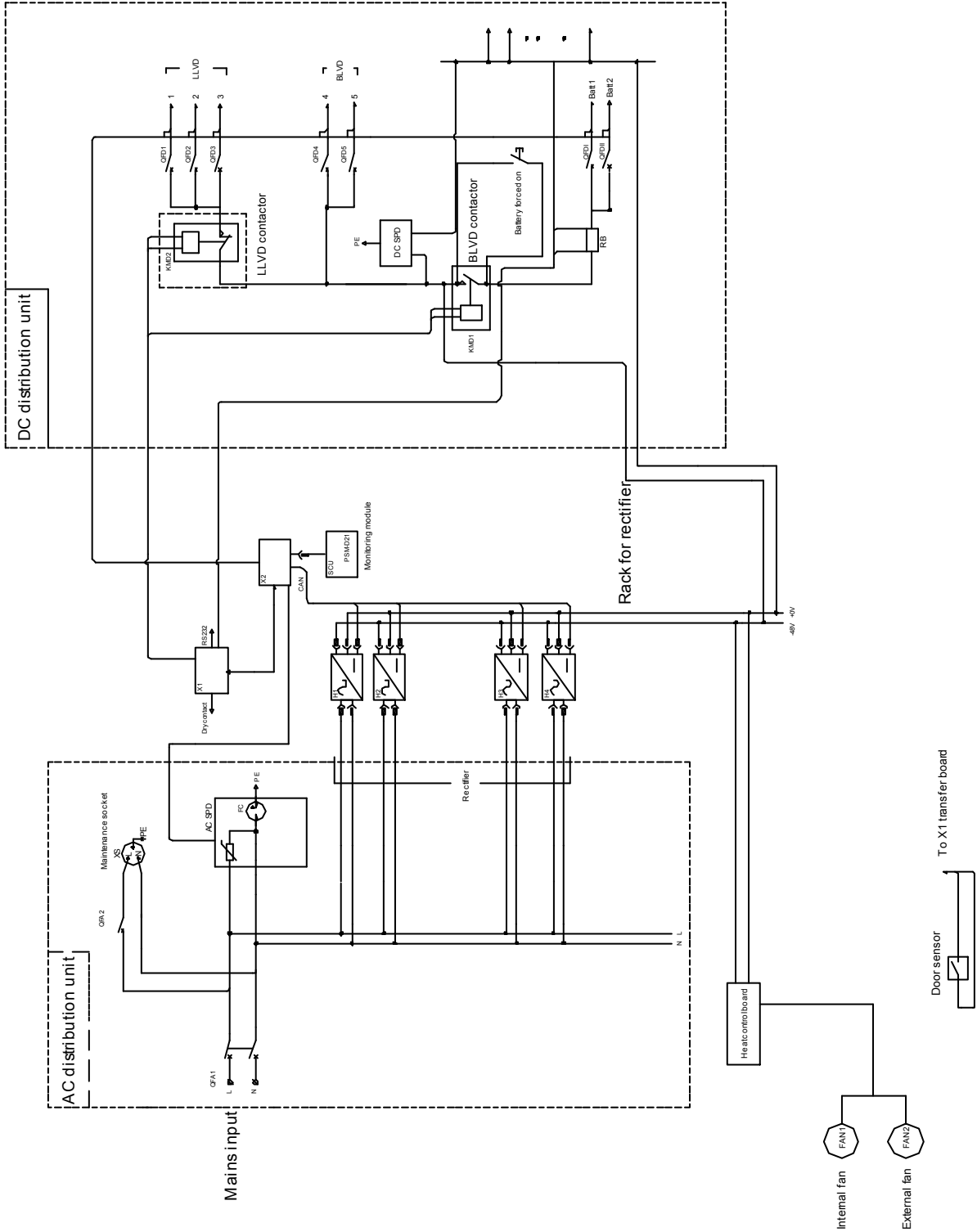


Figure 7 EPC48120/1800-H90B schematic diagram

Appendix 6 Glossary

Abbreviation	Full word
Amb.Temp	Ambient Temperature
Batt	Battery
BC	Boost Charging
BLVD	Battery Lower Voltage Disconnection
Cap	Capacity
CommMode	Communication Mode
CurrLimit	Current Limit
CycBC	Cyclic Boost Charging
Con Alarm Voice	Control Alarm Voice
Hist Alarm	Historical alarm
HVSD	High Voltage Shutdown
InitParam	Initialize Parameters
InitPWD	Initialize Password
LLVD	Load Low Voltage Disconnection
LVD	Low Voltage Disconnection
MCB	Miniature Circuit Breaker
Ph-A	Phase A
PWD	Password
Rect	Rectifier
Shunt coeff	Shunt Coefficient
SPD	Surge Protection Device
SW Version	Software Version
Sys	System
Temp	Temperature
Temp Comp	Temperature Compensation
Volt	Voltage