

TP48200A-D14A1 Telecom Power

User Manual

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Preface

Purpose

This document describes the TP48200A-D14A1 in terms of overview, component description, safety precautions, and system maintenance.

Intended Audience

This document is intended for:

- Technical engineers
- Maintenance engineers
- System engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 04 (2019-12-20)

Optimized the content about rectifiers.

Issue 03 (2013-07-25)

Modified the LCD menu.

Issue 02 (2012-12-09)

Port description is modified.

Issue 01 (2012-03-01)

This issue is the first official release.

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1 Safety Precautions

1.1 General Safety

Statement

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "CAUTION", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Huawei will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting equipment malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

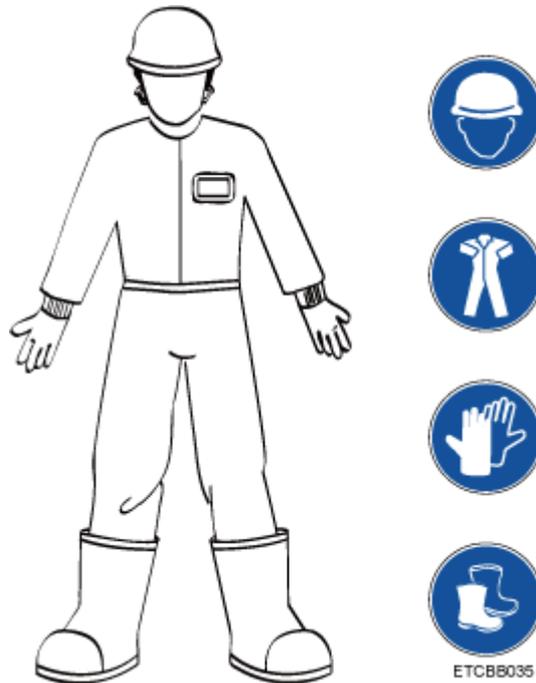
Huawei will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document
- Installation or use in environments which are not specified in relevant international or national standards
- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Equipment damage due to force majeure, such as earthquakes, fire, and storms
- Damage caused during transportation by the customer
- Storage conditions that do not meet the requirements specified in this document

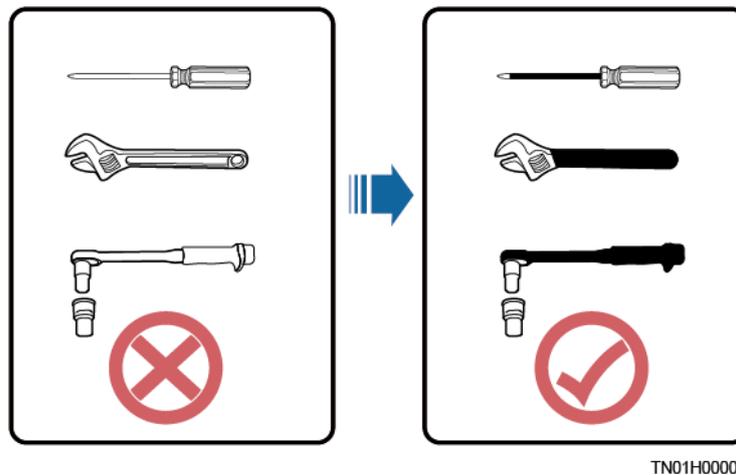
General Requirements

- Before installing, operating, or maintaining the equipment, remove any conductive objects such as watches or metal jewelry like bracelets, bangles, and rings to avoid electric shock.

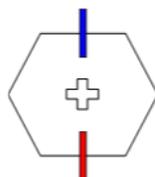
- When installing, operating, or maintaining the equipment, wear dedicated protective gears such as insulation gloves, goggles, and safety clothing, helmet, and shoes, as shown in the following figure.



- Use insulated tools or tools with insulated handles, as shown in the following figure.

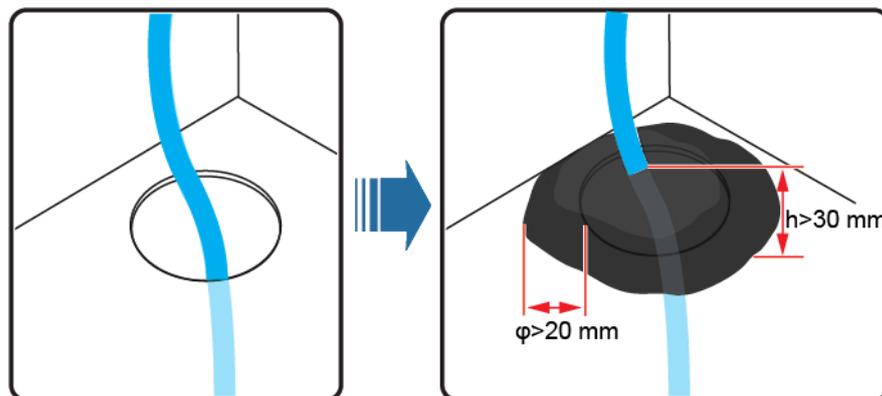


- Follow the specified procedures for installation, operation, and maintenance.
- Ensure that bolts are tightened with a torque wrench and marked using red or blue color. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm if the bolts are tightened and then mark them in red. (The marks should cross the edges of the bolts, as shown in the following figure.)



- Before installing, operating, or maintaining a cabinet, clean up any water, ice, snow, or other sundries on the top of the cabinet to prevent sundries from falling into the cabinet when you open the cabinet door.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Before handling a conductor surface or terminal, measure the contact point voltage and ensure that there is no risk of electric shock.
- Ensure that all slots are installed with boards or filler panels. Avoid hazards caused by hazardous voltages or energy on boards. Ensure that the air channel is normal, control electromagnetic interference, and prevent dust and other sundries on the backplane, baseplate, and boards.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not stop using protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment. Promptly replace warning labels that have worn out.
- Keep irrelevant people away from the equipment. Only operators are allowed to access the equipment.
- All cable holes should be sealed. Seal the used cable holes with firestop putty. Seal the unused cable holes with the caps delivered with the cabinet. The following figure shows the criteria for correct sealing with firestop putty.



TN01H00006

- Do not use water, alcohol, oil, or other solvents to clean electrical components inside and outside a cabinet.

Personal Safety

- If there is a probability of personal injury or equipment damage during operations on the equipment, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.
- To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telecommunication network voltage (TNV) circuits.
- Do not power on the equipment before it is installed or confirmed by professionals.

Symbol Conventions

To ensure personal and equipment safety, observe all the safety instructions marked on the equipment when installing, operating, and maintaining the equipment.

Symbol	Description
	Indicates a part exposed to high voltage. This symbol warns operators that both direct and indirect contact with the power grid is fatal. Such areas include hazardous voltage points or protective power supply covers that may be removed during maintenance.
	Warns users of overheating. This symbol is attached to a device surface that may overheat and cause scalding. It warns users not to touch the surface during operations or maintenance. Users should wear heat insulation gloves before operations to prevent scalding.
	Indicates protection earthing. This symbol is attached next to a protection ground terminal next to grounded equipment and an external ground system. An equipment ground cable is connected to an external ground bar through the protection ground terminal.
	Indicates equipotential bonding. This symbol is found with equipotential terminals inside equipment.
	Indicates electrostatic discharge (ESD). This symbol is used in all electrostatic sensitive areas. Before operating equipment in these areas, wear ESD gloves or an ESD wrist strap.
	Indicates that the equipment is safe to use at altitudes below 2000 m (6561.6 ft.).
	Indicates that the equipment is not safe to use in tropical climates.
	Indicates a fan assembly or moving part. This symbol is silkscreened on or attached to the panel of a fan assembly, warning operators to keep away. Do not touch the blades when the fan is rotating.
	Indicates that users should refer to the instruction. This symbol is used when the usage of a device port cannot be clearly described. For example, this symbol can be used in but not limited to the following scenarios: <ol style="list-style-type: none"> 1. For a multi-power device, use it near the power supply to replace the multi-power supply identifier. The symbol indicates that the device has multiple power inputs. Therefore, when powering off the device, you must disconnect all power inputs. 2. If there are multiple output ports, use the symbol near the output ports. Connect cables according to the rated power output and configuration parameter information in the instruction. 3. If there are multiple slots, use the symbol near the slot

Symbol	Description
	information. For details, see the description of slot information, restrictions on boards, and usage conditions in the instruction.

1.2 Personnel Requirements

- Personnel who plan to install or maintain Huawei equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.

NOTE

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance
- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

1.3 Electrical Safety

Grounding

- The protective ground of the equipment should be reliably connected to the ground screw on the metal enclosure (grounding resistance ≤ 0.1 ohm).
- For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- For the equipment that uses a three-pin socket, ensure that the ground terminal in the socket is connected to the protection ground.

AC and DC Power

 **DANGER**

- The power system is energized by power sources with hazardous voltage. Direct or indirect contact (through damp objects) with the power sources may result in electric shock.
 - Non-standard and improper operations may result in fire or electric shock.
 - Do not connect or disconnect power cables with power on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.
-
- If the power supply to the equipment is permanently connected, install an easily accessible disconnecter at the exterior of the device.
 - Before making electrical connections, switch off the disconnecter on the upstream device to cut off the power supply if people may contact energized components.
 - If a "high electricity leakage" tag is attached on the equipment, ground the protective ground terminal on the equipment enclosure before connecting the AC power supply; otherwise, electric shock as a result of electricity leakage may occur.
 - Before installing or removing a power cable, turn off the power switch.
 - Before connecting a power cable, check that the label on the power cable is correct.
 - Before connecting the power supply, ensure that cable connections are correct.
 - If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

Cabling

- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Do not route cables behind the air intake and exhaust vents of the equipment.
- Ensure that cables meet the VW-1 flame spread rating requirements.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- Ensure that all cables are securely bound. Route and bind cables so that they appear neat and tidy and their cable sheaths are intact.
- If an AC input power cable is connected to the cabinet from the top, bend the cable in a U shape outside the cabinet and then route it into the cabinet.
- Ensure that the bending radius of each cable is at least five times the diameter of the cable.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.

ESD

- When installing, operating, and maintaining the equipment, comply with the ESD protection regulations and wear the ESD clothing, gloves, and wrist strap.
- When holding a board, hold its edge without touching any components. Do not touch the components with your bare hands.
- Package boards with ESD packaging materials before storing or transporting them.

1.4 Installation Environment Requirements

- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Ensure that there are no acid, alkaline, or other corrosive gases in the installation place.
- Do not place the equipment near heat sources or exposed fire sources, such as electric heaters, microwave ovens, roasters, water heaters, furnace fire, candles, or other places where high temperature may occur. Otherwise, the enclosure will melt or the equipment will heat up, which can cause a fire.
- Install the equipment in an area far away from liquids. Do not install it under areas prone to condensation, such as under water pipes and air exhaust vents, or areas prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.
- Before installing the equipment into a cabinet, ensure that the cabinet is secured and will not tilt or fall down due to loss of balance, which can cause personal injury or equipment damage.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

Installation at Heights

Working at heights refers to operations that are performed at least 2 meters above the ground.

Do not at heights in any of the following situations:

- Rainwater remains on steel pipes or other risky conditions exist. After the preceding conditions no longer exist, the safety director and relevant technical personnel need to check the involved equipment. Operators can begin working only after obtaining consent.
- When working at heights, comply with local relevant laws and regulations.
- Only trained and qualified personnel are allowed to work at heights.
- Before working at heights, check the climbing tools and safety gears such as safety helmets, safety belts, ladders, springboards, scaffolding, and lifting equipment. If they do not meet the requirements, take corrective measures or disallow working at heights.
- Wear personal protective equipment such as the safety helmet and safety belt or waist rope and fasten it to a solid structure. Do not mount it on an insecure moveable object or metal object with sharp edges. Make sure that the hooks will not slide off.

 **DANGER**

- Set a restricted area and eye-catching signs for working at heights to warn away irrelevant personnel.
 - Carry the operation machinery and tools properly to prevent them from falling off and causing injuries.
 - Personnel involving working at heights are not allowed to throw objects from the height to the ground, or vice versa. Objects should be transported by tough slings, hanging baskets, highline trolleys, or cranes.
 - Do not perform operations on the upper and lower layers at the same time. If unavoidable, install a dedicated protective shelter between the upper and lower layers or take other protective measures. Do not pile up tools or materials on the upper layer.
 - Ensure that guard rails and warning signs are set at the edges and openings of the area involving working at heights to prevent falls.
 - Do not pile up scaffolding, springboards, or other sundries on the ground under the area involving working at heights. Do not allow people to stay or pass under the area involving working at heights.
 - Inspect the scaffolding, springboards, and workbenches used for working at heights in advance to ensure that their structures are solid and not overloaded.
 - Dismantle the scaffolding from top down after finishing the job. Do not dismantle the upper and lower layers at the same time. When removing a part, ensure that other parts will not collapse.
 - Do not loiter when working at heights. Do not sleep at heights.
-
- Any violations must be promptly pointed out by the site manager or safety supervisor and the involved personnel should be prompted for correction. Personnel who fail to stop violations will be forbidden from working.
 - Operators who violate the safety regulations are responsible for accidents caused. The supervisor has to bear the responsibility accordingly.

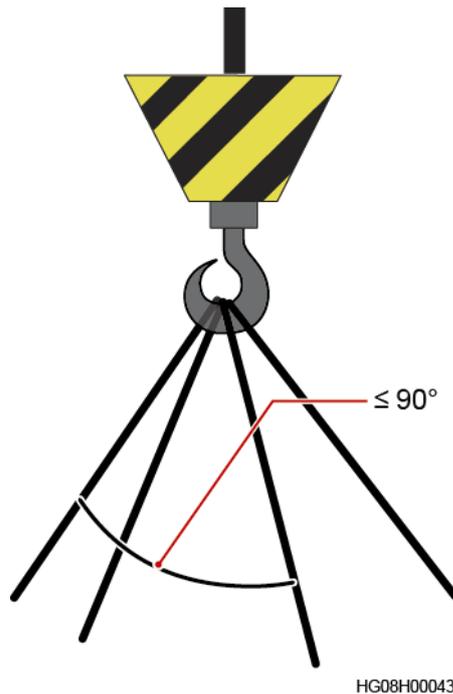
1.5 Mechanical Safety

Hoisting Devices

 **DANGER**

Do not walk under hoisted objects.

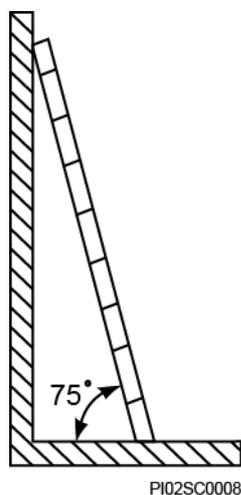
-
- Only trained and qualified personnel should perform hoisting operations.
 - Check that hoisting tools are available and in good condition.
 - Before hoisting objects, ensure that hoisting tools are firmly secured onto a load-bearing object or wall.
 - Ensure that the angle formed by two hoisting cables is no more than 90 degrees, as shown in the following figure.



- Do not drag steel ropes and hoisting tools or bump hoisted objects against hard objects during hoisting.

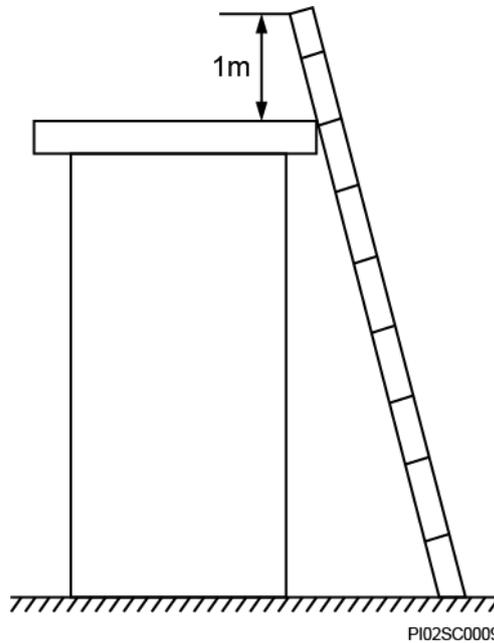
Using Ladders

- Use wooden or fiberglass ladders when you need to perform live working at heights.
- When a step ladder is used, ensure that the pull ropes are secured and the ladder is held firm.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the wider end of the ladder is at the bottom, or protective measures have been taken at the bottom to prevent the ladder from sliding.
- Ensure that the ladder is securely positioned. The recommended angle for a ladder against the floor is 75 degrees, as shown in the following figure. An angle rule can be used to measure the angle.



When climbing a ladder, take the following precautions to reduce risks and ensure safety:

- Keep your body steady.
- Do not climb higher than the fourth rung from the top.
- To climb onto a roof, ensure that the ladder top is at least one meter higher than the roof line, as shown in the following figure.



- Ensure that your body's center of gravity does not shift outside the legs of the ladder.

Drilling Holes

When drilling holes into a wall or floor, observe the following safety precautions:

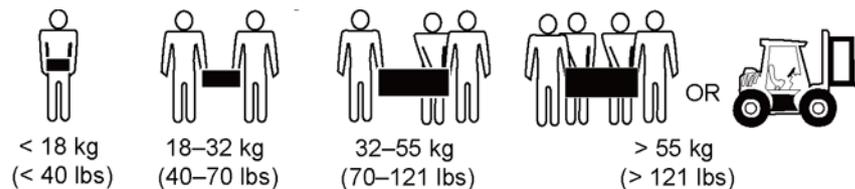
NOTICE

Do not drill holes into the equipment. Doing so may affect the electromagnetic shielding of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.



- When moving the equipment by hand, wear protective gloves to prevent injuries.

- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules (such as power supply units, fans, and boards) that are installed in the equipment because they cannot support the weight of the equipment.

1.6 Battery Safety

If no battery is involved, skip this section.

Before installing, operating, or maintaining batteries, read the battery manufacturer's instructions. The safety precautions specified in this document are highly important precautions that require special attention. For additional safety precautions, see the instructions provided by the battery manufacturer.

Basic Requirements

Before operating batteries, carefully read the safety precautions for battery handling and master the correct battery connection methods.

 DANGER

- Do not expose batteries at high temperatures or around heat-generating devices, such as sunlight, fire sources, transformers, and heaters. Excessive heat exposure may cause the batteries to explode.
- Do not burn batteries. Otherwise, the batteries may explode.
- To avoid leakage, overheating, fire, or explosions, do not disassemble, alter, or damage batteries, for example, insert sundries into batteries or immerse batteries in water or other liquids.
- When replacing a battery, use a battery of the same model or type. Improper replacement may cause the battery to explode.
- Do not connect a metal conductor to the battery poles or touch the battery terminals. Otherwise, the battery may be short-circuited and heat up, which can cause injuries such as burning.

To ensure safety during battery installation, operation, and maintenance, pay attention to the following:

- Do not wear conductive articles such as watches, bracelets, bangles, and rings.
- Wear goggles, rubber gloves, and protective clothing to prevent skin contact with electrolyte in the case of electrolyte overflow. If a battery leaks, protect the skin or eyes from the leaking liquid. If the skin or eyes come in contact with the leaking liquid, wash it immediately with clean water and go to the hospital for medical treatment.
- Use dedicated insulated tools.
- Move batteries in the required direction. Do not place a battery upside down or tilt it.
- Keep the battery loop disconnected during installation and maintenance.
- Do not drop, squeeze, or puncture a battery. Protect batteries from external high pressure to prevent internal short circuits and overheating.
- Dispose of waste batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. If a battery is disposed of improperly, it may explode.

- Do not use a damaged battery.
- To prevent injuries or explosion, do not allow children or pets to swallow or bite a battery.
- If batteries experience discoloration, deformation, abnormal heating, or other abnormalities during working, charging, or storage, stop using the batteries and replace them with new ones.
- Batteries can work properly with the allowed charge and discharge parameters when the temperature is within the specified range. If the temperature is outside the specified range, the battery charge and discharge performance and safety are affected.

Battery Installation

Before installing batteries, observe the following safety precautions:

- Install batteries in a dry and cool environment with good ventilation, which is away from high temperature and flammable materials, and take precautions against fire.
- Place and secure batteries horizontally.
- Note the polarities when installing batteries. Do not short-circuit the positive and negative poles of the same battery or battery string. Otherwise, the battery may be short-circuited.
- When installing a battery string, retain at least one breakpoint to prevent a loop being formed. After checking that the installation is correct, close the breakpoints to finish the installation.
- During the installation, insulate the terminals of cables connecting batteries. Ensure that the terminals do not come into contact with metal components such as the cabinet.
- Secure battery cables or copper bars by tightening bolts to the required torque. Loose connections will result in excessive voltage drop or cause batteries to burn out in the case of excessive current.
- Check battery connections periodically, ensuring that all bolts are securely tightened.

Battery Short Circuit



Battery short circuits can generate high instantaneous current and release a great amount of energy, which may cause equipment damage or personal injury.

-
- If permitted, disconnect the batteries in use before performing any other operations.
 - To avoid battery short-circuit, do not maintain batteries with power on.

Flammable Gas

NOTICE

- Do not use unsealed lead-acid batteries.
 - To prevent fire or corrosion, ensure that flammable gas (such as hydrogen) is properly exhausted for lead-acid batteries.
-

Lead-acid batteries emit flammable gas when used. Ensure that batteries are kept in a well-ventilated area and take preventive measures against fire.

Battery Leakage

NOTICE

Battery overheating causes deformation, damage, and electrolyte spillage.

If the battery temperature exceeds 60°C, check for and promptly handle any leakage.

Electrolyte overflow may damage the equipment. It will corrode metal parts and boards, and ultimately damage the boards.

WARNING

When the electrolyte overflows, absorb and neutralize the electrolyte immediately. When moving or handling a battery whose electrolyte leaks, note that the leaking electrolyte may hurt human bodies.

If the electrolyte overflows, follow the instructions of the battery manufacturer or neutralize the electrolyte by using sodium bicarbonate (NaHCO₃) or sodium carbonate (Na₂CO₃).

Lithium Battery

The safety precautions for lithium batteries are similar to those for lead-acid batteries except that you also need to note the precautions described in this section.

WARNING

There is a risk of explosion if a battery is replaced with an incorrect model.

- A battery can be replaced only with a battery of the same or similar model recommended by the manufacturer.
- When handling a lithium battery, do not place it upside down, tilt it, or bump it with other objects.
- Keep the lithium battery loop disconnected during installation and maintenance.
- When the ambient temperature is lower than the lower limit of the operating temperature (charge is forbidden at 0°C), do not charge the battery. Otherwise, a short circuit would occur inside the battery.
- Do not throw a lithium battery in fire.

- When maintenance is complete, return the waste lithium battery to the maintenance office.

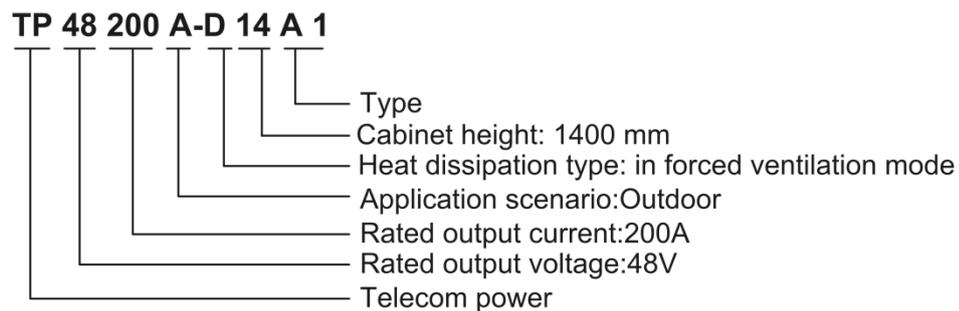
2 Overview

2.1 Designation Explanation

The TP48200A-D14A1 is an outdoor cabinet-type power system and supplies power to the -48 V DC telecom equipments. The TP48200A-D14A1 uses 50 A rectifiers and outputs a maximum of 200 A current.

Figure 2-1 shows the TP48200A-D14A1 designation explanation.

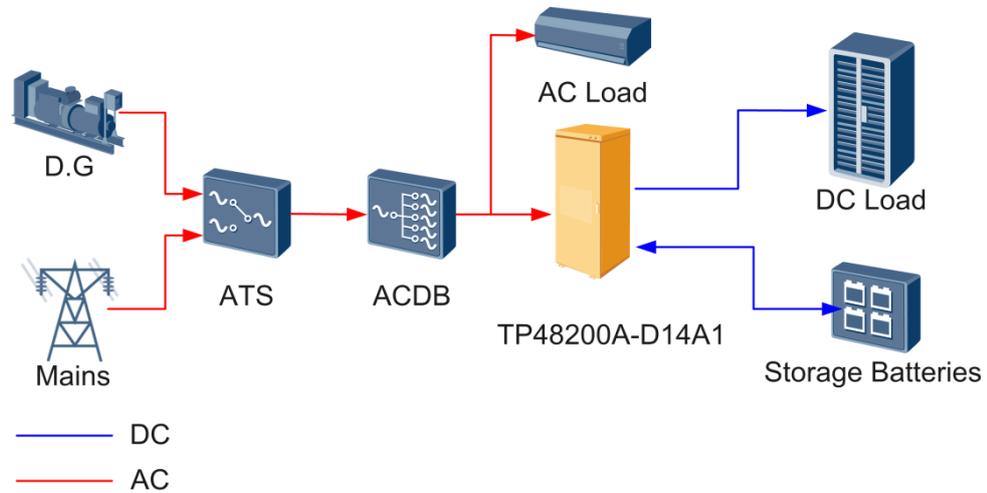
Figure 2-1 Designation explanation



2.2 Typical Networking

The TP48200A-D14A1 power system, AC power supply, ATS, storage batteries, and related devices constitute the site power solution. Figure 2-2 shows the application of the TP48200A-D14A1 power system in the typical site power solution.

Figure 2-2 Typical site power solution



2.3 Features

- **Easy Installation of Modules**
The monitoring module (PMU) and rectifier module are hot-swappable, thus facilitating the installation, saving maintenance time, and reducing the OPEX.
- **Intelligent Sleep Technology**
According to the load power, the power system automatically enables one or more rectifiers to enter the sleep mode.
- **Wide Range of AC Input Voltage**
The AC input voltage of the system ranges from 90 V AC to 290 V AC phase voltage.
- **Highly Level Safety Design**
The power system complies with the CE standard, the power distribution components comply with the CE and 3C standards, and the rectifier complies with the UL, CE, and TUV standards.

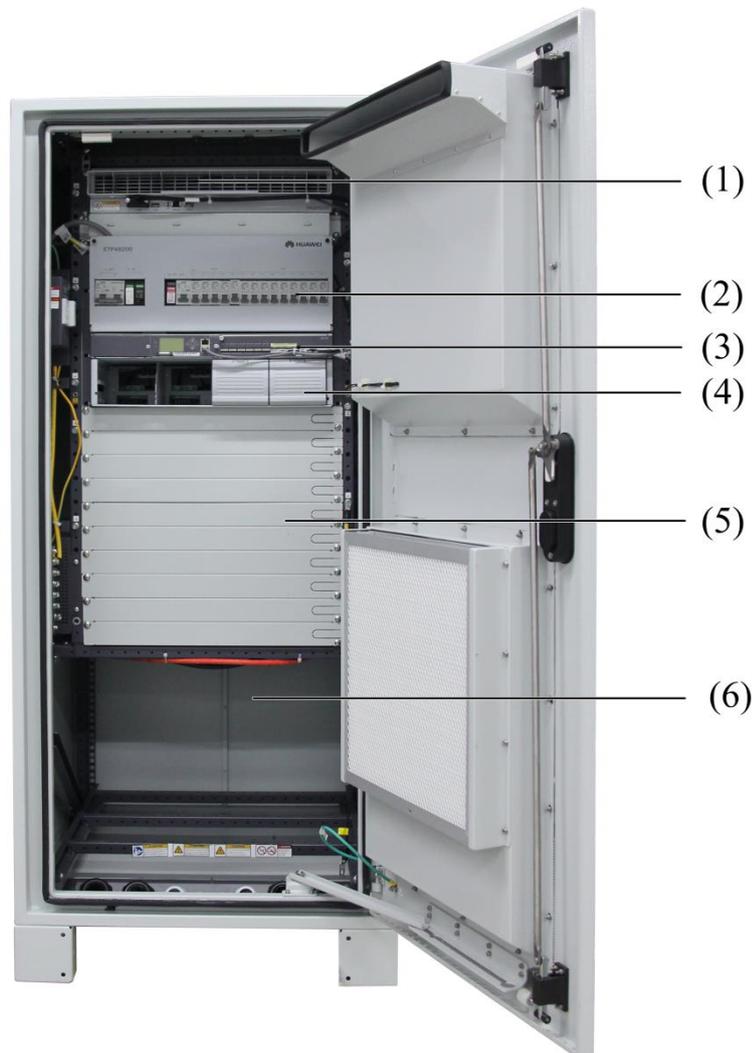
2.4 Configuration

The TP48200A-D14A1 power system mainly consists of the cabinet, temperature control unit (TCU), rectifier, power distribution unit (PDU), and monitoring unit.

Table 2-1 Configuration

Item	Composition	AC input mode
TP48200A-D14A1	<ul style="list-style-type: none"> • PMU02C1 • UIM02A • R4850G1 • PDU 	Single phase three wire

Figure 2-3 TP48200A-D14A1 interior



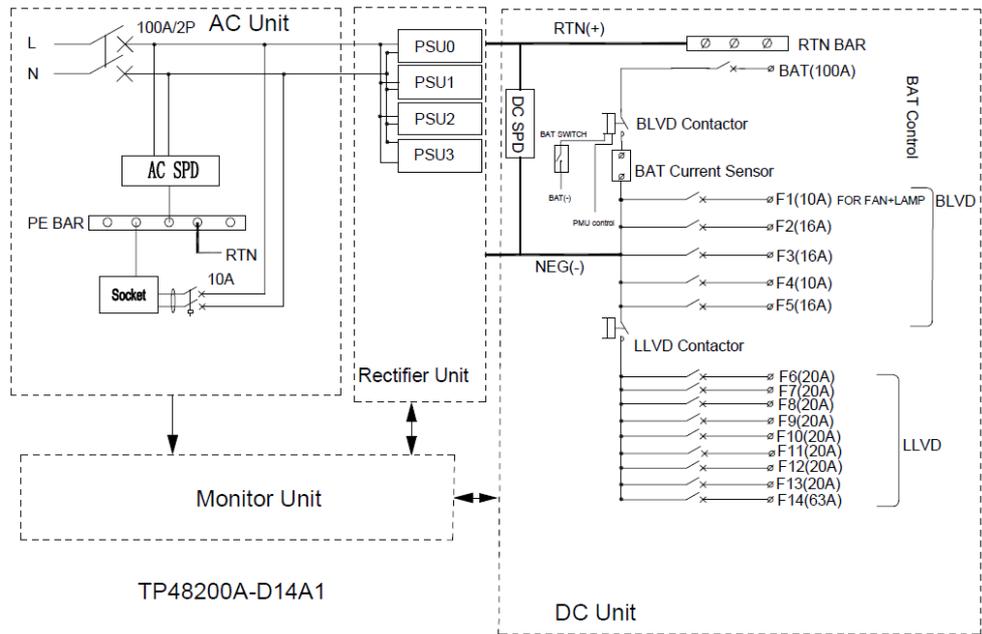
- | | | |
|-------------------------|-----------------------------|---------------------------|
| (1) Fan assembly | (2) Power distribution unit | (3) Power monitoring unit |
| (4) Space of rectifiers | (5) Space for customer | (6) Space for battery |

2.5 Working Principles

Working principles are described as follows:

- The rectifier converts AC power into -48 V DC power.
- The direct currents (DCs) generated by rectifiers converge on a busbar and then divide into multiple routes to power loads.
- The monitoring unit monitors operating parameters in real time, analyzes the operating status, and generates alarms when necessary.

Figure 2-4 Conceptual diagram



3 Component Description

3.1 Cabinet

Figure 3-1 shows the cabinet and Table A-1 shows the detailed specification.

Figure 3-1 Cabinet



3.2 Temperature Control System

3.2.1 Overview

The temperature control system of the TP48200A-D14A1 is composed of a direct-cooling unit. The temperature control system accelerates the air ventilation and reduces the temperature inside the cabinet by using fans and other ventilation devices.

Figure 3-2 Fan speed line chart

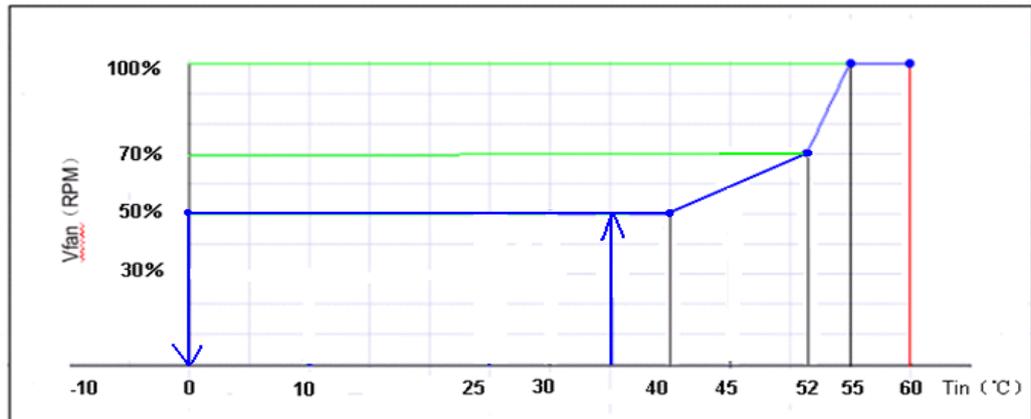


Table 3-1 Technical specifications of the temperature control system

Item	Specifications
Operating temperature	-40°C to +50°C (include 1120W/M ² sun radiation)
Cooling capacity	Rated power: 1500W; Maximum power: 1700 W
Acoustic noise	ETS 300 753 Class 4.1 (rural environment)

3.2.2 Direct-Cooling Unit

The direct-cooling unit consists of an air-exhaust device, an air-intake device, an air filter, and a fan assembly. The direct-cooling unit extends the area for exchanging air inside and outside the cabinet, speeds up air circulation, and reduces the operating temperature in the cabinet.

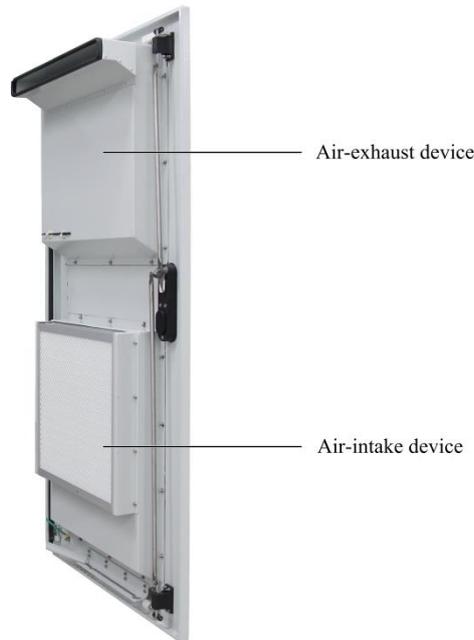
- Air-exhaust device

The air-exhaust device is mounted in the upper part on the interior of the cabinet door, as shown in Figure 3-3.

- Air-intake device

The air-intake device as shown in Figure 3-3.

Figure 3-3 Air-exhaust device and air-intake device



3.2.3 Fan Assembly

The fan assembly houses two centrifugal fans. The fans direct air into the cabinet through the lower part of the door and out of the cabinet through the upper.

Figure 3-4 shows the fan assembly. Figure 3-5 shows a centrifugal fan.

Figure 3-4 Fan assembly



Figure 3-5 Centrifugal fan



Table 3-2 Technical specifications of the fan

Item	Specifications
Rated voltage	-48 V DC
Rated power	34 W

3.3 Rectifier

Appearance

The rectifier converts the AC input power into stable -48 V DC power.

Figure 3-6 shows the rectifier.

Figure 3-6 Rectifier appearance



Panel

The rectifier panel provides the run indicator, alarm indicator, and fault indicator. Figure 3-7 shows the rectifier panel. Table 3-3 shows the indicator description.

Figure 3-7 Rectifier panel



(1) Run indicator

(2) Protection indicator

(3) Fault indicator

Table 3-3 Indicator description of rectifier

Indicator	Color	Abnormal Status	Exception Causes	Suggestion
Run indicator	Green	Off	No AC input exists	Check that the AC input voltage is normal.
			The rectifier is faulty	Replace the rectifier.
Alarm indicator	Yellow	Steady on	Overtemperature pre-alarm	Ensure that the vent of the rectifier is unblocked.
			The rectifier hibernates	-
			AC input undervoltage or overvoltage occurs	-
Fault indicator	Red	Steady on	Output overvoltage occurs	Remove the rectifier and then install it again. If there is still no output, replace the rectifier.
			The fan is faulty	Replace the rectifier.
			Overtemperature occurs	Ensure that the vent is unblocked and that the ambient temperature is within the specified range.
			No output exists because of a fault inside the rectifier	Replace the rectifier.

3.4 Power Distribution Unit

The power distribution unit distributes AC and DC power for the power system.

For details about the specifications of the power distribution unit, see Table 3-4.

Figure 3-8 Power distribution unit

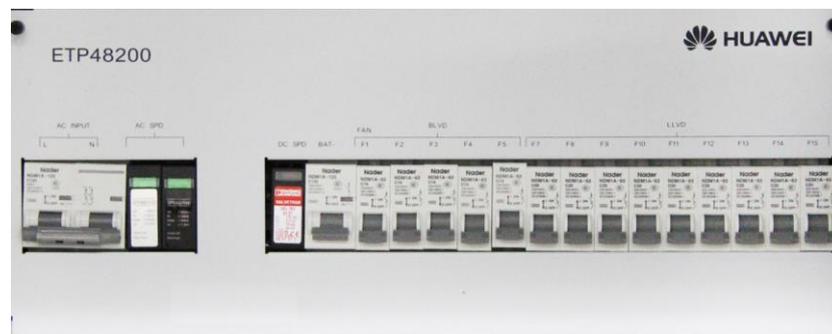


Table 3-4 Power distribution specifications

Item		Specifications
AC power distribution	Main AC input	One 100 A two-pole MCB;
DC power distribution	Load shutdown	<ul style="list-style-type: none"> • BLVD: 10 A MCB x 2; 16 A MCB x 3 • LLVD: 20 A MCB x 8; 63 A MCB x 1
	Battery branch	100 A MCB x 1

3.5 Monitoring Unit

Appearance

The monitoring unit is 1 U (44.45 mm [1.75 in.]) high, and can be installed in a 19-inch rack. Figure 3-9 shows the monitoring unit.

Figure 3-9 Monitoring unit



PMU02C1

The PMU provides a RUN LED (green), an ALM LED (red), an embedded buzzer, and a [liquid crystal display](#) (LCD) that displays the operating parameters, operating status, alarm status, configured parameters, and controlling parameters of the DC power, AC power, PSUs and storage batteries. These parameters are collected by the PMU. Detail information refer to 6.1.1 PMU02C1.

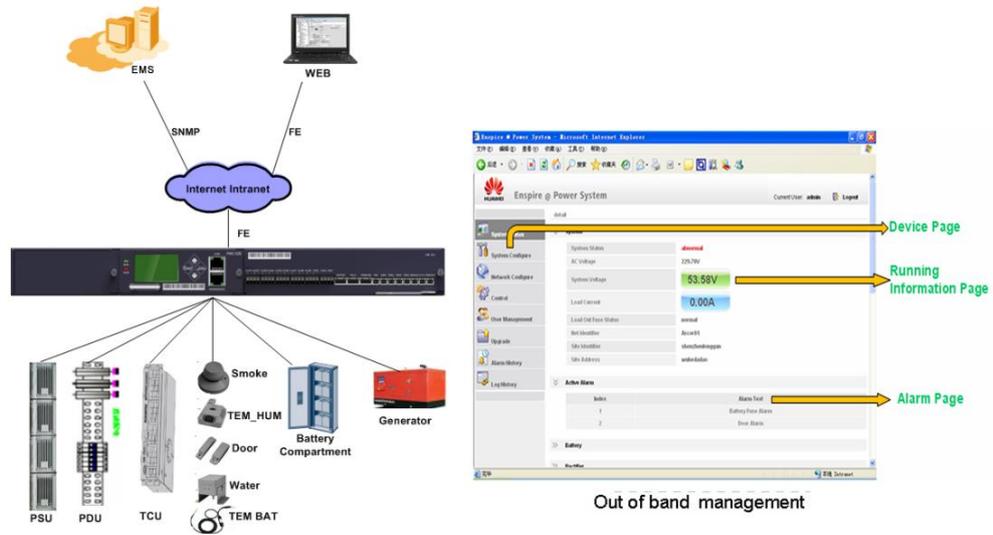
UIM02A

The UIM02A panel provides sensor detection ports, Boolean value input ports, dry contact outputs. Please refer to 6.1.2 UIM02A.6.1.2 UIM02A.

Network Diagrams

Figure 3-10 shows the network diagram.

Figure 3-10 Network diagram



3.6 Storage Battery (Optional)

Storage batteries store electrical energy and supply power to the loads when the power supply of the D.G. and mains is insufficient.

TP48200A-D14A1 supports 1 group 100Ah VRLA batteries.

4 Installation and Commissioning

The detailed installation refers to the *TP48200A-D14A1 Quick Installation Guide*.

5 System Maintenance

5.1 Routine Maintenance

The TP48200A-D14A1 is maintained every six months. If faults are identified, clear them immediately.

Table 5-1

Maintenance Item	Check Whether	Check Method	Repair When	Measures
Electricity	The voltage output is normal.	Using a multimeter	The BLVD or LLVD voltage exceeds the threshold.	For details, see section 5.2 Troubleshooting
Preventive maintenance inspection (PMI)	Indicators are normal.	Observing indicators	Alarms are generated.	
Cabinet appearance	The paint or the electroplated coating on the cabinet are flaking off or scratches occur.	Observing the cabinet	The cabinet surface is damaged or distorted.	Repaint and repair the cabinet.

5.2 Troubleshooting

5.2.1 Troubleshooting Common Faults

Table 5-2 Common faults and troubleshooting methods

Fault Type	Fault Analysis	Handling Method
AC power off	<ul style="list-style-type: none"> AC input cable fault 	1. Check whether the DC input cable is correctly and

Fault Type	Fault Analysis	Handling Method
	<ul style="list-style-type: none"> • Grid fault or D.G. fault 	<p>securely connected. If the cable is not correctly and securely connected, reconnect the cable.</p> <ol style="list-style-type: none"> 2. Check whether the AC input is available. If the AC input is not available, check whether faults such as short-circuit or open circuit exist on the AC input loop. If the AC input loop is proper, contact the mains supplier for troubleshooting. If the AC input is from the D.G., check the D.G. by referring to the <i>Diesel Generator User Manual</i>. 3. If the power-off duration is short, supply DC power using batteries. If the power-off duration is long, start other systems for power supply.
AC overvoltage and undervoltage	<ul style="list-style-type: none"> • Improper setting of PMU AC undervoltage or overvoltage threshold • Mains supply grid fault or D.G. fault 	<ol style="list-style-type: none"> 1. Check whether the AC undervoltage or overvoltage alarm threshold is properly set. If the threshold is excessively high or low, lower or raise the threshold according to the actual conditions. 2. If the AC input is the mains supply, contact the mains supplier for troubleshooting. If the AC input is from the D.G., check the D.G. by referring to the <i>Diesel Generator User Manual</i>.
DC overvoltage and undervoltage	<ul style="list-style-type: none"> • Improper setting of PMU DC undervoltage or overvoltage threshold 	<ol style="list-style-type: none"> 1. Check the alarm thresholds of the DC overvoltage and undervoltage. If the thresholds are not proper, reset the thresholds according to the actual conditions. 2. When the storage battery is powering the load, remove all the PSUs, and then insert each PSU one by one. If an overvoltage alarm is generated after a PSU is inserted, the voltage of the PSU exceeds the upper threshold. Then replace the PSU.
Charging overcurrent	<ul style="list-style-type: none"> • Communication failure between rectifier and PMU • Battery loop fault 	<ol style="list-style-type: none"> 1. Check whether the rectifier module is in position or whether contact is proper. If the PMU is inserted in an incorrect position, insert it correctly. If the contact is not proper, remove and then insert it. 2. Check whether the battery loop is short-circuited or has other faults. 3. Check whether the batteries are faulty. If the batteries are faulty, replace them.
Load shutdown	<ul style="list-style-type: none"> • Load circuit breaker set to OFF • Contactor fault • Excessively high setting of PMU load shutdown voltage • Output undervoltage due to greater load power than configured rectifier module power 	<ol style="list-style-type: none"> 1. Check whether the load detection cable is securely connected. If the cable is not connected securely, connect it correctly. 2. Check whether the load circuit breaker is turned off. Checking method: Check the position of the handle on the circuit breaker. If the circuit breaker is turned off, turn on the circuit breaker. 3. Check whether the contactor is faulty and whether it can be connected and disconnected. If the contactor is faulty, replace it. 4. Check whether the PMU load shutdown voltage is set excessively high. If it is set excessively high, set it according to the actual situation.

Fault Type	Fault Analysis	Handling Method
		<ol style="list-style-type: none"> 5. Check whether the load power is higher than the configured rectifier module power. If the load power is higher than the configured rectifier module power, add a rectifier module. If the load power exceeds the maximum supported power of the system, lower the load power.
<p>Battery shutdown</p>	<ul style="list-style-type: none"> • Improper setting of PMU battery parameters • Contactor fault 	<ol style="list-style-type: none"> 1. Check whether the mains supply is off or the voltage of storage batteries is lower than the “Battery Shutdown Voltage”. 2. Check whether the battery shutdown permission is set. 3. Check whether the battery cables or the connectors are faulty. If the cables or connectors are faulty, replace them. 4. Check whether the contactor is faulty and whether it can be connected and disconnected. If the contactor is faulty, replace it.
<p>Battery loop failure</p>	<ul style="list-style-type: none"> • Battery loop fault • Contactor fault • Battery fault 	<ol style="list-style-type: none"> 1. Check whether cables of the battery loop or connectors are faulty. If the cables or connectors are faulty, replace them. 2. Check whether the contactor is faulty and whether it can be connected and disconnected. If the contactor is faulty, replace it. 3. Check whether batteries are faulty. If the batteries are faulty, replace them.
<p>Ambient overtemperature or undertemperature alarm (The alarm is generated only when the temperature sensor is installed.)</p>	<ul style="list-style-type: none"> • Improper setting of PMU temperature alarm parameters • Overtemperature or undertemperature in the shelter with the temperature sensor • Temperature sensor fault 	<ol style="list-style-type: none"> 1. Check whether PMU temperature alarm thresholds are set according to local conditions. If the thresholds are not proper, set the thresholds accordingly. 2. Check whether the temperature control device in the shelter is faulty. If the temperature control device is faulty, repair it. The alarm is automatically cleared when the temperature in the shelter is adjusted to the proper range. 3. If the alarm persists when the temperature is proper, check whether the temperature sensor is faulty.
<p>Ambient overhumidity or underhumidity alarm (The alarm is generated only when the humidity sensor is installed.)</p>	<ul style="list-style-type: none"> • Improper setting of PMU humidity alarm parameters • Overhumidity or underhumidity in the shelter with the humidity sensor • Humidity sensor fault 	<ol style="list-style-type: none"> 1. Check whether PMU humidity alarm thresholds are set according to local conditions. If the thresholds are not proper, set the thresholds accordingly. 2. Check whether the floor of the shelter is wet. If the floor is wet, use a cotton cloth to wipe the floor and ensure it is dry or use other dehumidifiers. 3. If the alarm persists when the humidity is proper, check whether the humidity sensor is faulty.
<p>Battery overtemperature or undertemperature alarm</p>	<ul style="list-style-type: none"> • Battery cabin overtemperature • Improper setting of PMU battery temperature alarm 	<ol style="list-style-type: none"> 1. Check whether PMU battery temperature alarm thresholds are properly set. If the thresholds are not proper, set the thresholds accordingly. 2. Check whether the temperature in the battery room is excessively high. If the temperature is excessively high, the alarm can be cleared when the temperature

Fault Type	Fault Analysis	Handling Method
	parameters <ul style="list-style-type: none"> • Battery charging overcurrent • Temperature sensor fault 	is lowered. <ol style="list-style-type: none"> 3. Check the charging current. If the current is excessively strong, switch equalized charging to float charging and check whether the charging current is weakened. If the charging current is still excessively strong, adjust the current suppression to reduce the charging current. If the preceding steps do not work, replace the faulty battery.
Door alarm (The alarm is generated only when the door status sensor is installed.)	<ul style="list-style-type: none"> • Opened cabinet door • Door status sensor fault 	<ol style="list-style-type: none"> 1. The alarm is cleared after the cabinet door is closed. 2. If the alarm persists after the cabinet door is closed, check whether the door status sensor is faulty.
Water immersion alarm (The alarm is generated only when the water sensor is installed.)	<ul style="list-style-type: none"> • Shelter water accumulation • Water sensor fault 	<ol style="list-style-type: none"> 1. Check whether the floor of the shelter is wet. If the floor is wet, use a cotton cloth to wipe the floor and ensure it is dry or use other dehumidifiers. 2. If the alarm persists after the water is drained, check whether the water sensor is faulty.
Smoke alarm (The alarm is generated only when the smoke sensor is installed.)	<ul style="list-style-type: none"> • Smoke in the shelter • Smoke sensor fault 	<ol style="list-style-type: none"> 1. Check whether the smoke caused by fire pervades in the shelter. If there is fire, extinguish the fire and ventilate the shelter. 2. If the alarm persists when there is no smoke, check whether the smoke sensor is faulty.
Rectifier fault	<ul style="list-style-type: none"> • Poor contact of the rectifier module • Rectifier module fault 	<ol style="list-style-type: none"> 1. Check whether the ALM indicator on the panel of the rectifier module steady on. If the ALM indicator steady on, it indicates that the rectifier module is faulty. Replace the rectifier module. 2. Disconnect AC input to the rectifier module and restart the rectifier module later on. If the alarm persists, replace the rectifier module.
Module shutdown Module protection	<ul style="list-style-type: none"> • Input overvoltage or undervoltage of the rectifier module • Rectifier module fault 	<ol style="list-style-type: none"> 1. Check whether the mains voltage is over the AC overvoltage alarm threshold (300 V) of the rectifier module or below the AC undervoltage alarm threshold (85 V). For the power supply network with long-time overvoltage or undervoltage, negotiate with the maintenance personnel of the electricity department to improve the power supply network. 2. If the alarm persists when the input voltage of the rectifier module is proper, check whether the rectifier module is proper. If the rectifier module is faulty, replace it.
Communication failure of rectifiers	<ul style="list-style-type: none"> • Signal cable connection fault of the rectifier module • Rectifier module out of position • Poor contact of the rectifier module 	<ol style="list-style-type: none"> 1. Check whether the rectifier module is in position or whether contact is proper. If the PMU is inserted in an incorrect position, insert it correctly. If the contact is not proper, remove and then insert it. 2. If the alarm persists, replace the rectifier module.

Fault Type	Fault Analysis	Handling Method
	<ul style="list-style-type: none"> Rectifier module fault 	
Disconnection of the load fuse	<ul style="list-style-type: none"> Load circuit breaker set to OFF 	<ol style="list-style-type: none"> Check whether the load circuit breaker is set to OFF. If it is set to OFF, set it to ON. If the circuit breaker is automatically set to OFF after you set it to ON, check whether the load branch is overloaded or short-circuited. Check and rectify the load loop fault.
AC surge protector fault	<ul style="list-style-type: none"> AC surge protector fault 	<ol style="list-style-type: none"> Check the observation window on the AC surge protector. If the color of the window is red, replace the surge protector. If the color is not red, check whether the fault detection cables of the AC surge protector are correctly connected or whether the cables are in good condition. If the cables are not in good condition, replace and reconnect them. If the cable connection is proper, it indicates that the alarm loop is faulty. Replace the PMU.
DC surge protector fault	<ul style="list-style-type: none"> DC surge protector fault 	<ol style="list-style-type: none"> Check whether the fault detection cables of the DC surge protector are correctly and securely connected. If the cables are not correctly and securely connected, reconnect them. If the cables are correctly connected, replace the DC surge protector.

 **NOTE**

- If you rectify the corresponding faults, the alarms in the PMU are automatically cleared and saved in history alarm information.
- After the PMU is replaced, set the parameters again.
- The PMU and rectifier module are hot-swappable.

5.2.2 Troubleshooting Components

AC SPD

Observe the indication window on the surge protection module. If the indication window turns red, the surge protection module is damaged. In this case, replace the surge protection module. If the indication window remains green, the SPD runs properly.

Circuit Breaker

The circuit breaker fault is usually caused by overcurrent or short circuits. To check whether a circuit break is faulty, perform the following steps:

Step 1 Switch the circuit breaker to the ON position.

Step 2 Measure the resistance at the two ends of the circuit breaker using a multimeter. If the resistance is infinity, the circuit breaker is damaged.

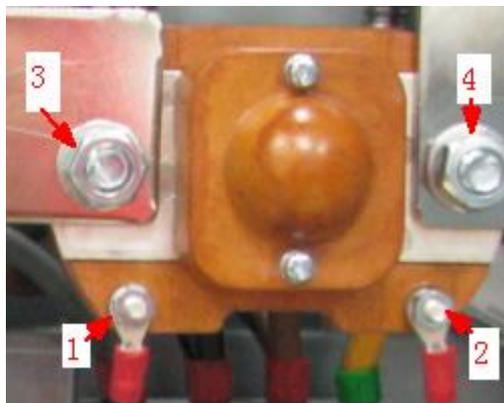
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DC Contactor

Table 5-3 DC contactor description

Position	Type	Check Method
Load Disconnected Branch	Closed type, (when the contactor without electricity, the state is closed)	<ul style="list-style-type: none"> When there is no voltage at the control poles of the contactor, check whether the input and output poles of the contactor are proper by using the multimeter. For example, the contactor of the power system is closed type contactor as shown in Figure 5-1. When there is no voltage at control poles 1 and 2 but measuring shows that the input and output poles 3 and 4 are disconnected, it indicates that the contactor is faulty. When there is voltage at the control poles of the contactor, check whether the input and output poles of the contactor are proper by using the multimeter. For example, the contactor of the power system is a closed type contactor as shown in Figure 5-1. When there is voltage at control poles 1 and 2 but measuring shows that the input and output poles 3 and 4 are connected, it indicates that the contactor is faulty.
Battery Fuse or battery circuit breaker Branch	Open type, (when the contactor without electricity, the state is open)	<ul style="list-style-type: none"> When there is no voltage at the control poles of the contactor, check whether the input and output poles of the contactor are proper by using the multimeter. For example, the contactor of the power system is an open type contactor as shown in Figure 5-1. When there is no voltage at control poles 1 and 2 but measuring shows that the input and output poles 3 and 4 are connected, it indicates that the contactor is faulty. When there is voltage at the control poles of the contactor, check whether the input and output poles of the contactor are proper by using the multimeter. For example, the contactor of the power system is an open type contactor as shown in Figure 5-1. When there is voltage at control poles 1 and 2 but measuring shows that the input and output poles 3 and 4 are disconnected, it indicates that the contactor is faulty.

Figure 5-1 DC contactor



Rectifier

The rectifier is damaged if either of the following conditions is not met:

- The Run indicator of the rectifier is steady on and the Fault indicator is off when the rectifier does not communicate with the PMU and the input AC voltage is around 220 V. The rectifier outputs power normally.
- The PMU can perform control on the charge mode (boost charge or floating charge) and current for the rectifier when the rectifier communications cable is properly connected and the rectifier communicates with the PMU normally.

PMU

If any of the following occurs, the PMU is faulty:

- The PMU breaks down or fails to start, or its LCD or keyboard fails.
- The PMU does not generate an alarm when a fault occurs in the system.
- The PMU generates an alarm (false alarm) when the system runs properly.
- Communication between the PMU and all subordinate equipment is interrupted.
- The PMU fails to control or monitor all the modules when these modules run properly and communications cables are connected properly.
- The PMU fails to monitor or control AC or DC distribution when AC/DC power is distributed normally and communications cables are connected properly.
- Parameters cannot be set or operating information cannot be viewed on the PMU.

5.3 Component Replacement

Describe how to replace the main components of the power system.

NOTE

- Load disconnection is prohibited when you replace the main components. Take measures to ensure that important loads are always connected during the replacement. For example, keep the circuit breaker of important loads set to ON and storage batteries and AC input are not cut off at the same time.
- If a load must be disconnected, ask for the customer's prior permission.
- The rectifier and the PMU are hot-swappable.

Replacing the rectifier

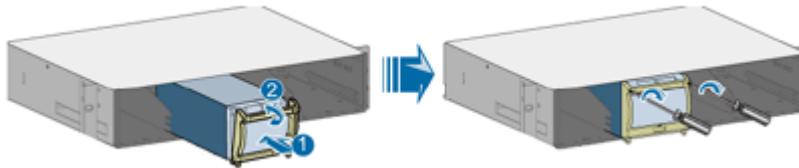
To replace the rectifier, perform the following steps:

- Step 1** Loosen the screws on the rectifier panel using a flat-head screwdriver.
- Step 2** Pull the handle of the rectifier outwards, and then remove the rectifier from the plug-in subrack, as shown in Figure 5-2.
- Step 3** Insert the rectifier into the corresponding slot in the plug-in subrack. Then, loosen the screws on the handle and pull out the handle.
- Step 4** Slide the rectifier into the plug-in subrack slowly along the guide rails. Then, lock the handle.
- Step 5** Tighten the screws on the handle, as shown in Figure 5-3.

Figure 5-2 Removing the old rectifier



Figure 5-3 Installing the new rectifier



----End

Replacing the PMU

To replace the PMU, perform the following steps:

- Step 1** Loosen the screws on the PMU panel using a Phillips screwdriver.
- Step 2** Pull the PMU outwards.
- Step 3** Insert the new PMU.
- Step 4** Tighten the screws on the handle.
- Step 5** Set the parameters of the new PMU.

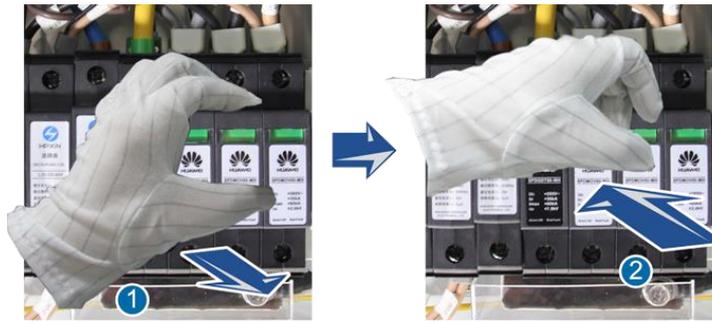
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Replacing the AC SPD

To replace the AC SPD, perform the following steps:

- Step 1** Remove the faulty SPD.
- Step 2** Insert the new SPD.

Figure 5-4 Replacing the AC SPD



----End

Replacing Circuit breakers

To replace a circuit breaker, perform the following steps:

- Step 1** Disconnect the power supply of a circuit breaker. For example, disconnect the DC input and set the circuit breaker to OFF before replacing the input circuit breaker.
- Step 2** Remove the cables or copper bars connected to the circuit breaker using a Phillips screwdriver, and then wrap the cables or copper bars using black PVC insulation tape to avoid hazards.
- Step 3** Press the contact plate at the bottom of the circuit breaker using a flat-head screwdriver. Then, remove the circuit breaker, as shown in Figure 5-5.
- Step 4** Press the contact plate at the bottom of the circuit breaker using a flat-head screwdriver again to install the new circuit breaker in the correct position. Then, push the contact plate upwards using the screwdriver.
- Step 5** Install the cables or copper bars to the circuit breaker using a Phillips screwdriver in the same way.
- Step 6** Set the circuit breaker to ON and connect power supply of this circuit breaker, as shown in Figure 5-6.

Figure 5-5 Removing the circuit breaker

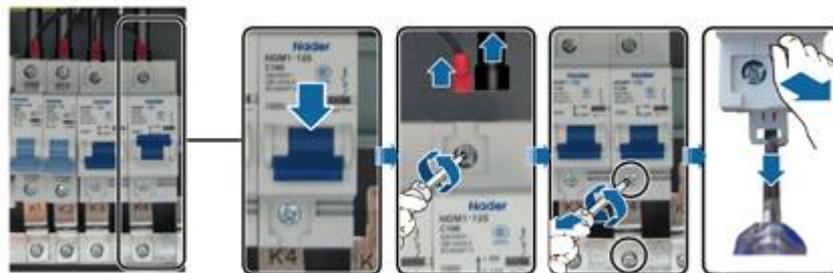
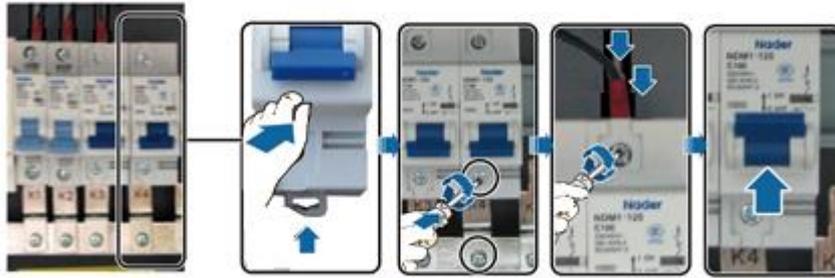


Figure 5-6 Installing the circuit breaker



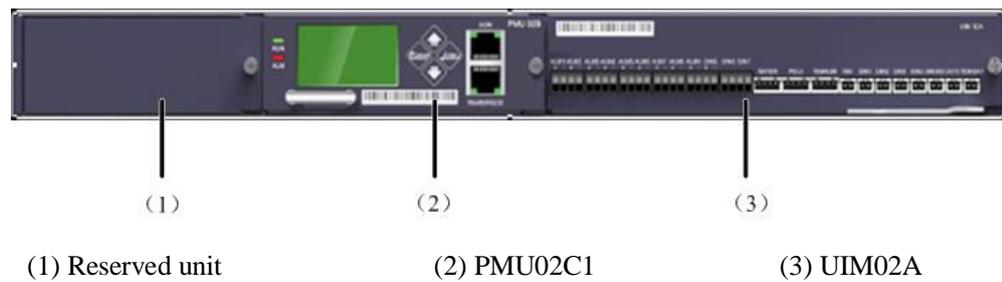
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6 Monitoring Function

6.1 PMU Panel

Figure 6-1 shows the front panel of the monitoring module.

Figure 6-1 Front panel of the monitoring module



6.1.1 PMU02C1

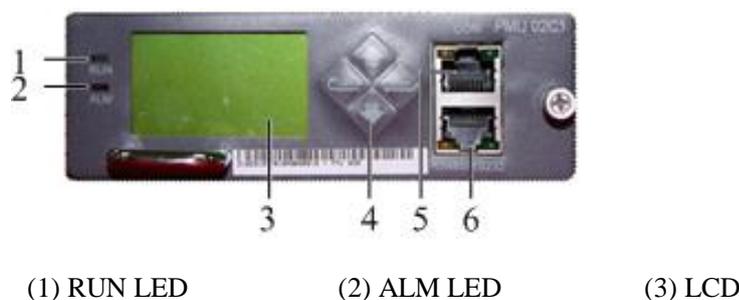
NOTE

All ports in this manual are protected by a security mechanism.

The PMU02C1 is a component of the monitoring module.

Figure 6-2 shows the front panel of the PMU02C1.

Figure 6-2 Front panel of the PMU02C1



(4) Buttons (4)

(5) COM port

(6) RS485/RS232 port

LEDs

Table 6-1 describes the LEDs on the front panel of the PMU02C1.

Table 6-1 LEDs on the front panel of the PMU02C1

Silkscreen	Color	Status	Description
RUN	Green	Off	The PMU02C1 is faulty or is not supplied with DC power.
		Blinking at 0.5 Hz	The PMU02C1 communicates with the host properly.
		Blinking at 4 Hz	The PMU02C1 communicates with the host abnormally.
ALM	Red	On	A critical alarm is generated.
		Off	No critical alarm is generated.

NOTE

The RUN LED is valid only when the COM port is used in communication over RS485 or RS232

LCD

The information displayed on the LCD of the PMU02C1 can be set and queried in real time.

You can query and set parameters by using the four buttons on the front panel.

Buttons

Table 6-2 describes buttons on the front panel of the PMU02C1.

Table 6-2 Button description

Button	Description
▲ or ▼	Press ▲ or ▼ to scroll the menu or set a selected parameter.
Cancel	Press Cancel to return to the previous menu without saving the settings.
Enter	On the standby screen, press Enter to display the main menu. On the main menu screen, press Enter to display the sub-menu. On the sub-menu screen, press Enter to save the settings.

Button	Description
<p>NOTE</p> <ul style="list-style-type: none"> • After a menu is displayed, the standby screen is displayed if no button is pressed within 5 minutes.. • After a menu is displayed, the LCD screen becomes dark if no button is pressed within 8 minutes. • On the standby screen, the LCD contrast can be decreased by pressing ▲ and Enter simultaneously or be increased by pressing ▼ and Enter simultaneously. 	

Ports

Table 6-3 describes the ports on the front panel of the PMU02C1.

Table 6-3 Ports on the front panel of the PMU02C1

Port	Communication Mode	Rate	Communication Protocol
COM	FE (Fast Ethernet)	10/100Mbit/s Auto-negotiation	TCP/IP, SNMP, or HTTPS
RS485/RS232	RS485/RS232	9600/19200 bit/s	Master-slave protocol
<p>Notes: The communication modes RS485 and RS232 are mutually exclusive. The baud rate is 9600/19200 bit/s (adaptive).</p>			

The COM and RS485/RS232 ports support RJ45 connectors.

Figure 6-3 shows the pins of such ports.

Figure 6-3 Pins

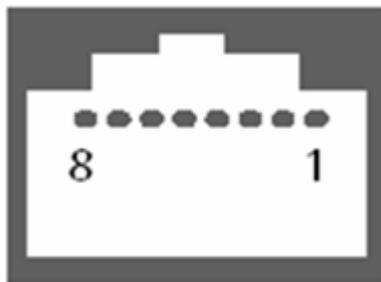


Table 6-4 describes the pins of a COM port.

Table 6-4 Pin description

Pin	Signal	Meaning
1	TX+	Transmit data.

Pin	Signal	Meaning
2	TX-	
3	RX+	Receive data.
6	RX-	

NOTE

The other pins are not used in a COM port.

Table 6-5 describes the pins of an RS485/RS232 port.

Table 6-5 Pin description

Pin	Signal	Meaning
1	TX+	Transmit data.
2	TX-	
4	RX+	Receive data.
5	RX-	
3	RX232	Receive data.
7	TX232	Transmit data.
6	PGND	Protection ground.

6.1.2 UIM02A

The UIM02A provides sensor ports, Boolean value input ports, dry contact output ports. Figure 6-4 shows the front panel of the UIM02A.

Figure 6-4 UIM02A panel

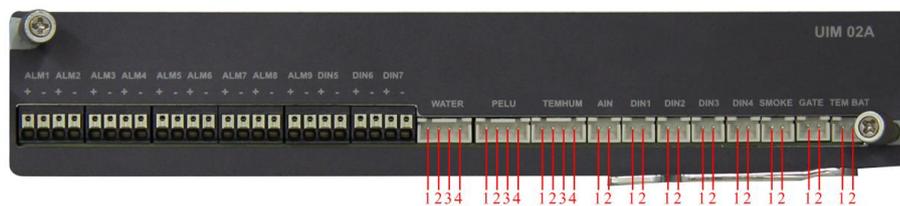


Table 6-6 Port descriptions

Port Type	Silk Screen	Description
Sensor port	TEM BAT	Used by the battery temperature sensor

Port Type	Silk Screen	Description
	GATE	Used by the door status sensor
	SMOKE	Used by the smoke detector
	WATER	Used by the water detector
	TEMHUM	Used by the environment temperature humidity sensor
Analog value detection	AIN	Used for detecting the battery status
Boolean value detection port	DIN1	Used for inputting Boolean value 1
	DIN2	Used for inputting Boolean value 2
	DIN3	Used for detecting AC SPD faults
	DIN4	Used for detecting DC SPD faults
	DIN5	Used for inputting Boolean value 5
	DIN6	Used for inputting Boolean value 6
	DIN7	Used for inputting Boolean value 7
Dry contact output port	ALM1	Used for reporting smoke alarms
	ALM2	Used for reporting door broken alarms
	ALM3	Used for reporting rectifier faults and rectifier communication faults
	ALM4	Used for reporting load fuse blown alarms and battery fuse blown alarms and battery stolen alarms
	ALM5	Used for reporting battery temperature alarms and ambient temperature alarms
	ALM6	Used for reporting TCU alarms
	ALM7	Used for reporting mains failure alarms
	ALM8	PMU failure alarms
	ALM9	Used for reporting SPD fault alarms
Power electronic manufacturing information	PELU	Used for displaying electronic manufacturing information about the power system

 **NOTE**

The relate definition of dry contact output port is a default value; it can be set based on customer requirements.

Table 6-7 Pin definition

Silk Screen	Pin	Pin definition
WATER	1	12 V
	2	WATER
	3	GND
	4	NULL
PELU	1	5 V
	2	SCL
	3	SDA
	4	PGND
TEMHUM	1	24 V
	2	VTEM
	3	24 V
	4	VHUM
AIN	1	SIM1
	2	SIM2
DIN1	1	JTD1
	2	12 V
DIN2	1	JTD2
	2	12 V
DIN3	1	JTD3
	2	12 V
DIN4	1	JTD4
	2	12 V
SMOKE	1	SMOKE
	2	24 V
GATE	1	GATE
	2	12 V
TEM BAT	1	24 V
	2	VBTEM

6.2 LCD UI Operation

You can perform the following operations on the LCD of the monitoring module:

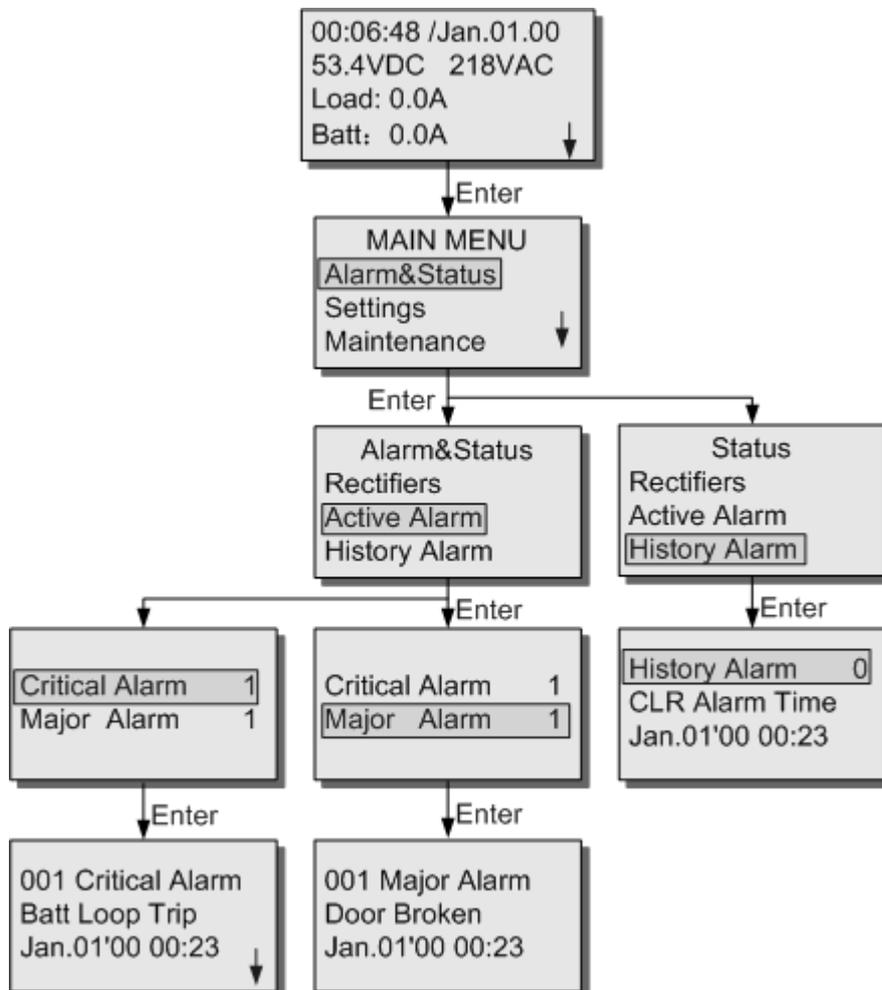
- View the status of the system.
- Set parameters, including system parameters, load parameters, environment parameters, battery parameters, and TCU parameters.
- View current alarms and historical alarms.
- Modify network parameters, such as the IP address and system date and time.

Querying Alarms

Figure 6-5 depicts how to query alarms on the LCD.

For the descriptions of buttons, see Table 6-2.

Figure 6-5 Querying alarms

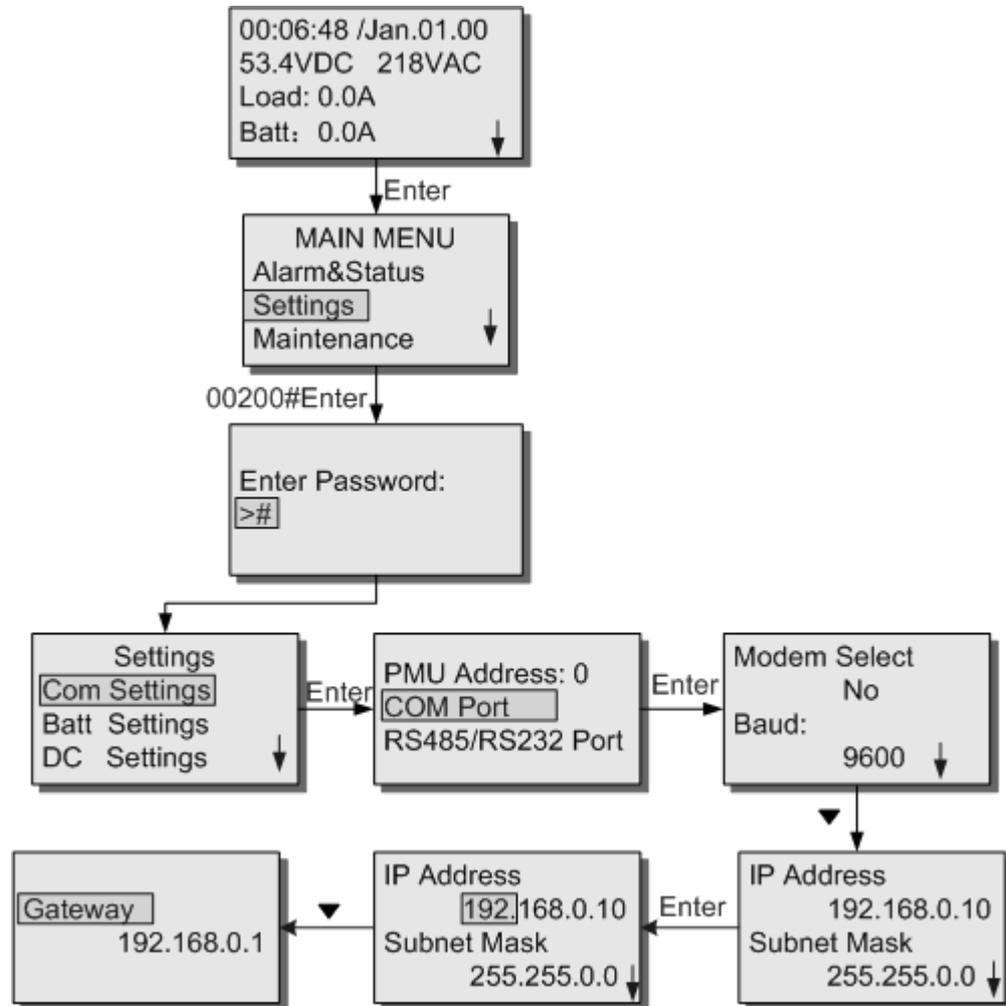


Setting Parameters

Figure 6-6 shows how to set an IP address.

For the descriptions of buttons, see Table 6-2.

Figure 6-6 Setting an IP address



You can also set others system parameters on the LCD. For details, see Table B-1.

The parameter setting screen and maintenance screen are password protected.

Intelligent Hibernation

The rectifier efficiency is small when the load power is low. When the total load power is low, certain rectifiers can be hibernated to improve the load power of running rectifiers and increase the rectifier efficiency. This saves energy.

Rectifiers should be hibernated in turn to ensure the same aging degree. When the started rectifier with the longest running time in total runs for 7 days (by default) more than the hibernated rectifier with the longest running time in total, start all rectifiers for 2 hours and then hibernate the rectifiers with long running time.

You can set these parameters to enable and adjust the Intelligent Hibernation function. The menu path is: Settings->Rect Settings

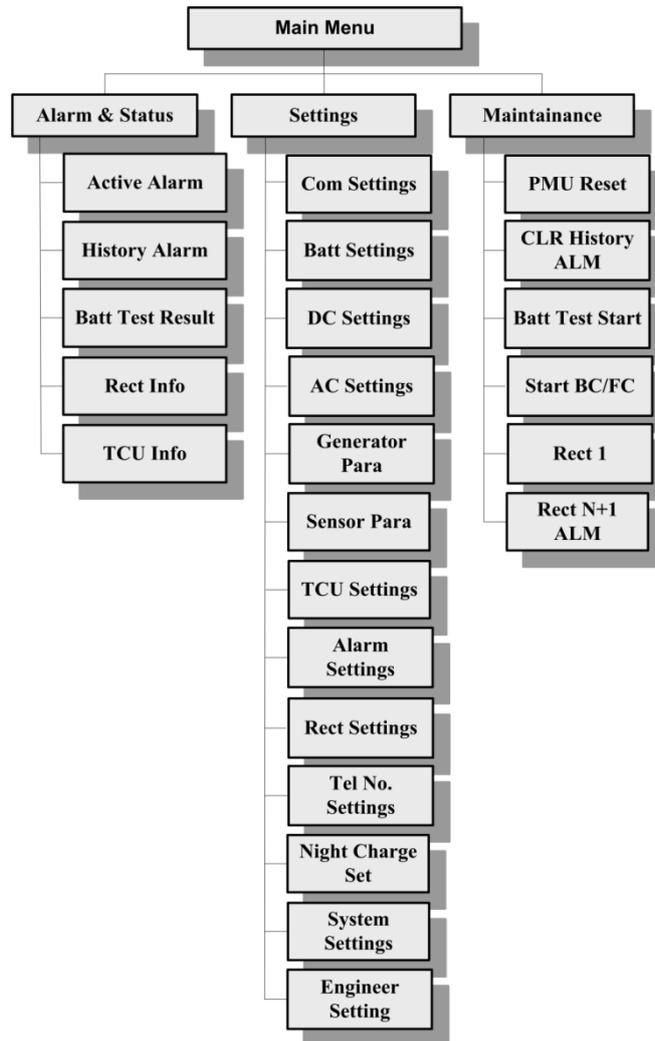
Table 6-8 Parameters

Parameter	Description	Default Value	Range
Sleep Enable	Before enabling the periodic battery test, you need to set this parameter to Yes	No	YES or NO
Best Effi Point	The optimal efficiency of one rectifier	70%	60%–80%
Exch Cycle	Interval between hibernation operations	7 days	5–30 days
Min Num Rect On	Minimum number of running rectifiers under the no-load condition	1 pcs	1–3

LCD Menu Hierarchy

Figure 6-7 shows the LCD main menu. For details about the parameters, see Table B-1.

Figure 6-7 LCD menu hierarchy



6.3 Web UI Operation

Overview

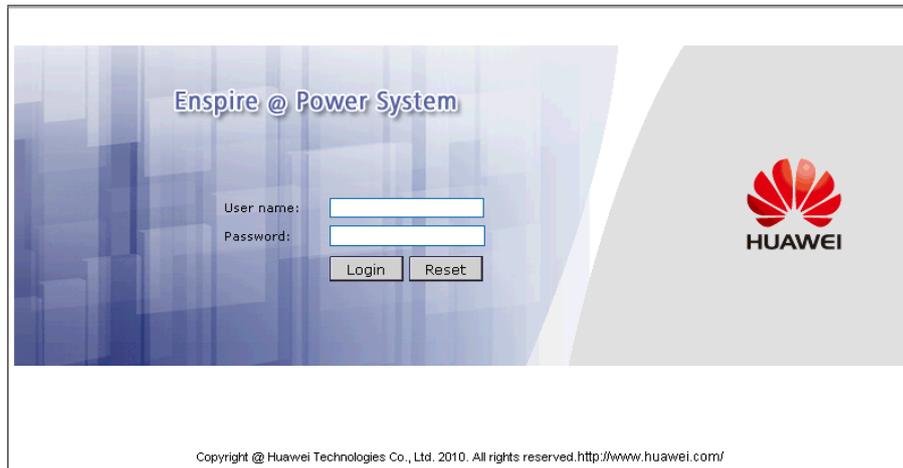
You can perform the following operations on the Web UI:

- Query the status of the system.
- Set parameters, including system parameters, load parameters, environment parameters, battery parameters, and TCU parameters.
- Query current alarms and historical alarms.
- Query system logs.
- Modify network parameters, such as the IP address and system date and time.
- Set the EMS addresses and port for receiving Trap messages.
- Import configuration files and upgrade application software.

Login to the Web UI

Open the Internet Explorer and type the PMU02C1 IP address in the address bar, and then press **Enter**. On the Web UI shown in Figure 6-8, enter the user name and password. The preset user name is **admin** and preset password is **00200**.

Figure 6-8 Login page



Query System Status

On the **System Status** page, you can view the system status, including the system information, active alarms, battery status, and module status. See Figure 6-9

Figure 6-9 System Status



Configure System Parameters

Perform the following steps:

Step 1 Set related parameters on the **System Configure** page shown in Figure 6-10.

Figure 6-10 System Configure

The screenshot shows the 'PMU Configure Parameter' section of the Huawei Enspire @ Power System configuration page. The interface includes a left-hand navigation menu with options like System Status, System Configure, Digital Configure, Network Configure, Control, User Management, Upgrade, Alarm History, and Log History. The main content area displays a list of parameters for configuration, each with a value field and a unit or range. At the bottom of this section, there are fields for 'Net Identifier', 'Site Identifier', and 'Site Address', each with a 'Sample' value. A 'Submit' button is located at the bottom right of the parameter list.

Parameter	Value	Unit/Range
Battery Group	1	(0-2)
Battery1 Capacity	400	(30-1000Ah)
Battery2 Capacity	0	(30-1000Ah)
Charge Boost Voltage	56.5	(Charge Float Volt-57.6V)
Charge Float Voltage	53.5	(43.2V-Charge Boost Volt)
Charge Current Limited Coefficient	0.10	(0.05-0.25)
Cycled BC Duration	60	(30-240 Days)
Battery Temp Comp Coefficient	80	(0-500mV/°C)
Foundation of Temp Comp	1	(1-2)
Load LVD Allow State	Prohibit	(Allow or Prohibit)
Battery LVD Allow State	Allow	(Allow or Prohibit)
Battery HTD Allow State	Prohibit	(Allow or Prohibit)
Load LVD Voltage	44.0	(Battery LVD Volt-Sys Volt Low Limit)
Battery LVD Voltage	43.0	(35V-Load LVD Volt)
Battery HTD Temperature	53	(40°C-70°C)
AC Voltage Upper Limit	280	(AC Volt Lower Limit-300V)
AC Voltage Lower Limit	180	(60V-AC Volt Upper Limit)
System Voltage Upper Limit	58.0	(58-60V)
System Voltage Lower Limit	45.0	(Load LVD Volt-Sys Volt Upper Limit)
Environment Temperature Upper Limit	50	(Env Temp Lower Limit-100°C)
Environment Temperature Lower Limit	0	(-50°C-Env Temp Upper Limit)
Environment Temperature Measure Upper Limit	80	(0-100°C)
Environment Temperature Measure Lower Limit	-20	(-50-0°C)
Environment Humidity Upper Limit	80	(Humid Lower Limit-Humid Sens Upper Limit)
Environment Humidity Lower Limit	10	(Humid Sens Lower Limit-Humid Upper Limit)
Environment Humidity Measure Upper Limit	100	(Humid Sens Lower Limit-100%)
Environment Humidity Measure Lower Limit	0	(0%-Humid Sens Upper Limit)
Battery Temperature Upper Limit	50	(Bat Temp Lower Limit-Bat Temp Sens Upper Limit)
Battery Temperature Lower Limit	0	(Bat Temp Sens Lower Limit-Bat Temp Upper Limit)
Battery Temperature Measure Upper Limit	80	(0-100°C)
Battery Temperature Measure Lower Limit	-20	(-50-0°C)
Net Identifier	Sample: Local Network	
Site Identifier	Sample: Huawei Site	
Site Address	Sample: ShenZhen, China	

Step 2 Click **Submit**.

Step 3 The parameter settings are saved as a .txt file in drive C.

----End

Configure a PMU02C1

NOTE

- You can configure a PMU02C1 by importing the .txt file saved in drive C.
- You are not recommended to change the file because the import will fail if the file name is changed.

The procedure is as follows:

Step 1 On the System Configure page, click Import from file. The Choose files page is displayed.

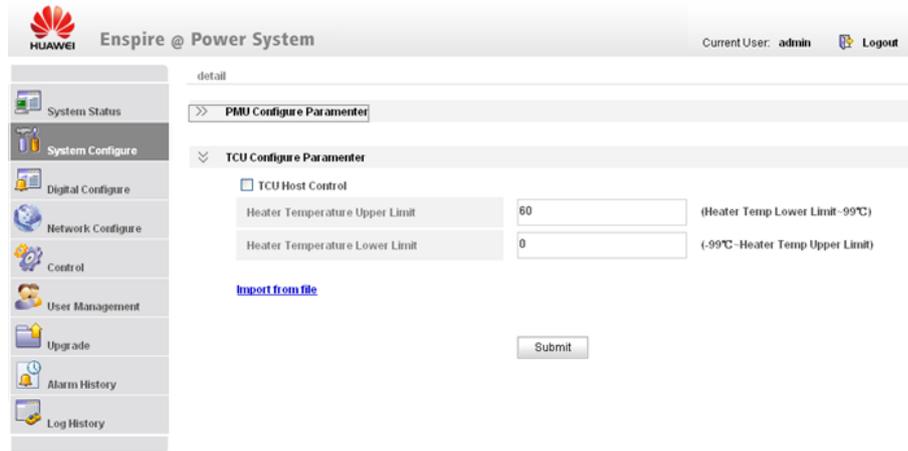
Step 2 Select the .txt file and then click **Open** to import the parameter settings.

Step 3 Click **Submit**, after parameter setting, the data will be refreshed in a few minutes.

----End

Set TCU parameters as required, detailed see Figure 6-11.

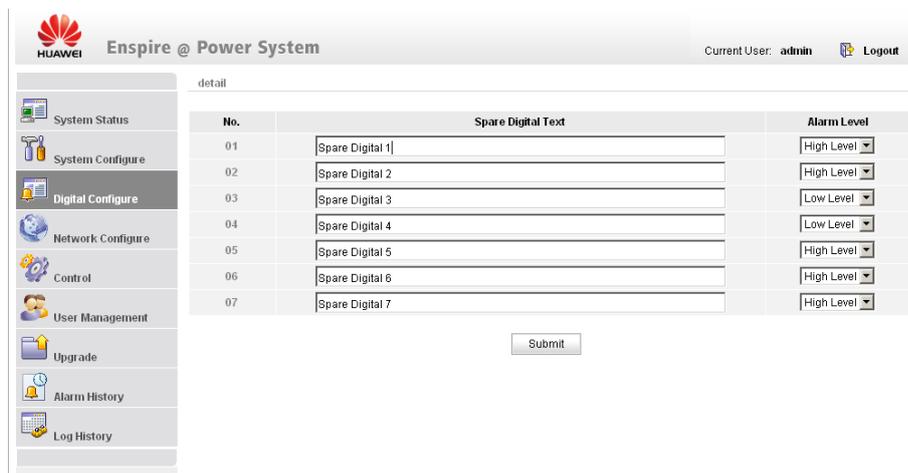
Figure 6-11 TCU Configure Parameter



Configure Digital Parameters

On the **Digital Configure** page, set alarm names and severity to match the actual alarm names and spare digitals. Then click **Submit**.

Figure 6-12 Digital Configure



Configure Network Parameters

In the navigation area, double-click **Network Configure** to set network configuration parameters. See Figure 6-13

Figure 6-13 Network Configure

The screenshot displays the 'Network Configure' interface in the Huawei Enspire @ Power System. The left sidebar contains navigation options: System Status, System Configure, Digital Configure, Network Configure (selected), Control, User Management, Upgrade, Alarm History, and Log History. The main content area is titled 'detail' and is divided into several sections:

- System Time:** Includes a checkbox for 'NTP Server Synchronization'. Below it are input fields for 'System Time' (12 . 43 . 00) and 'System Date' (05-07-2010), with labels '(HH : MM : SS)' and '(DD-MM-YYYY)' respectively. A 'Submit' button is located below these fields.
- System IP:** Includes input fields for 'System IP' (192 . 168 . 0 . 10), 'Netmask' (255 . 255 . 0 . 0), and 'Gateway' (192 . 168 . 0 . 1). A 'Submit' button is located below these fields.
- SNMP:** Includes a dropdown menu for 'SNMP Version' (SNMPv1 & v2c), and text boxes for 'SNMP Port' (161), 'Read Community' (read), and 'Write Community' (write). A 'Submit' button is located below these fields.
- SNMP Trap:** Includes a table with columns 'select', 'trap address', and 'trap port'. The table contains one row: [] 192.168.0.253 162.

Setting the System Time

If there is a Network Time Protocol (NTP) server, select **NTP Server Synchronization**, set **NTP Server IP** and **System Time Zone**, and then click **Submit**. The settings take effect upon restart.

If there is no NTP server, set **System Time** and **System Date**. Then click **Submit**.

Step 1 Setting the System IP Address

Set **System IP**, **Netmask**, and **Gateway**, and then click **Submit**.

Step 2 Setting SNMP Parameters

On the **PMU** page, set SNMP parameters and then click **Submit**.

Step 3 Setting EMS Trap Parameters

On the **SNMP Trap** page, set the EMS addresses and port for receiving Trap messages. You can set a maximum of six addresses. The PMU02C1 sends Trap messages to the EMS through the configured port. The port configured here is the alarm listening port and is 162 by default.

----End

Control

As shown in Figure 6-14

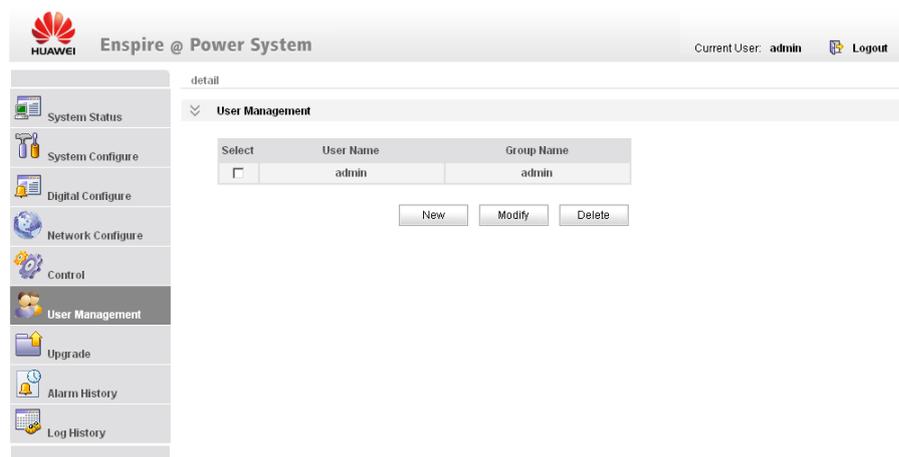
Figure 6-14 Control



User Management

On the **User Management** page, you can create and delete users, and set the user group of users. See Figure 6-15

Figure 6-15 User Management



If you click **New**, the **Add User** page is displayed. If you click **Modify**, the **Modify User** page is displayed. See Figure 6-16

Figure 6-16 Add User and Modify User

The image shows two side-by-side web forms. The left form is titled 'Add User' and contains four input fields: 'User Name' (text box), 'Group Name' (dropdown menu showing 'admin'), 'Password' (text box), and 'Confirm Password' (text box). Below the fields are 'Submit' and 'Return' buttons. The right form is titled 'Modify User' and contains four input fields: 'User Name' (text box with 'test' pre-filled), 'Group Name' (dropdown menu showing 'admin'), 'Password' (text box), and 'Confirm Password' (text box). Below the fields are 'Submit' and 'Return' buttons.

On the **User Management** page, you can add or delete a user, or modify user information. Users are classified into three groups, namely, **admin**, **engineer**, and **operator**. You can add a user to any user groups.

PMU02C1 Upgrade

You can upgrade the PMU02C1 remotely on the **Upgrade** page shown in Figure 6-17

To upgrade the PMU module, perform the following steps:

- Step 1** Before upgrade, obtain the name, size, and save path of the upgrade file.
- Step 2** On the **Upgrade** page, click **Browse** and then select the *.hex file.
- Step 3** Click **Send**.

----**End**

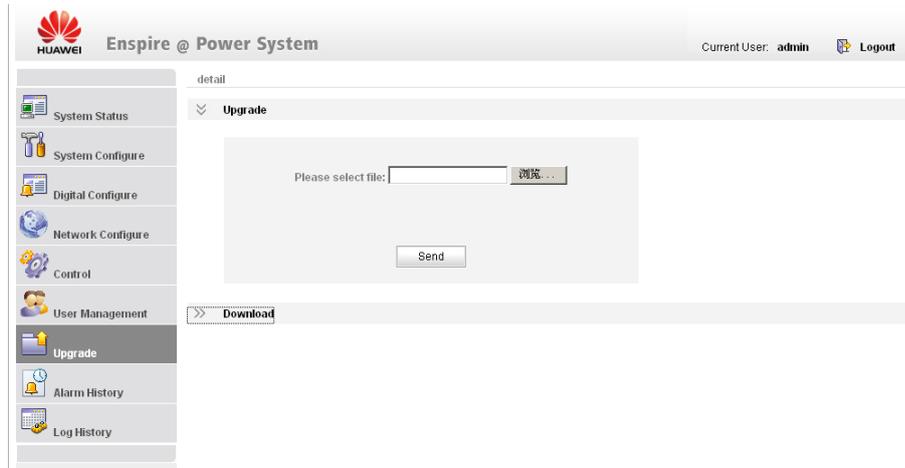
You can learn about the upgrade result in the following ways:

- View the message displayed during the upgrade.
- View the records in the log history.
- Check whether the version of **Power Manufacturer** is the target version of the upgrade.

NOTE

The upgrade takes about 30 minutes. Do not perform any operations on the Web UI during the upgrade. Regardless of success or failure, the PMU02C1 will be restarted automatically. If the upgrade fails, you need to repeat Step 2 till the upgrade succeeds.

Figure 6-17 Upgrade



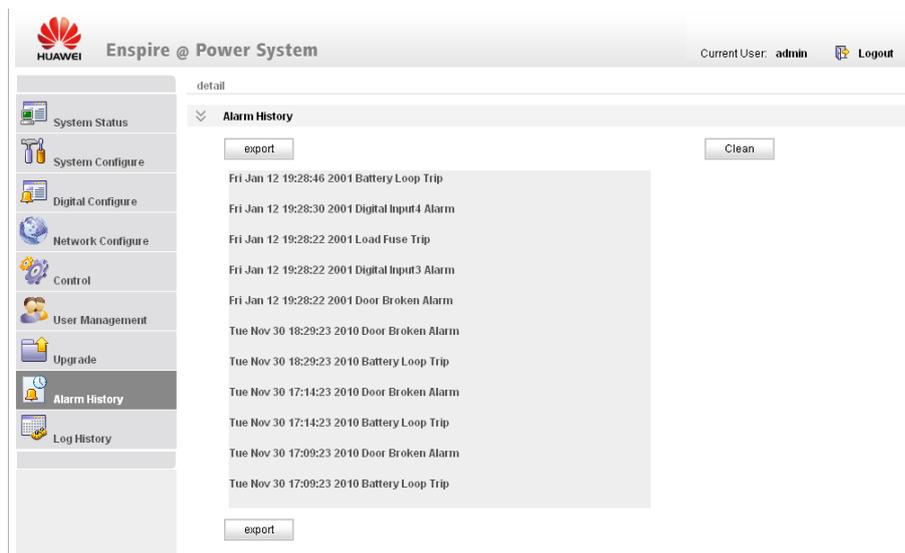
Query History Alarm

The **Alarm History** page displays the information about historical alarms, as shown in Figure 6-18

NOTE

Clicking **export** will overwrite the alarms exported previously. Clicking **Clean** will delete historical alarms for good.

Figure 6-18 Alarm History



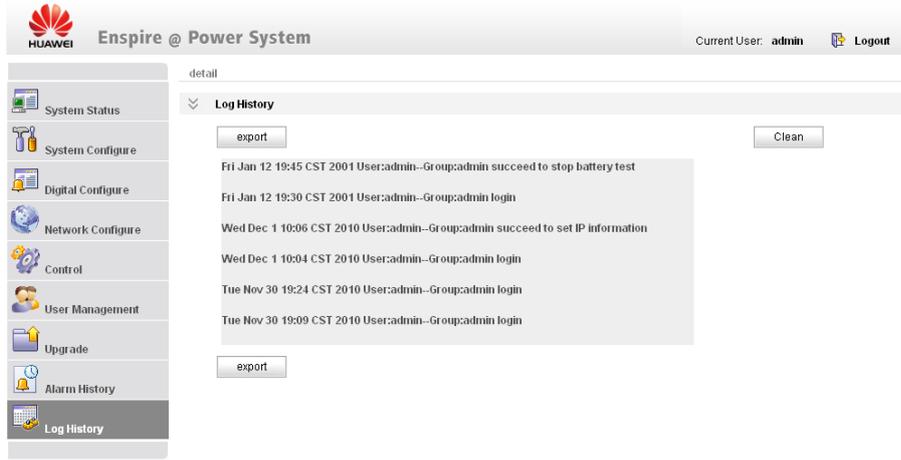
6.3.1 Query History Log

The **Log History** page displays the information about historical logs, shown in Figure 6-19

 **NOTE**

Clicking **export** will overwrite the logs exported previously. Clicking **Clean** will delete historical logs for good.

Figure 6-19 Log History



A Technical Specifications

Table A-1 Technical Specifications

Category	Item	Specifications
Environmental conditions	Operating temperature	-10°C to +50°C (+14°F to +122°F)
	Storage temperature	-40°C to +70°C (-40°F to +158°F)
	Transportation temperature	-40°C to +70°C (-40°F to +158°F)
	Operating humidity	5%–95% RH (non-condensing)
	Storage humidity	5%–95% RH (non-condensing)
	Altitude	0–4000 m (0-13123.2 ft) When the altitude ranges from 3000 m (9842.4 ft) to 4000 m (13123.2 ft), the operating temperature is derated by 1°C (1.8°F) for each additional 100 m (328.08 ft).
AC input	Input mode	Single phase three wire (L, N, and PE)
	Input voltage	90–290 V AC (rated voltage: 220 V AC)
	Input frequency	40–65 Hz (rated frequency: 50/60 Hz)
	Power factor	≥ 0.99 (rated load)
DC output	Output voltage range	-42 V DC to -58V DC
	Default output voltage	-53.5 V DC
	Maximum output power	Number of rectifiers multiplied by the output power of a single rectifier
	Regulated voltage precision	≤ 1%
	Peak-to-peak noise voltage	≤ 200 mV (0–20 MHz)
	Others	No damage is caused if a storage battery is connected reversely.

Category	Item	Specifications
AC input protection	AC input overvoltage protection threshold	Overvoltage protection is performed when the single-phase AC input voltage exceeds the AC input overvoltage protection threshold (300 V AC by default).
	AC input overvoltage recovery threshold	When the voltage is restored to 290 V AC, the output resumes.
	AC input undervoltage protection threshold	Undervoltage protection is performed when the single-phase AC input voltage is below the AC input undervoltage protection threshold (85 V AC by default).
	AC input undervoltage recovery threshold	When the voltage is restored to 90 V AC, the output resumes.
DC output protection	DC output overvoltage protection threshold	58.5–60.5 V DC
EMC	CE	CISPR 22 class A (AC terminal, DC terminal and Signal terminal)
	RE	CISPR 22 Class A
	Harmonic	IEC 61000-3-2
	Fluctuation and blinking	IEC 61000-3-3
	ESD	Standard: IEC61000-4-2 Contact discharge voltage: 6kV (Class B); air discharge voltage: 8 kV (Class B);
	EFT	<ul style="list-style-type: none"> The voltage at signal ports is 0.5 kV (Class B) The voltage at the DC power ports is 2 kV (Class B) The voltage at the AC power ports is 2 kV (Class B)
	RS	Standard: IEC61000-4-3 10 V/m
	CS	Standard: IEC61000-4-3
Others	AC surge protection	Level-B surge protection <ul style="list-style-type: none"> Standard surge discharge current: 30 kA, 8/20 μs Maximum surge discharge current: 60 kA
	Safety and regulatory design	IEC60950-1, IEC 60950-22
	MTBF	100,000 hours
Structure	Dimensions (H x W x	Cabinet (without base): 1400 mm x 650 mm x 700 mm (55.11

Category	Item	Specifications
	D)	in. x 25.59 in. x 27.56 in.). Base: 100 mm x 650 mm x 700 mm (3.94 in. x 25.59 in. x 27.56 in.)
	Weight	200 kg (without storage batteries and rectifiers)
	Space for customer	More than 10U
	Protection level	Equipment compartment is IP55 Battery compartment is IP23
	Installation and carrying	Mounted on concrete pad and carried by using a hoist
	Maintenance	From the front, supporting module-level replacement.
	Cabling	Bottom inlet and bottom outlet
	Heat dissipation mode	Direct ventilation
	Heat dissipation capability	More than 1500 W

B LCD Menu

Table B-1 LCD Menu

Main Menu	Second Menu	Third Menu	Forth Menu	Fifth Menu	Default Value
Alarm & Status	Active Alarm	Critical ALM	-	-	-
		Major Alarm	-	-	-
	History Alarm	History	-	-	-
		CLR Alarm Time	-	-	-
	Bat Test Result	-	-	-	-
	Rect Info	ID	-	-	-
		Voltage	-	-	-
		Current	-	-	-
		Current Limit	-	-	-
		Status	-	-	-
		Output Power	-	-	-
		Rated Efficiency	-	-	-
		Input Power	-	-	-
		Input Current	-	-	-
		Rated Current	-	-	-
		Inner Temp	-	-	-
	Version Info	-	-	-	
	TCU Info	Fan Rev	Outlet Vent		-
Intake Vent		TCU Inner Temp	-	-	

Main Menu	Second Menu	Third Menu	Forth Menu	Fifth Menu	Default Value		
Settings	Com Settings	PMU Address	-	-	0		
		COM Port	-	-	-		
		RS485/RS232 Port	-	-	RS232		
	Batt Settings	Batt Selection	Batt String	-	-	1	
			Capacity1	-	-	400AH	
			Capacity2	-	-	0AH	
			Install Date	-	-	2001-01-01	
			Maintenance Date	-	-	Jan.01'01	
			Warranty Date	-	-	Jan.01'01	
		Batt Off Para	BLVD Enable	-	-	Yes	
			BLVD	-	-	43.0 V	
			BHTD Enable	-	-	No	
			BHTD	-	-	53°C	
		Charge Para	FC Volt	-	-	53.5 V	
			BC Volt	-	-	56.5 V	
			Curr Limit	-	-	0.10 C10	
			Temp Comp	-	-	80 mV/°C	
		Batt Test Para	Auto Test	Auto Test Enable	-	-	Disch Test
				Cycle	-	-	120days
				Test End Voltage	-	-	1.9 V
				Duration	-	-	10hours
				Test Delay	-	-	14days
			Short Test	Test End Voltage	-	-	45.0 V
		Duration		-	-	60min	
	DC Settings	Over Volt	-	-	-	58.0 V	
		Under Volt	-	-	-	45.0	
		LLVD Enable	-	-	-	No	
		LLVD Volt	-	-	-	44.0 V	

Main Menu	Second Menu	Third Menu	Forth Menu	Fifth Menu	Default Value
		LLVD Mode	-	-	By Voltage
		LLVD Time	-	-	301 Min
	AC Settings	Over Volt	-	-	280VAC
		Under Volt	-	-	180VAC
	Generator Para	Generator Enable	-	-	No
	Sensor Para	Batt Temp High	-	-	50°C
		Batt Temp Low	-	-	0°C
		Amb. Temp High	-	-	50°C
		Amb. Temp Low	-	-	0°C
		Humidity High	-	-	80%
		Humidity Low	-	-	10%
	TCU Settings	TCU In-slot	-	-	Yes
		TCU Temp High	-	-	68°C
		TCU Temp Low	-	-	-20°C
	Alarm Settings	Alarm Severity	Alarm	-	-
			Level	-	-
		Digital Alarm	Digital No.	-	-
			Mode	-	-
		Relate Relay	Alarm	-	-
			Relate Relay	-	-
	Default Type		-	-	
	Rect Settings	Sleep Enable	-	-	No
		Best Effi Point	-	-	70%
		Exch Cycle	-	-	7days
		Min Num Rect On	-	-	1pcs
	Tel No. Settings	SMS Enable	-	-	No
		SMS No.1	-	-	-
		SMS No.2	-	-	-
		SMS No.3	-	-	-
	Night Charge	Function Enable	-	-	No

Main Menu	Second Menu	Third Menu	Forth Menu	Fifth Menu	Default Value
	Set	Charge at Day	-	-	0.05C10
		Charge at Night	-	-	0.05C10
		Night Start Time	-	-	22:00
		Night End Time	-	-	08:00
	System Settings	Text	-	-	English
		Disp Contrast	-	-	3
		Date	-	-	Jan.01'01
		Time	-	-	01:01
	Engineering Settings	Modify PWD	-	-	User
		Init Dara	-	-	No
		System Type	-	-	TP48200A
		Version Info	-	-	V200R001C02B 012SP13
Maintenance	PMU Reset	-	-	-	No
	CLR History ALM	-	-	-	No
	Batt Test Start	-	-	-	Std Test
	Start BC/FC	-	-	-	Float Charge
	Rect1	-	-	-	ON
	Rect N+1 ALM	-	-	-	No

 **NOTE**

The LCD menu varies based on configurations. Table 6-8 is for reference only.

C Acronyms and Abbreviations

A

ATS	automatic transfer switch
ACDB	alternating current distribution box

B

BLVD	battery low voltage disconnection
-------------	-----------------------------------

E

EMC	electromagnetic compatibility
EMI	electromagnetic interference
EMS	element management system
	electromagnetic susceptibility

L

LLVD	load low voltage disconnection
-------------	--------------------------------

I

IEC	International Electrotechnical Commission
------------	---

M

MTBF	mean time between failures
-------------	----------------------------

O

OPEX	operational expenditure
-------------	-------------------------

P

PSU power supply unit

PMU power monitor unit

R

RoHS [restriction of the use of certain hazardous substances](#)

S

SNMP Simple Network Management Protocol

SPD surge protection device