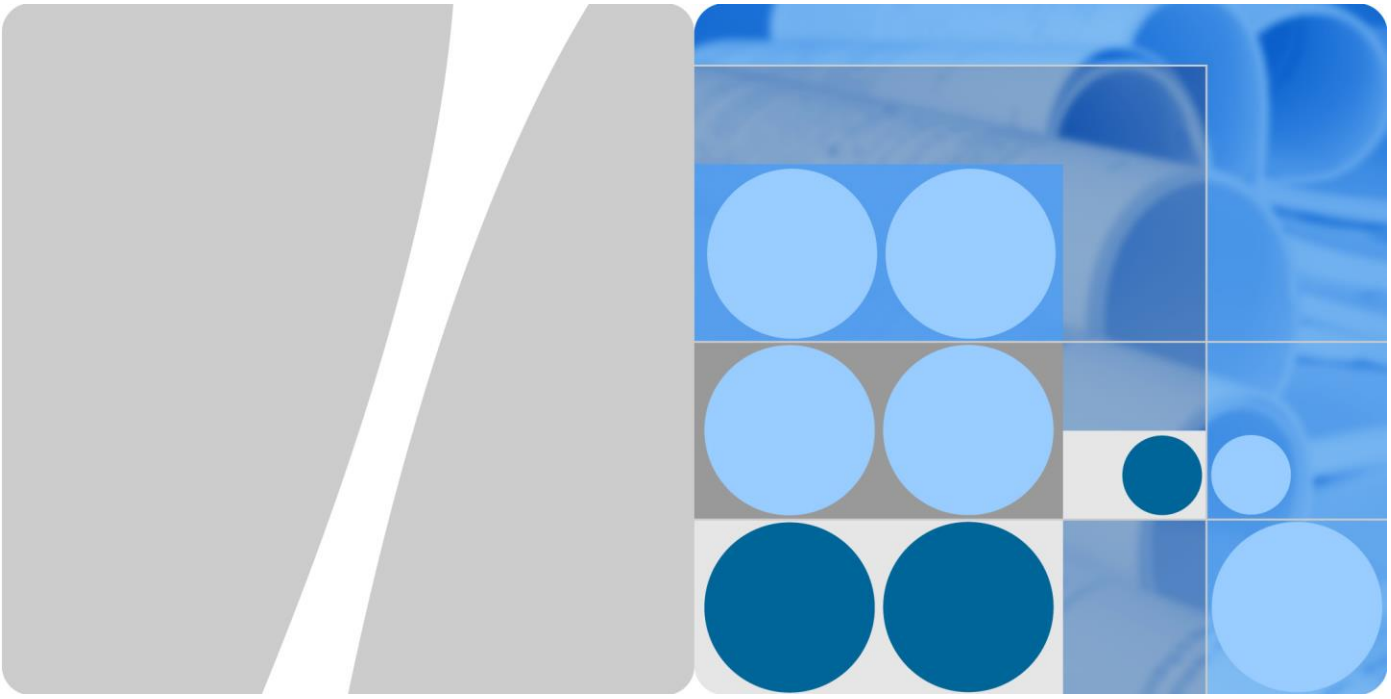

TP48200A-DX12A1 Telecom Power

User Manual

Issue 07

Date 2019-11-15

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Preface

Purpose

This document describes the DC power system in terms of product introduction, component introduction, and system maintenance.

Figures provided in this document are for reference only.

Intended Audience

This document is intended for:

- Sales engineers
- Technical support engineers
- Maintenance 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 updates made in previous issues.

Issue 07 (2019-11-15)

Deleted contents about the app.

Optimized the content about rectifiers.

Issue 06 (2019-02-26)

Optimized the content of the document.

Issue 05 (2017-03-20)

Modified appendix **A.3 EMC Specifications**.

Issue 04 (2016-02-05)

Modified all the cabinet figures.

Issue 03 (2016-01-12)

Modified appendix **C Associations Between Alarms and Dry Contacts on the UIM**.

Issue 02 (2015-11-24)

Modified all the cabinet figures.

Modified section **2.3 System Configurations**.

Modified section **4.2.20 Batt Test Negative**.

Issue 01 (2015-11-15)

This issue is the first official release.

Contents

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.

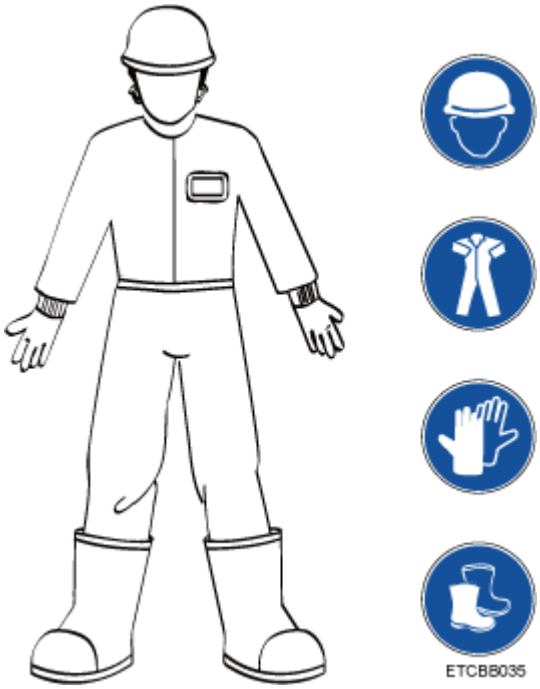
Huawei will not be liable for any consequences of the following circumstances:

- 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

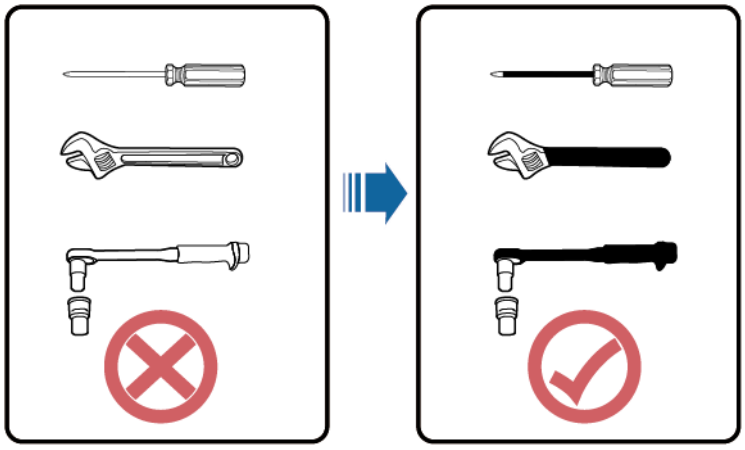
General Requirements

- 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.

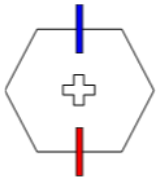
- When installing, operating, or maintaining the equipment, wear dedicated protective gears such as insulation gloves, goggles, and safety clothing, helmet, and shoes, as shown in the following figure.



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

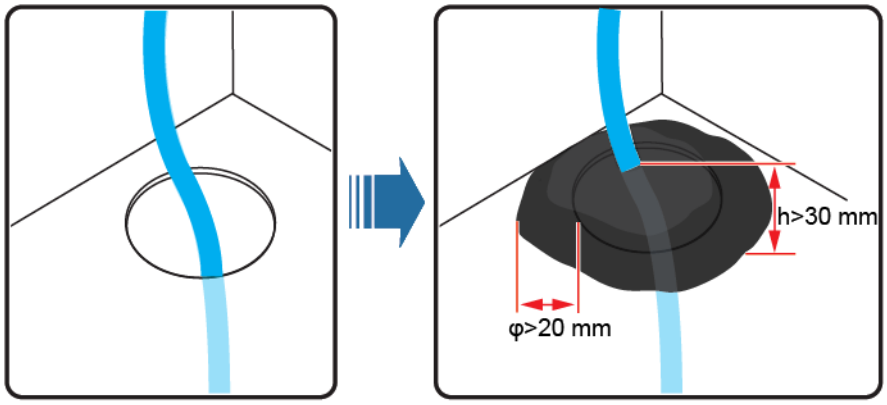


- Follow the specified procedures for installation, operation, and maintenance.
- Ensure that bolts are tightened with a torque wrench and marked using red or blue color. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm if the bolts are tightened and then mark 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.



- 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.
 or 	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.
 or	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.
 or or	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: 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 disconnector at the exterior of the device.
- Before making electrical connections, switch off the disconnector 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.

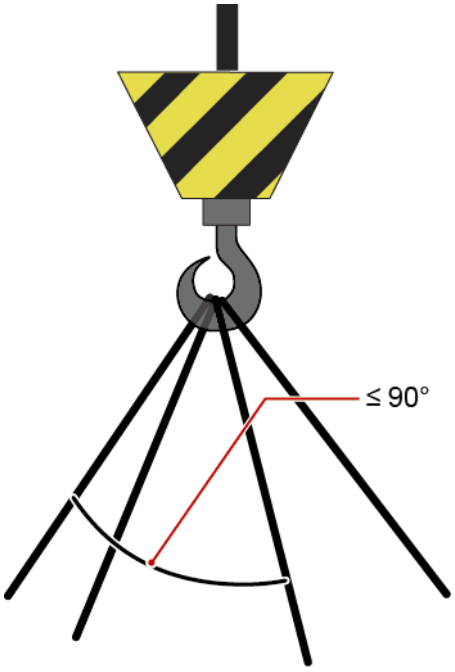
1.5 Mechanical Safety

Hoisting Devices

DANGER

Do not walk under hoisted objects.

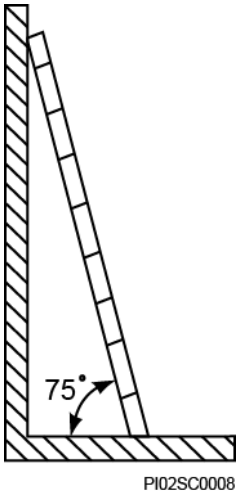
- Only trained and qualified personnel should perform hoisting operations.
- Check that hoisting tools are available and in good condition.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a load-bearing object or wall.
- Ensure that the angle formed by two hoisting cables 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.

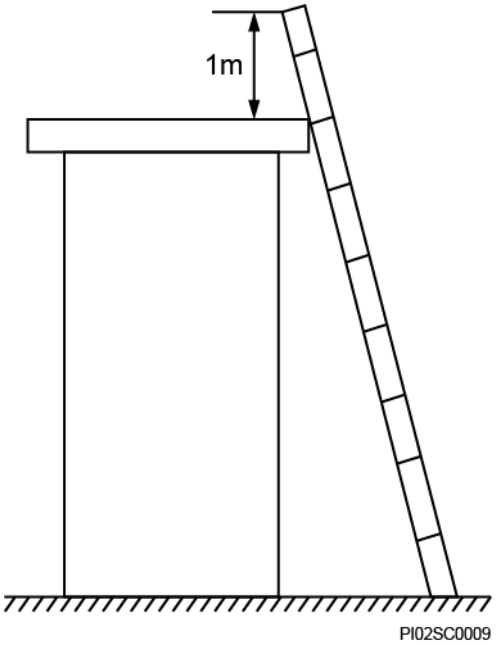
Using Ladders

- 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 of the ladder 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:

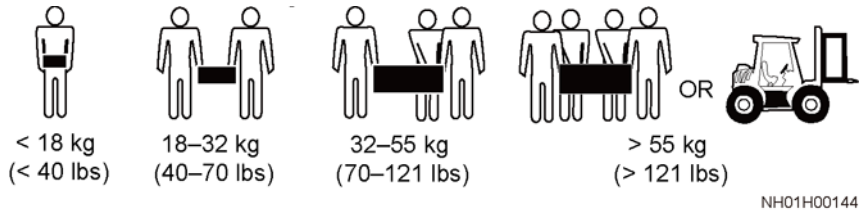
NOTICE

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

DANGER

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.

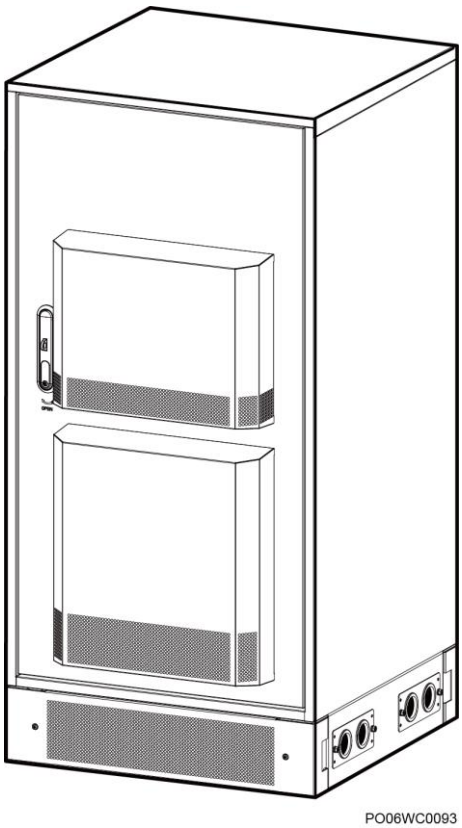
- When maintenance is complete, return the waste lithium battery to the maintenance office.

2 Overview

2.1 Introduction

The TP48200A-DX12A1 (DC2) is an integrated telecom power system that supplies power to and backs up power for –48 V DC outdoor communications equipment. It also provides space for installing the equipment.

Figure 2-1 TP48200A-DX12A1 (DC2) exterior



2.2 Features

- Wide input voltage range of 85 V AC to 300 V AC
- Comprehensive battery management
- Comprehensive DC surge protective design
- One fast Ethernet (FE) port and one RS485/RS232 port for network connections
- SNMP and HTTPS for communicating with HUAWEI Network Ecosystem (NetEco) and third-party network management systems (NMSs), which ensures remote management and unattended operation
- Liquid crystal display (LCD) for display and buttons for user operations
- Web user interface (WebUI) for user operations
- Multiple display languages, such as English, Chinese, Italian, French, Spanish, Portuguese, Russian, German, and Turkish
- Hot-swappable rectifiers and site monitoring unit (SMU)
- Rectifier power factor (PF) of 0.99

2.3 System Configurations

Table 2-1 Power cabinet configurations

Item	**TP48200A-DX12A1 (DC2)**
Input system	220/380 V AC three-phase; dual inputs: AC input and emergency AC input
Surge protection	Type 1+Type 2
System capacity	8.5 kW + backup
Rectifier	A maximum of four R4850G2s
Battery (optional)	One 150 Ah lead-acid battery string
Space for customer equipment	≥ 8 U
Application environment	Class B
Cooling	Free cooling
Site monitoring unit (SMU)	SMU02B
User interface module (UIM)	UIM02C
Sensor	Battery temperature sensor, door status sensor
Heater	A maximum of two 500 W heaters: • Standard: One 500 W heater • Optional: One 500 W heater

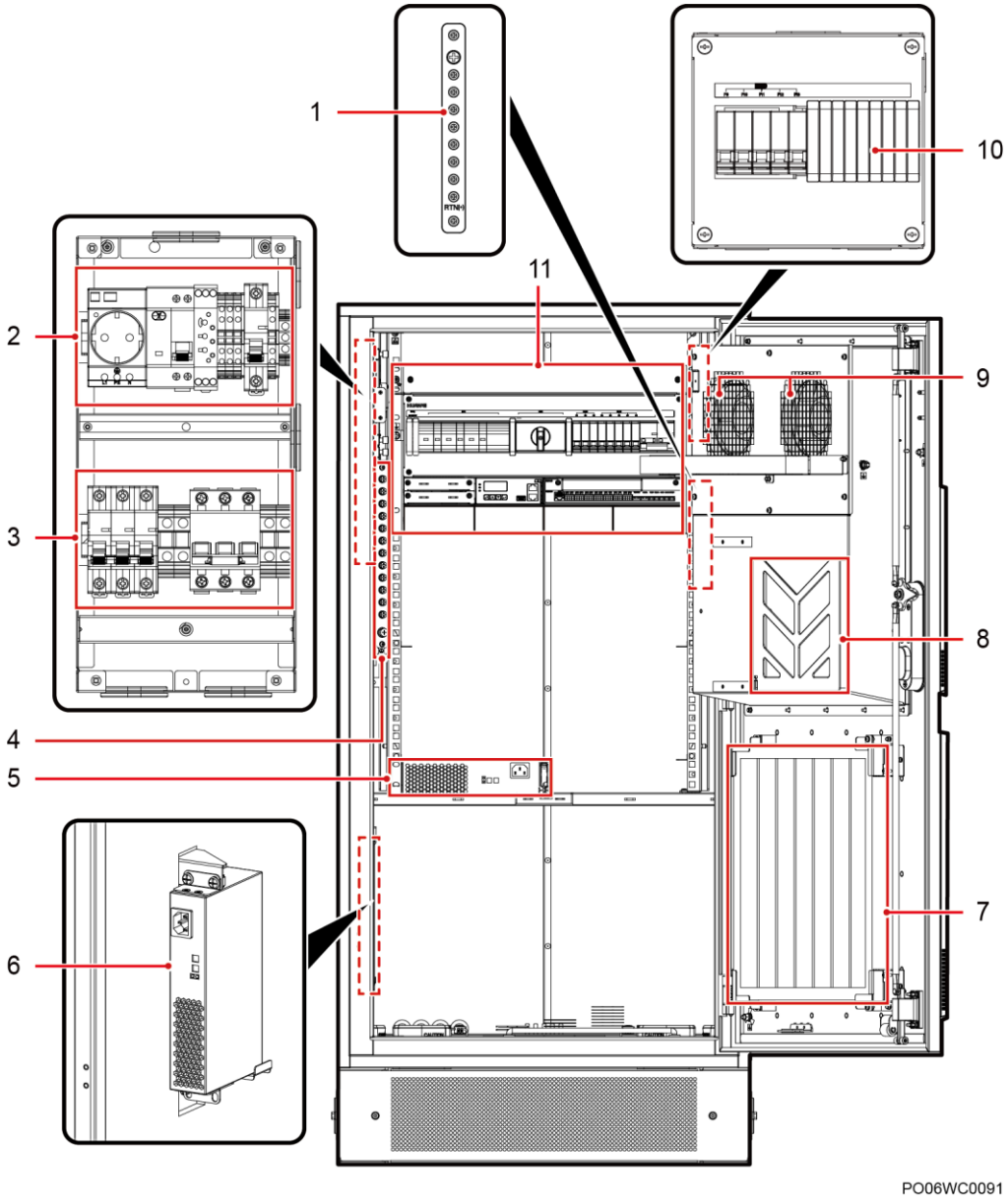
NOTE

- Class A environments refer to indoor environments where temperature and humidity are controllable, including rooms where human beings live.
- Class B environments refer to indoor environments in which the ambient temperature and humidity are not controlled and outdoor environments (with simple shielding measures) where the humidity can reach 100%.
- Class C environments refer to sea environments or outdoor land environments (with simple shielding measures) near pollution sources. If a site is near a pollution source, it is at most 3.7 km away from salt water, such as the sea and salt lakes, 3 km away from heavy pollution sources, such as smelteries, coal mines, and thermal power plants, 2 km away from medium pollution sources, such as chemical, rubber, and galvanization industries, or 1 km away from light pollution sources, such as packing houses, tanneries, and boiler rooms.
- Class D environments refer to areas about 500 m away from the seashore. Class D environments are special Class C environments.

3 Components

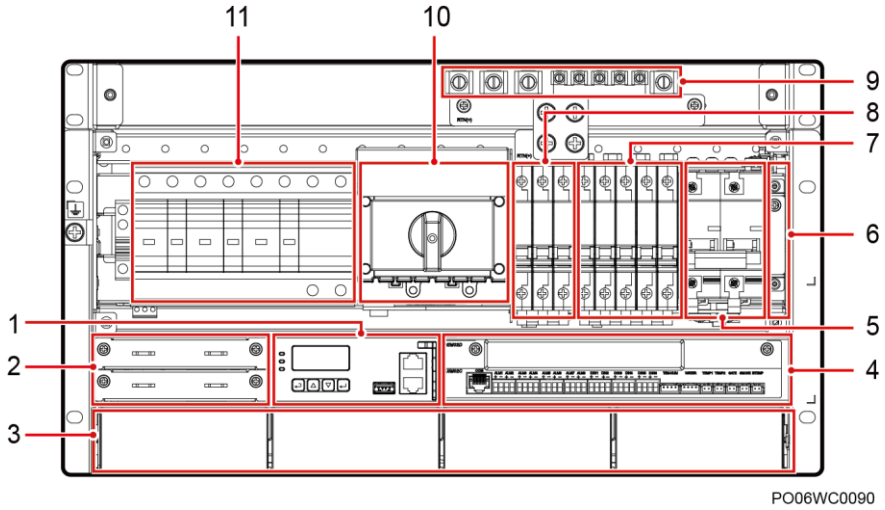
3.1 Interior

Figure 3-1 TP48200A-DX12A1 (DC2)interior



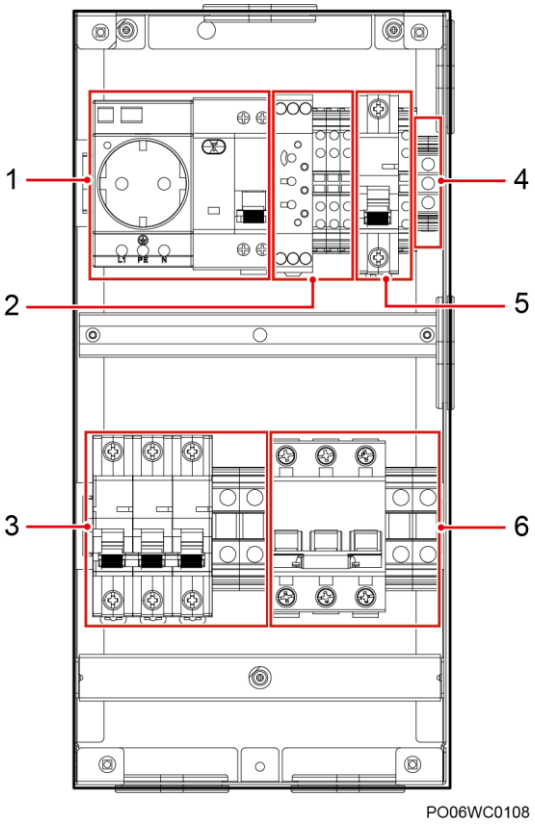
(1) RTN+ busbar	(2) AC output unit	(3) AC input unit
(4) Cabinet ground bar	(5) Heater (optional)	(6) Heater (standard)
(7) Air filter	(8) Folder	(9) Direct ventilation fan
(10) Battery low voltage disconnection (BLVD) output box	(11) Power subrack	

Figure 3-2 Power subrack on TP48200A-DX12A1 (DC2)



(1) SMU02B	(2) Space for NIM01C	(3) Space for rectifiers
(4) UIM02C	(5) Battery circuit breaker	(6) Battery switch (behind the cover)
(7) BLVD circuit breakers	(8) Load low voltage disconnection (LLVD) circuit breakers	(9) RTN+ busbar
(10) AC input transfer switch	(11) AC surge protective device (SPD)	

Figure 3-3 AC box without cover on TP48200A-DX12A1 (DC2)



(1) German standard maintenance socket and protective circuit breaker

(2) AC light power terminals and time relay

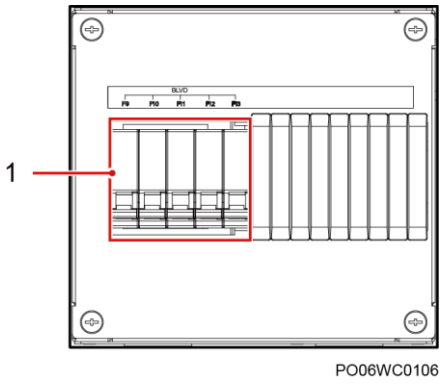
(3) AC input circuit breaker and terminals

(4) PE terminal

(5) AC output circuit breaker and terminal

(6) Emergency AC input circuit breaker and terminals

Figure 3-4 DC output box on TP48200A-DX12A1 (DC2)



(1) BLVD circuit breakers

3.2 Power Distribution Unit

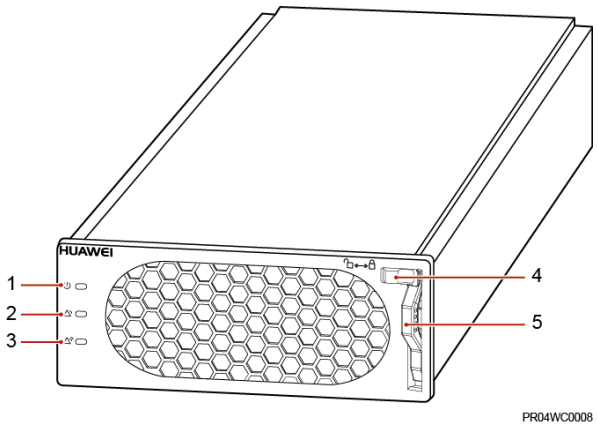
Table 3-1 Power distribution specifications

Item	TP48200A-DX12A1 (DC2)
Input system	220/380 V AC three-phase
AC power distribution	• AC input: two 3-pole 40 A circuit breakers, with a knob-type dual power switch • AC output: one German standard socket (with a 10 A RCD), one 1-pole 10 A circuit breaker, and AC light power terminals and one time relay (5 A resistive load or 1 A capacitive load)
DC power distribution	• BLVD circuit breakers: 2x32 A/1P, 2x20 A/1P, 2x16 A/1P, 2x10 A/1P, 2x6 A/1P • LLVD circuit breakers: 3x63 A/1P
Battery route	One 2-pole 125 A circuit breaker

3.3 Rectifier

Rectifiers convert AC input into stable DC output.

Figure 3-5 Rectifier



(1) Run indicator (2) Alarm indicator (3) Fault indicator

(4) Locking latch (5) Handle

Table 3-2 Rectifier indicator description

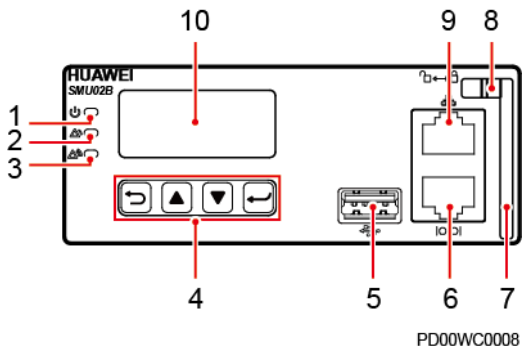
Indicator	Color	Status	Description
Run indicator	Green	Steady on	The rectifier has an AC power input.

Indicator	Color	Status	Description
		Off	The rectifier has no AC power input.
			The rectifier is faulty.
		Blinking at 0.5 Hz	The rectifier is being queried.
		Blinking at 4 Hz	The rectifier is loading an application program.
Alarm indicator	Yellow	Off	No alarm has been generated.
		Steady on	• The rectifier has generated an alarm due to ambient overtemperature. • The rectifier has generated an alarm for shutdown due to ambient overtemperature or undertemperature.
			The rectifier is protecting itself against AC input overvoltage or undervoltage.
			The rectifier is hibernating.
		Blinking at 0.5 Hz	The communication between the rectifier and the SMU has been interrupted.
Fault indicator	Red	Off	The rectifier is running properly.
		Steady on	The rectifier has been locked out due to output overvoltage.
			The rectifier has no output due to an internal fault.

3.4 SMU02B

Panel

Figure 3-6 SMU02B panel



(1) Run indicator (2) Minor alarm indicator (3) Major alarm indicator

(4) Buttons	(5) USB port (protected by a security mechanism)	(6) RS485/RS232 port
(7) Handle	(8) Locking latch	(9) Fast Ethernet (FE) port
(10) LCD		

Indicators

Table 3-3 Indicator description

Name	Color	Status	Description
Run indicator	Green	Off	The SMU is faulty or has no DC input.
		Blinking slowly (0.5 Hz)	The SMU is running properly and communicating with the host properly.
		Blinking fast (4 Hz)	The SMU is running properly but fails to communicate with the host properly.
Minor alarm indicator	Yellow	Off	No minor or warning alarm is generated.
		Steady on	A minor or warning alarm is generated.
Major alarm indicator	Red	Off	No critical or major alarm is generated.
		Steady on	A critical or major alarm is generated.

Buttons

Table 3-4 Button description

Button	Name	Description
	Up	Press **Up** and **Down** to scroll through the menus or to change the value of a parameter.
	Down	
	Cancel	Returns to the previous menu without saving the settings.
	Enter	• Enters the main menu from the standby screen. • Enters a submenu from the main menu. • Saves menu settings on a submenu.

Button	Name	Description
NOTE • The LCD screen becomes dark if no button is pressed within 30 seconds. • You need to log in again if no button is pressed within 1 minute. • To increase or decrease a parameter value quickly, hold down  or  . • To restart the SMU, hold down  and  for 10 seconds. • To increase (or decrease) the LCD contrast ratio, hold down  and  (or ) for 2 seconds.		

USB Ports

You can quickly deploy a site, import and export configuration files, export running logs, and upgrade software by inserting the USB flash drive that is specially used for site deployment into the USB port.

After installing the specific WiFi module using the USB port, you can access the WebUI locally, which facilitates operations.

NOTICE

Using WiFi modules provided by another vendor may cause data loss or function exception. Consequences arising from this will not be borne by Huawei.

Communications Ports

Table 3-5 Communication port description

Communications Port	Communications Parameter	Communications Protocol
FE	10/100M autonegotiation	HTTPS, NetEco protocol, SNMP and TCP-Modbus protocol
RS485/RS232	Baud rate: 1200bit/s, 2400bit/s, 4800bit/s, 9600bit/s, 14400bit/s, 19200bit/s, 115200bit/s	Master/slave protocol, YDN protocol, and Modbus protocol
NOTE All these ports are protected by a security mechanism.		

Figure 3-7 FE/RS485/RS232 port pins

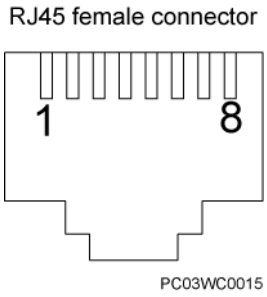


Table 3-6 Pin definitions for the FE port

Pin	Signal	Description
1	TX+	Transmits data over FE.
2	TX-	
3	RX+	Receives data over FE.
6	RX-	
4, 5, 7, 8	NA	-

Table 3-7 Pin definitions for the RS485/RS232 port

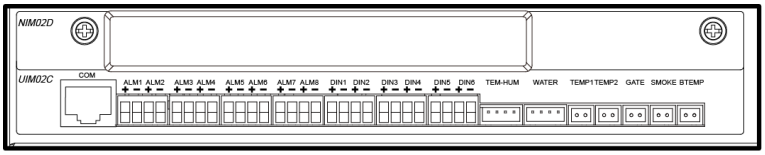
Pin	Signal	Description
1	TX+	Transmits data over RS485.
2	TX-	
4	RX+	Receives data over RS485.
5	RX-	
3	RX232	Receives data over RS232.
7	TX232	Transmits data over RS232.
6	PGND	Connects to the ground.
8	NA	–

3.5 User Interface Module UIM02C

Panel

The user interface module UIM02C supports eight dry contact outputs, six dry contact inputs, and seven sensor ports. The sensor ports include one ambient temperature and humidity input, one water sensor input, two ambient temperature inputs, one door status sensor input, one smoke sensor input, and one battery temperature input.

Figure 3-8 UIM02C panel



PO06WC0113

Ports

Table 3-8 UIM02C ports

Port Type	Silk Screen	Description
Sensor ports	TEM-HUM	Ambient temperature and humidity sensor
	WATER	Water sensor
	TEMP1	Ambient temperature sensor 1
	TEMP2	Ambient temperature sensor 2
	GATE	Door status sensor
	SMOKE	Smoke sensor
	BTEMP	Battery temperature sensor
Dry contact input ports	DIN1	**NOTE** For the associations between the dry contact input ports and alarms, see the appendix.
	DIN2	
	DIN3	
	DIN4	
	DIN5	
	DIN6	
Dry contact output ports	ALM1	**NOTE** For the associations between the dry contact output ports and alarms, see the appendix.
	ALM2	
	ALM3	
	ALM4	

Port Type	Silk Screen	Description
	ALM5	
	ALM6	
	ALM7	
	ALM8	
Communications port	COM	RS485 port

Communications Port

Table 3-9 COM communications port description

Communications Port	Communications Parameter	Communications Protocol	Function
COM port	Baud rate: 9600 bit/s, 19,200 bit/s, 115,200 bit/s	Master/slave protocols and Modbus	Connects to a lower-level device such as the battery voltage detector or intelligent air conditioner.
NOTE The COM port is protected by a security mechanism.			

Figure 3-9 Pins in the COM port

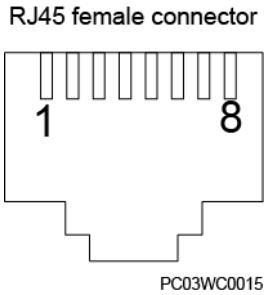


Table 3-10 Pin definitions for the COM port

Pin	Signal	Description
1	RX+	Receives data over RS485.
2	RX-	
4	TX+	Sends data over RS485.

Pin	Signal	Description
5	TX-	
6	PGND	Protective grounding.
3, 7, and 8	Reserved	N/A

Pins

Figure 3-10 UIM02C pin numbers

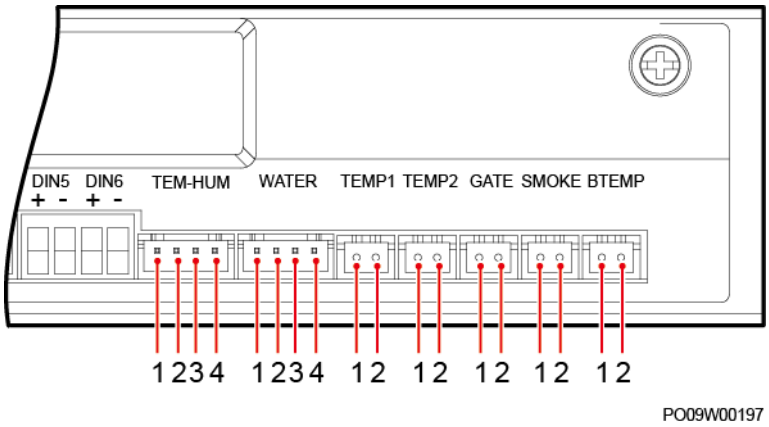


Table 3-11 UIM02C pin definitions

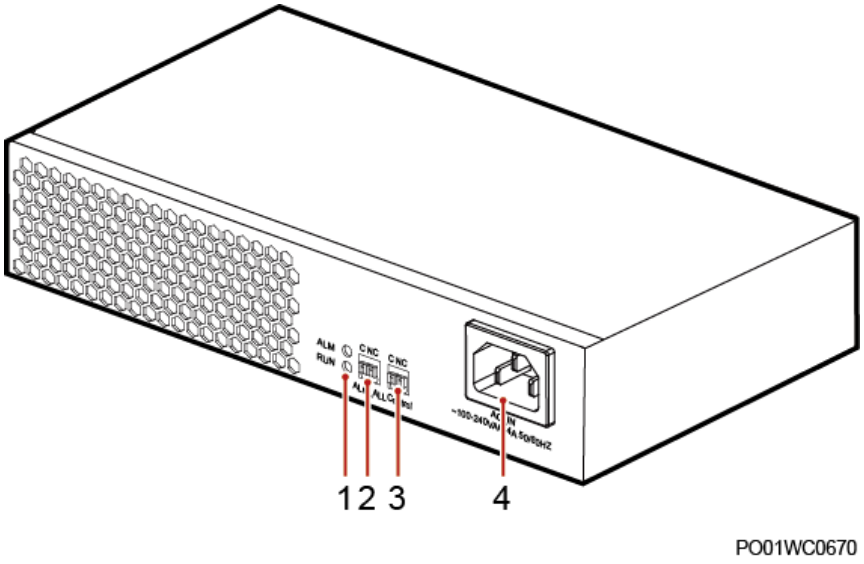
Silk Screen	No.	Pin Definition
TEM-HUM	1	12 V
	2	ENV_TEMP
	3	12 V
	4	ENV_HUM
WATER	1	12 V
	2	WATER
	3	GND
	4	Not defined
TEMP1	1	GND
	2	TEMP1
TEMP2	1	GND
	2	TEMP2

Silk Screen	No.	Pin Definition
GATE	1	GATE+
	2	GATE-
SMOKE	1	SMOKE
	2	12 V
BTEMP	1	GND
	2	BTEMP

3.6 (Optional) Heater

A heater assembly unit (HAU) is adopted to ensure a proper operating temperature for the equipment inside the cabinet.

Figure 3-11 Heater



(1) Indicator (2) Alarm dry contact (3) Control dry contact

(4) AC input port

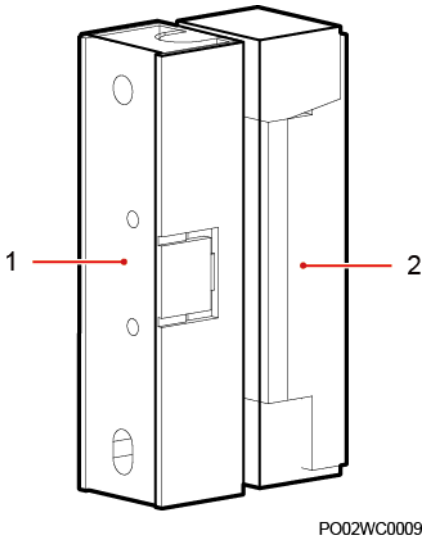
Table 3-12 Indicator description

Silk Screen	Color	Status	Description
RUN	Green	Steady on	The heater is powered on and takes a self-test.

Silk Screen	Color	Status	Description
		Off	The heater is not powered on.
ALM	Red	Off	No alarm is generated.
		Steady on	An alarm is generated and the heater needs to be replaced.

3.7 Door Status Sensor

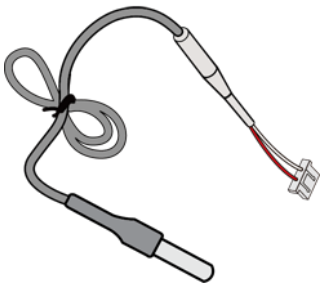
Figure 3-12 Door status sensor



(1) Switch (2) Magnet

3.8 Battery Temperature Sensor

Figure 3-13 Battery temperature sensor



4 Maintenance

4.1 Routine Maintenance

Perform routine maintenance periodically based on site requirements. The recommended interval is six months. If any fault occurs, rectify it in a timely manner.

Table 4-1 Routine maintenance checklist

Maintenance Item	Check Item	Check Method	Repair When	Measure
Door lock	The door lock is damaged.	By observation or by locking and unlocking the door	The door lock is damaged.	Replace the door lock.
Fan	Dust accumulates on the fan.	By observation	Thick dust accumulates on the fan.	Clean the dust.
	The fan is intact, and the rotation speed, noise, and vibration are in normal ranges.	By observing or listening to the fan	The fan is damaged, the vibration is abnormal, or the noise is loud.	Replace the fan.
TCUC control board	The TCUC control board works properly.	By observation or by checking the indicator and alarms	The TCUC control board does not work properly.	Replace the TCUC control board.
Air filter	Dust accumulates on the dust filter.	By observation	• The high temperature alarm is generated frequently, and the temperature in the cabinet is obviously higher than the ambient temperature. • Dust accumulates on the dust filter.	Replacing an Air Filter
Electricity	The output voltage is normal.	Multimeter	The BLVD or LLVD voltage exceeds the threshold.	For details, see 4.2 Rectifying Common

Maintenance Item	Check Item	Check Method	Repair When	Measure
Preventive maintenance	Indicators are normal.	By observation	An alarm is generated.	Faults.
Exterior	The paint or electroplated coating on the cabinet is intact.	By observation	The cabinet is damaged or deformed.	Repaint and repair the shell.
Grounding	The ground point properly connects to the equipment room ground bar.	By observation or by using a screwdriver or wrench	The cable that connects the ground point and the equipment room ground bar is loose.	Secure the ground point or replace the ground cable.

4.2 Rectifying Common Faults

4.2.1 AC Failure

Possible Causes

- The AC input power cable is faulty.
- The AC input circuit breaker is OFF.
- The power grid is faulty.

Measures

1. Check whether the AC input cable is loose. If so, secure the AC input cable.
2. Check whether the AC input circuit breaker is OFF. If so, handle the fault which caused the AC input circuit breaker to turn OFF and then switch on the circuit breaker.
3. Check whether the AC input voltage is lower than 50 V AC. If so, handle the power grid fault.

4.2.2 AC Over Volt

Possible Causes

- The AC overvoltage alarm threshold is incorrectly set on the SMU.
- The power grid is faulty.

Measures

1. Check whether the AC overvoltage alarm threshold is correctly set. If not, set the threshold to the correct value.
2. Check whether the AC input voltage exceeds the AC overvoltage alarm threshold (280 V AC by default). If so, handle the AC input fault.

4.2.3 AC Under Volt

Possible Causes

- The AC undervoltage alarm threshold is incorrectly set on the SMU.
- The power grid is faulty.

Measures

1. Check whether the AC undervoltage alarm threshold is correctly set. If not, set the threshold to the correct value.
2. Check whether the AC input voltage is below the AC undervoltage alarm threshold (180 V AC by default). If so, handle the AC input fault.

4.2.4 DC Over Volt

Possible Causes

- The DC overvoltage alarm threshold is incorrectly set on the SMU.
- The power system voltage has been manually set to a very high value.
- Rectifiers are faulty.

Measures

1. Check whether the DC overvoltage alarm threshold (58 V DC by default) is correctly set. If not, set the threshold to the correct value.
2. Check whether the system voltage has been manually set to a very high value. If so, check with other maintenance personnel whether the voltage can be changed to a normal value.
3. Remove the rectifiers one by one and check whether the alarm is cleared. If the alarm still exists, reinstall the rectifier. If the alarm is cleared, replace the rectifier.

4.2.5 DC Under Volt

Possible Causes

- An AC power failure occurs.
- The DC undervoltage alarm threshold is not set properly on the SMU.
- The system configuration is not proper.
- The power system voltage is set too low in manual mode.
- Rectifiers are faulty.

Measures

1. Check whether an AC power failure occurs. If yes, resume the AC power supply.
2. Check whether the DC undervoltage alarm threshold (46.8 V DC by default) is properly set. If no, adjust it to a proper value.
3. Check whether the load current is greater than the current power system capacity. If yes, expand the power system capacity or reduce the load power.

4. Check whether the system voltage is set too low in manual mode. If yes, confirm the reason and adjust the voltage to a proper value after the operation.
5. Check whether the power system capacity is insufficient for the loads due to rectifier failures. If yes, replace the faulty rectifier.

4.2.6 Batt Chg. Overcur.

Possible Causes

- Rectifier communication is interrupted.
- SMU connections are loose.
- The SMU is faulty.

Measures

1. Check whether an alarm has been generated for interrupted rectifier communication. If so, remove the rectifier, reinstall it, and check whether the alarm is cleared. If the alarm still exists, replace the rectifier.
2. Remove the SMU, reinstall it, and check whether the alarm is cleared. If the alarm still exists, replace the SMU.

4.2.7 LLVD Disconnected

Possible Causes

- An AC power failure has occurred.
- Loads are manually disconnected.
- The load disconnection voltage has been set to a very high value on the SMU.

Measures

1. Check whether an AC power failure has occurred. If so, rectify the fault to restore the AC power supply.
2. Check whether loads are manually disconnected. If so, check with other maintenance personnel whether the loads can be reconnected.
3. Check whether the load disconnection voltage (44 V DC by default) has been set to a very high value on the SMU. If so, adjust it to a normal value.

4.2.8 BLVD Disconnected

Possible Causes

- An AC power failure has occurred.
- Batteries are manually disconnected.
- The battery disconnection voltage has been set to a very high value on the SMU.

Measures

1. Check whether an AC power failure has occurred. If so, rectify the fault to restore the AC power supply.

2. Check whether batteries are manually disconnected. If so, check with other maintenance personnel whether the batteries can be reconnected.
3. Check whether the battery disconnection voltage (43 V DC by default) has been set to a very high value on the SMU. If so, adjust it to a normal value.

4.2.9 Batt Loop Trip

Possible Causes

- The battery circuit breaker or fuse detection cable is loosely connected.
- The battery circuit breaker has tripped or the battery fuse has blown.
- The contactor is faulty.

Measures

1. Check whether the battery circuit breaker or fuse detection cable is loosely connected. If so, reconnect the cable.
2. Check whether the battery circuit breaker has tripped or the battery fuse has blown. If so, rectify the battery loop fault and then switch on the circuit breaker or replace the fuse.
3. Manually switch on or switch off the battery contactor and check whether the battery current changes accordingly. If not, replace the contactor.

4.2.10 Batt. High Temp.

NOTE

This alarm is generated only for the power system that has a battery temperature sensor installed.

Possible Causes

- The high battery temperature alarm threshold is incorrectly set.
- The battery temperature control system is faulty.
- The battery temperature sensor is faulty.

Measures

1. Check whether the high battery temperature alarm threshold (50°C by default) is correctly set. If not, set the threshold to the correct value.
2. Check whether the battery temperature control system is faulty. If so, rectify the fault. The alarm is cleared when the battery temperature falls within the allowed range.
3. Check whether the battery temperature sensor is faulty. If so, replace the temperature sensor.

4.2.11 Batt. Low Temp.

NOTE

This alarm is generated only for the power system that has a battery temperature sensor installed.

Possible Causes

- The low battery temperature alarm threshold is incorrectly set on the SMU.
- The battery temperature control system is faulty.

- The battery temperature sensor is faulty.

Measures

1. Check whether the low battery temperature alarm threshold (-10°C by default) is correctly set. If not, set the threshold to the correct value.
2. Check whether the temperature control system for the battery compartment is faulty. If so, rectify the fault. The alarm is cleared when the temperature in the battery compartment becomes normal.
3. Check whether the battery temperature sensor is faulty. If so, replace the battery temperature sensor.

4.2.12 Door Alarm

NOTE

This alarm is generated only for the power system that has door status sensor installed.

Possible Causes

- The cabinet doors are open.
- The door status sensor is faulty.

Measures

1. Close cabinet doors.
2. Check whether the door status sensor is faulty. If yes, replace the door status sensor.

4.2.13 Rectifier Missing

Possible Causes

- Rectifiers are not powered on.
- Rectifiers are faulty.
- The subrack or slot connectors are faulty.
- The SMU is faulty.

Measures

1. Check whether rectifier circuit breakers are ON. If not, switch them on.
2. Check whether rectifiers are removed. If so, confirm the reason and reinstall them.
3. Replace faulty rectifiers.
4. Check whether rectifiers in the rectifier subrack do not work. If so, remove these rectifiers and check whether their slot connectors are damaged. If the connectors are damaged, repair or replace the slot connectors or the entire subrack.
5. If the alarm persists after the preceding measures are taken and the SMU is restarted, replace the SMU.

4.2.14 Single Rect Fault

Possible Causes

- The subrack or slot connector is faulty.
- A rectifier is faulty.
- The SMU is faulty.

Measures

1. Remove the rectifier and check whether the slot connector is damaged or deformed. If so, repair or replace the slot connector or the entire subrack.
2. Reinstall the rectifier. If the alarm persists, replace the rectifier.
3. Restart the SMU. If the alarm persists, replace the SMU.

4.2.15 Multi-Rect. Fault

Possible Causes

- The subrack or slot connectors are faulty.
- Rectifiers are faulty.
- The SMU is faulty.

Measures

1. Remove the rectifiers and check whether the slot connectors are damaged or deformed. If so, repair or replace the slot connectors or the entire subrack.
2. Reinstall the rectifiers. If the alarm persists, replace the rectifiers.
3. Restart the SMU. If the alarm persists, replace the SMU.

4.2.16 Rect Fault

Possible Causes

- Rectifier connections are loose.
- A rectifier is faulty.

Measures

1. Check the Fault indicator on the rectifier panel. If it is steady red, remove the rectifier, and then reinstall it after the indicator turns off.
2. If the alarm persists, replace the rectifier.

4.2.17 Rect Protection

Possible Causes

- The rectifier input voltage is too high.
- The rectifier input voltage is too low.
- The ambient temperature is too high.

- The rectifier is abnormal.

Measures

1. Check whether the AC input voltage exceeds the upper threshold for rectifier working voltage. If so, locate and rectify the power supply fault and restore the power supply.
2. Check whether the AC input voltage is below the lower threshold for rectifier working voltage. If so, locate and rectify the power supply fault and restore the power supply.
3. Check whether the ambient temperature is higher than the maximum operating temperature of the rectifier. If so, locate and rectify the temperature control system fault.
4. Remove the rectifier that has generated the alarm and reinstall it after the indicator turns off. If the alarm persists, replace the rectifier.

4.2.18 Rect Comm Fault

Possible Causes

- A rectifier has been removed.
- Rectifier connections are loose.
- A rectifier is faulty.

Measures

1. Check whether a rectifier has been removed. If so, reinstall it.
2. If the rectifier is in position, remove the rectifier and reinstall it.
3. If the alarm persists, replace the rectifier.

4.2.19 DC SPD Fault

Possible Causes

- The DC SPD detection cable is disconnected.
- The DC SPD is faulty.

Measures

1. Check whether the DC SPD detection cable is disconnected. If so, reconnect the cable.
2. If the DC SPD detection cable is reliably connected, replace the DC SPD.

4.2.20 Batt Test Negative

Possible Causes

The battery voltage drops to the test end voltage (46 V by default) within the test end time (15 minutes by default).

Measures

1. Check whether the battery is overloaded or aged.
2. Check whether the test end time and test end voltage are correctly set.

NOTE

If the battery test duration is less than 30 minutes, the battery test result is displayed as "NO RESULT".

4.3 Identifying Component Faults

4.3.1 Identifying Circuit Breaker Faults

The following indicate that the circuit breaker is faulty:

- The circuit breaker cannot be switched to ON/OFF after the short circuit fault for its end circuit is rectified.
- When the circuit breaker is switched to ON and its input voltage is normal, the voltage between the two ends of the circuit breaker exceeds 1 V.
- The input voltage is normal, but the resistance between both ends of the circuit breaker is less than 1 kΩ when the circuit breaker is OFF.

4.3.2 Identifying Rectifier Faults

A rectifier is damaged if any of the following conditions is not met:

- When the rectifier does not communicate with the SMU and the AC input voltage is around 220 V, the green indicator on the rectifier is steady on, the yellow indicator is blinking, the red indicator is off, and the rectifier output is normal.
- The SMU can perform equalized charging, float charging, and current limiting control for the rectifier when the communication cable to the rectifier is correctly connected and communication is established between the rectifier and the SMU.

4.3.3 Identifying SMU Faults

The following indicate that the SMU is faulty:

- The DC output is normal but the green indicator on the SMU is off.
- The SMU breaks down or cannot be started. Its LCD has abnormal display or buttons cannot be operated.
- With alarm reporting enabled, the SMU does not report alarms when the power system is faulty.
- The SMU reports an alarm when the power system is not faulty.
- The SMU fails to communicate with the connected lower-level devices even though the communications cables are correctly connected.
- Communication between the SMU and all rectifiers fails even though the rectifiers and the communications cables are normal.
- The SMU cannot monitor AC or DC power distribution when communications cables are intact and AC and DC power distribution is normal.
- Parameters cannot be set or running information cannot be viewed on the SMU.

4.4 Replacing Components

NOTICE

- Performing maintenance or replacing components may interrupt power to the loads if battery reserve is insufficient. Ensure that the switches for primary loads are in the ON position and do not turn off the battery switch and the AC input switch at the same time.
- Obtain prior written consent from the customer if load disconnection is required.
- Do not perform maintenance on rainy days. Otherwise, rain water can enter the system and damage devices and components.

4.4.1 Replacing a Rectifier

Prerequisites

- Protective gloves and the cabinet door key are available.
- The new rectifier is intact.

⚠ CAUTION

To prevent burns, exercise caution when removing a rectifier because the rectifier may be hot as a result of continuous operation.

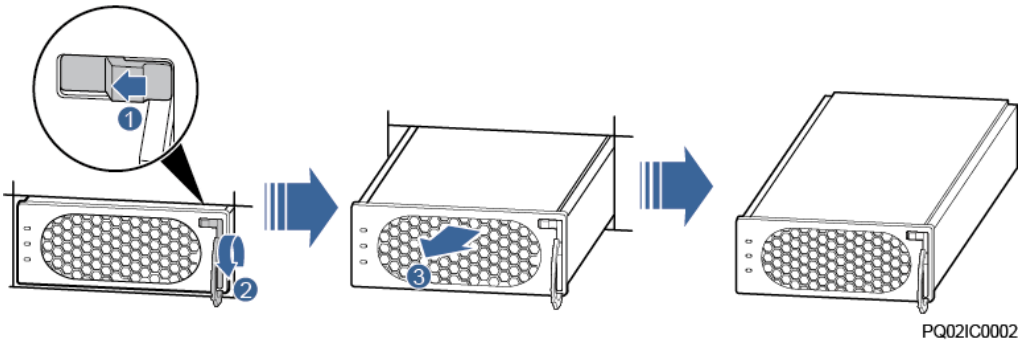
Procedure

Step 1 Wear protective gloves.

Step 2 Push the locking latch on the right side of the panel towards the left.

Step 3 Gently draw the handle outwards, and then remove the rectifier from the subrack, as shown in Figure 4-1.

Figure 4-1 Removing a rectifier

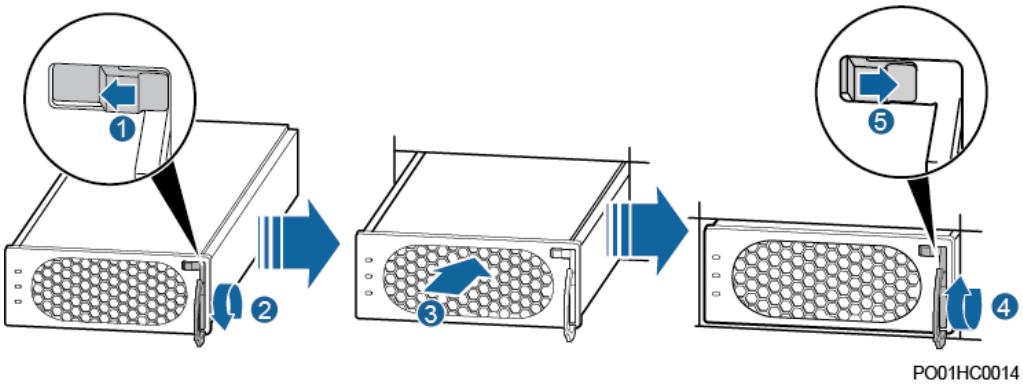


Step 4 Push the locking latch on the new rectifier towards the left, and pull out the handle.

Step 5 Place the new rectifier at the entry of the correct slot.

Step 6 Gently slide the rectifier into the slot along the guide rails until it is engaged. Close the handle, and push the locking latch towards the right to lock the handle, as shown in Figure 4-2.

Figure 4-2 Installing a rectifier



Step 7 Remove the protective gloves.

----End

Follow-up Procedure

Pack the removed component and send it to the local Huawei warehouse.

4.4.2 Replacing a Circuit Breaker

Prerequisites

DANGER

Before replacing an AC circuit breaker, switch off the input circuit breaker on the upper-level device.

- You have obtained the cabinet door key, insulation tapes, and tools.
- The new circuit breaker is intact, has the same specifications, and is OFF.

Procedure

Step 1 Unscrew and remove the cover before the circuit breaker.

Step 2 Switch off the circuit breaker that is to be replaced.

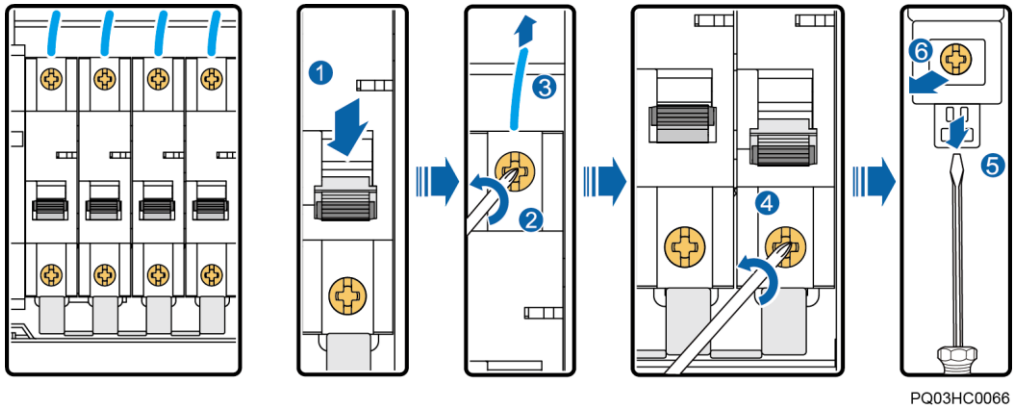
Step 3 Record connection positions of output cables.

Step 4 Loosen the screws that secure ports on the circuit breaker using a Phillips screwdriver and remove the cables. Wrap the cables using insulation tapes to prevent hazards.

Step 5 Loosen the screw that secures the lower port of the circuit breaker by using a Phillips screwdriver, and loosen the buckle at the circuit breaker base by using an insulated flat-head screwdriver.

Step 6 Remove the circuit breaker from the guide rail. Figure 4-3 shows the procedure for removing the circuit breaker.

Figure 4-3 Removing the circuit breaker



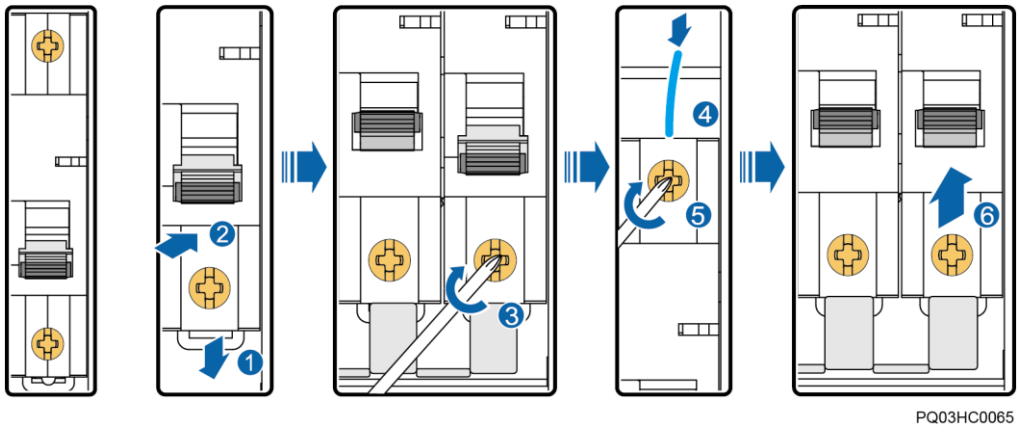
Step 7 Switch off the new circuit breaker. Press the buckle at the circuit breaker base by using an insulated flat-head screwdriver and install the new circuit breaker. Then loosen the buckle and secure the circuit breaker to the guide rail.

Step 8 Tighten the screw that secures the lower port of the circuit breaker.

Step 9 Remove the insulation tapes from the output cables. Then connect the output cables to the circuit breaker ports and tighten the screws.

Step 10 Switch the circuit breaker to ON, as shown in Figure 4-4.

Figure 4-4 Installing a circuit breaker



Step 11 Reinstall the cover and tighten the screws.

----End

4.4.3 Replacing a Plug-in Circuit Breaker

Prerequisites

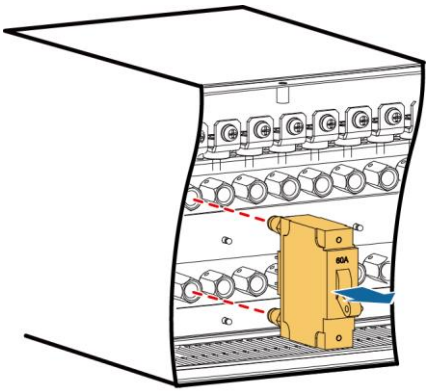
- You have obtained the cabinet door key and tools.
- The new circuit breaker is intact.

Procedure

Step 1 Loosen the screws and remove the front cover from the circuit breaker.

Step 2 Hold the faulty circuit breaker and pull it out, as shown in the following figure.

Figure 4-5 Removing a plug-in circuit breaker



Step 3 Switch off the new circuit breaker and install it in the correct position.

Step 4 Switch on the new circuit breaker.

Step 5 Tighten the screws and install the front cover on the circuit breaker.

----End

4.4.4 Replacing the PCB of UIM02C

Prerequisites

- An ESD wrist strap, ESD gloves, ESD box or bag, cabinet door key, and required tools are available.
- The new printed circuit board (PCB) of UIM02C is intact.

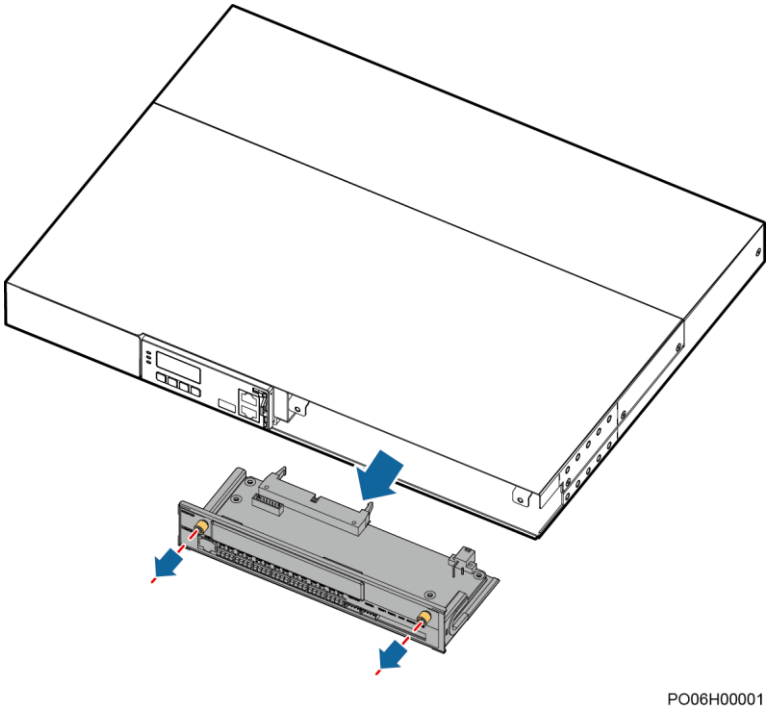
Procedure

Step 1 Connect the ground cable of the ESD wrist strap, and wear the ESD wrist strap and ESD gloves.

Step 2 Record the signal cable connection positions on the UIM02C panel and disconnect the cables.

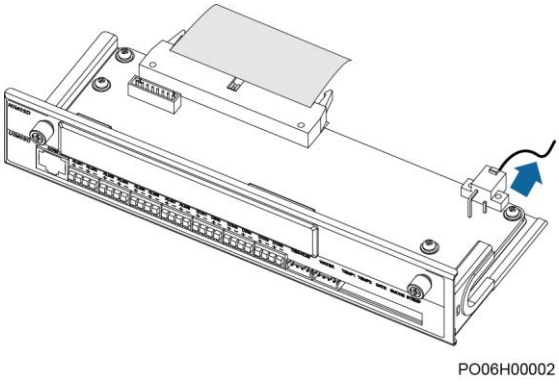
Step 3 Unscrew the UIM02C panel and remove the UIM02C, as shown in Figure 4-6.

Figure 4-6 Removing the UIM02C



Step 4 Remove the -48 V power cable from the PCB of UIM02C.

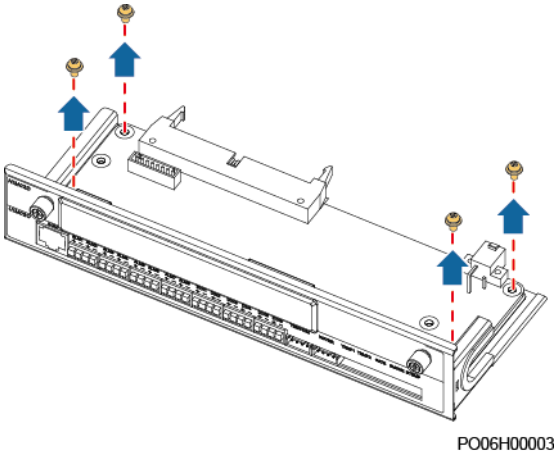
Figure 4-7 Removing the -48 V power cable



Step 5 Record the positions where the PCB of UIM02C connects to all the cables, and then disconnect the cables.

Step 6 Remove the PCB, as shown in Figure 4-8.

Figure 4-8 Removing the PCB of UIM02C



Step 7 Take out the new PCB and install it.

Step 8 Connect all cables back to the new PCB based on the recorded information.

Step 9 Connect the -48 V power cable to the PCB of UIM02C.

Step 10 Push in the UIM02C and tighten the screws.

Step 11 Reconnect the signal cables to the UIM02C panel based on the recorded information.

Step 12 Disconnect the ground cable of the ESD wrist strap, and remove the ESD wrist strap and ESD gloves.

----End

Follow-up Procedure

Pack the removed component and send it to the local Huawei warehouse.

4.4.5 Replacing an SMU

Prerequisites

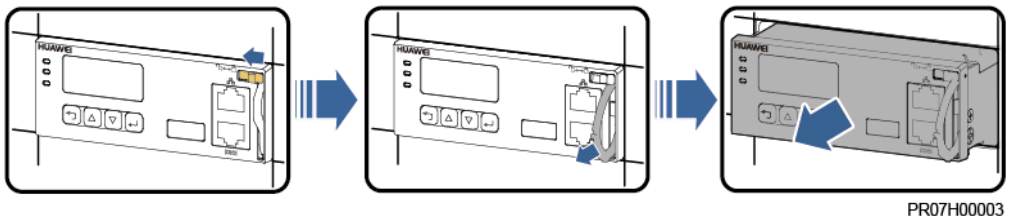
- The cabinet door key is available.
- The new SMU is intact.

Procedure

Step 1 Push the locking latch towards the left.

Step 2 Pull the handle outwards and remove the SMU, as shown in Figure 4-9.

Figure 4-9 Removing an SMU

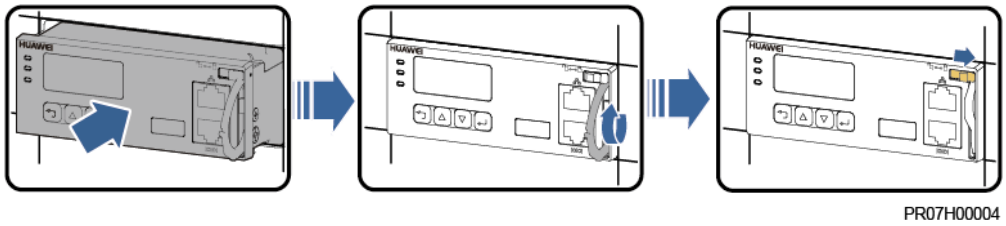


Step 3 Insert the new SMU into the subrack, push the locking latch towards the left, and pull out the handle.

Step 4 Slide the SMU into the subrack slowly along the guide rails, push in the handle, and then push the locking latch towards the right.

Step 5 Reset the parameters on the SMU.

Figure 4-10 Installing an SMU



----End

Follow-up Procedure

Pack the removed component and send it to the local Huawei warehouse.

4.4.6 Replacing an AC SPD Module

Prerequisites

- You have obtained an ESD wrist strap or a pair of ESD gloves, an ESD box or bag, and the cabinet door key.
- The new AC SPD module is intact and the indication window is green.

DANGER

Do not replace an AC SPD module during a thunderstorm.

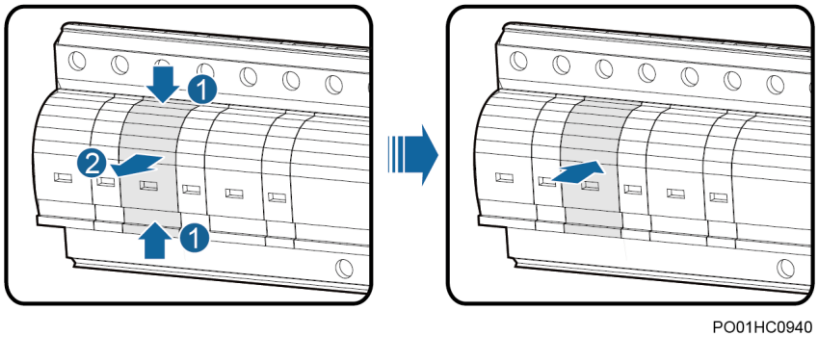
Procedure

Step 1 Connect the ground cable to the ESD wrist strap and wear the ESD wrist strap and ESD gloves.

Step 2 Hold down the faulty AC SPD module and pull it out, as shown in Figure 4-11.

Step 3 Install a new AC SPD module, as shown in Figure 4-11.

Figure 4-11 Replacing an AC SPD module



Step 4 Disconnect the ground cable from the ESD wrist strap and take off the ESD wrist strap and ESD gloves.

----End

Follow-up Procedure

Check that the alarm for the AC SPD is cleared.

4.4.7 Replacing a Direct Ventilation Fan

Prerequisites

- You have obtained an ESD wrist strap, a pair of ESD gloves, an ESD box or bag, the cabinet door key, and tools.
- The new fan is intact.

NOTICE

Install the fan according to airflow directions. Do not install the fan reversely.

Context

You need only to disconnect the fan power cable, but not the AC input to the system.

Procedure

Step 1 Disconnect the 48 V power cable from the UIM02C.

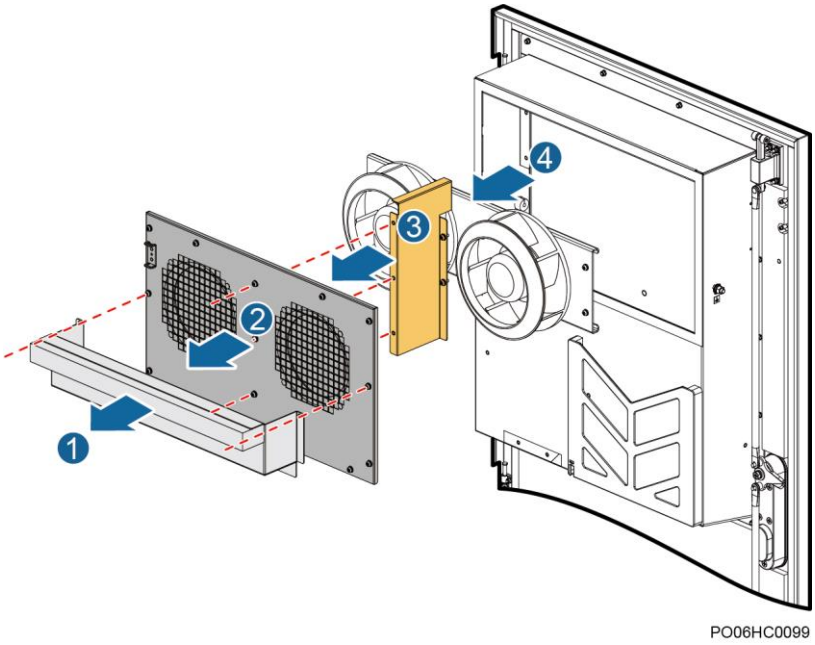
1. Connect the ground cable to the ESD wrist strap, and put on the ESD wrist strap and ESD gloves.
2. Record the positions of signal cables on the UIM02C, and disconnect the cables.
3. Unscrew and remove the UIM02C, as shown in Figure 1.

4. Disconnect the 48 V power cable from the UIM02C, as shown in Figure 2.

Step 2 Disconnect the interconnection terminal from the fan power cable.

Step 3 Record the fan installation direction and remove the fan, as shown in the following figure.

Figure 4-12 Removing a fan



Step 4 Install the new fan according to the fan installation direction you recorded.

Step 5 Reconnect the interconnection terminal to the fan power cable.

Step 6 Reinstall the UIM02C.

1. Connect the 48 V power cable to the UIM02C.
2. Insert the UIM02C into the correct slot, and tighten the screws.
3. Reconnect the signal cables to the UIM02C based on the recorded information.
4. Disconnect the ground cable from the ESD wrist strap, and take off the ESD wrist strap and ESD gloves.

----End

4.4.8 Replacing an Air Filter

Prerequisites

- You have obtained the cabinet door key and tools.
- The new air filter is intact.

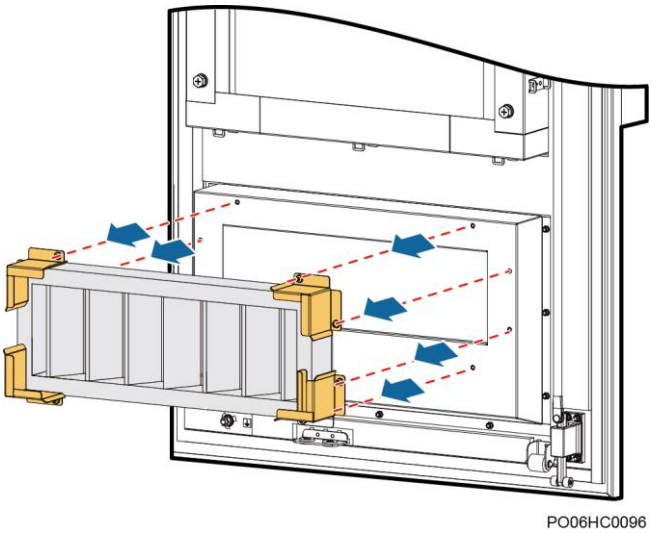
Context

The air filter can be directly replaced without the need to disconnect the AC input to the system.

Procedure

Step 1 Unscrew and remove the air filter, as shown in the following figure.

Figure 4-13 Removing an air filter



Step 2 Correctly place the new air filter (keep the side with a label upwards and the surface with a rubber strip facing the cabinet door). Tighten the screws to secure the air filter.

----End

4.4.9 Replacing a Heater

Prerequisites

- You have prepared an ESD wrist strap, a pair of ESD gloves, the cabinet door key, and tools.
- The new heater is intact.

CAUTION

Before replacing the heater, ensure that its circuit breaker is OFF.

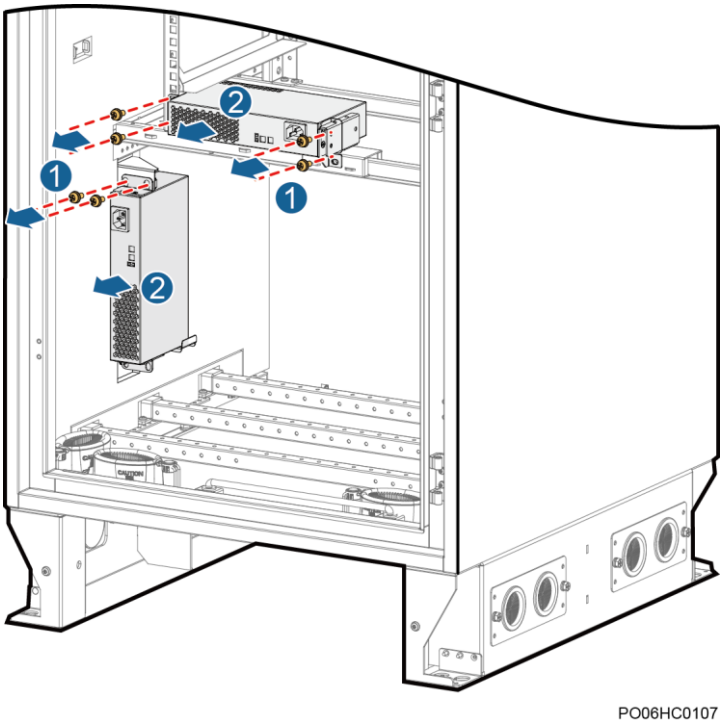
Procedure

Step 1 Connect the ground cable to the ESD wrist strap, and put on the ESD wrist strap and ESD gloves.

Step 2 Switch off the heater circuit breaker on the AC PDU.

Step 3 Unscrew and remove the heater, as shown in the following figure.

Figure 4-14 Removing a heater



Step 4 Record the cable connection positions on the heater and disconnect the cables.

Step 5 Connect the cables to the new heater based on the recorded information.

Step 6 Place the new heater in position and tighten the screws.

Step 7 Switch on the heater circuit breaker on the AC PDU.

Step 8 Disconnect the ground cable from the ESD wrist strap, and take off the ESD wrist strap and ESD gloves.

----End

4.4.10 Replacing a Battery Temperature Sensor

Prerequisites

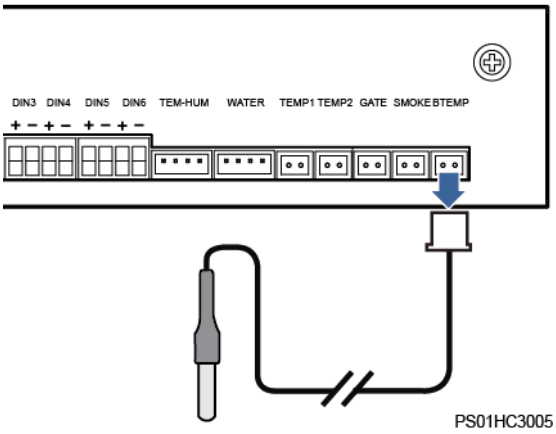
- You have obtained an ESD wrist strap, a pair of ESD gloves, an ESD box or bag, the cabinet door key, and a maintenance tool kit.
- The new battery temperature sensor is intact.

Procedure

Step 1 Connect the ground cable to the ESD wrist strap, and put on the ESD wrist strap and ESD gloves.

Step 2 Remove the battery temperature sensor cable from the UIM, as shown in Figure 4-15.

Figure 4-15 Removing the battery temperature sensor cable

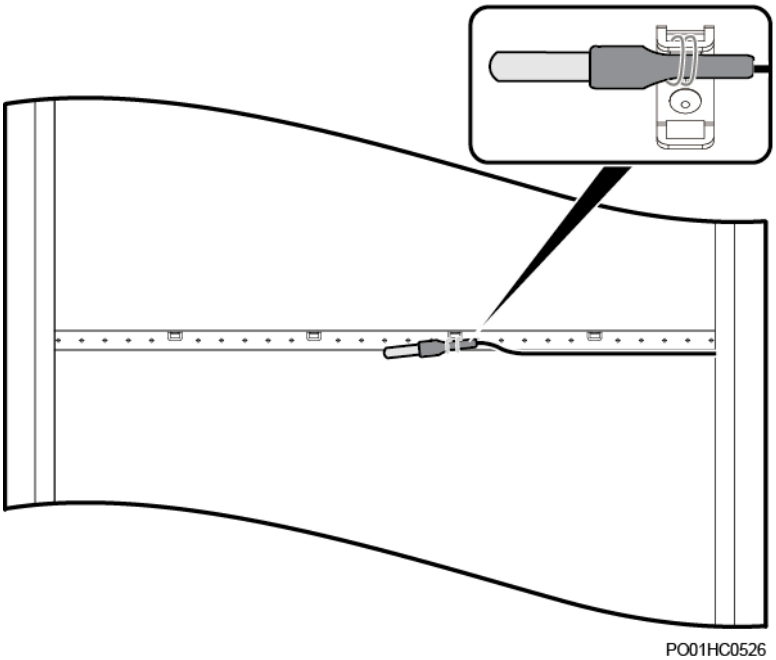


Step 3 Cut off the cable tie of the battery temperature sensor and remove the sensor.

NOTICE

The detection probe must not contact a metal surface.

Figure 4-16 Position of the battery temperature sensor



Step 4 Properly place the new battery temperature sensor and bind it securely with a cable tie.

Step 5 Reconnect the battery temperature sensor cable to the UIM.

Step 6 Disconnect the ground cable from the ESD wrist strap, and take off the ESD wrist strap and ESD gloves.

----End

4.4.11 Replacing a Door Status Sensor

Prerequisites

- The cabinet door key and required tools are available.
- The new door status sensor is intact.

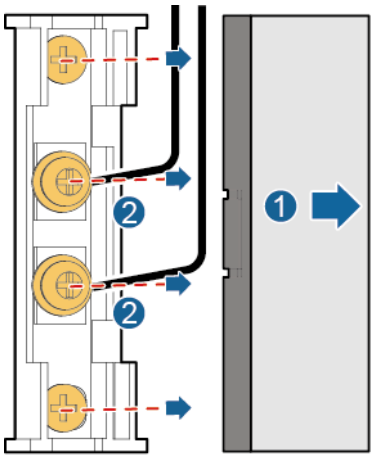
Procedure

Step 1 Open the cabinet door and remove the shell of the door status sensor.

Step 2 Record the positions where the alarm cables connect to the door status sensor, and unscrew the alarm cables.

Step 3 Unscrew the door status sensor, as shown in Figure 4-17.

Figure 4-17 Removing the door status sensor



PO01HC0286

Step 4 Remove the shell of the new door status sensor and remove the screws from the alarm cables.

Step 5 Properly place the new door status sensor at the installation position and tighten the screws.

Step 6 Place the alarm cables in sequence and secure the screws.

Step 7 Reinstall the shell of the door status sensor.

----End

Follow-up Procedure

Check that the door status alarm is cleared.

A Technical Specifications

A.1 Environment Specifications

Table A-1 Environment specifications

Item	Specifications
Operating temperature	–33ºC to +40ºC with 1120 W/m^2 solar radiation
Transport temperature	–40ºC to +70ºC
Storage temperature	–40ºC to +70ºC
Operating humidity	5%–95% RH
Storage humidity	5%–95% RH
Altitude	0–4000 m When the altitude ranges from 2000 m to 4000 m, the operating temperature decreases by 1°C for each additional 200 m.
Others	There should be no conductive dust, corrosive gas, or explosion hazard. Dust, corrosive substances, pests, molds, and other indicators should be controlled in accordance with class 4.1 requirements in ETSI EN 300 019-1-4 (V2.2.1).

A.2 Electrical Specifications

Table A-2 Electrical specifications

Item	Specifications	
AC input	Input system	220/380 V AC three-phase
	Input voltage	85–300 V AC

Item	Specifications	
	Input frequency	Frequency range: 45–66 Hz; nominal frequency: 50 Hz or 60 Hz
	Power factor	≥ 0.99 (rated input; rated load)
	THD	≤ 5% (Vin: 208 V AC, 220 V AC, or 230 V AC; load: 50%–100%)
DC output	Output voltage range	–42 V DC to –58 V DC
	Default output voltage	–53.5 V DC
	Output power	Maximum output power = Output power of a single rectifier x Number of rectifiers
	Regulated voltage precision	≤ ±1%
	Ripple and noise	≤ 200 mVp-p
	Psophometrically weighted noise	≤ 2 mV
	Current imbalance	< ±5% (50%–100% load)
AC input protection	AC input overvoltage protection threshold	> 300 V AC
	AC input overvoltage recovery threshold	When the voltage is restored to 290 V AC, the output resumes.
	AC input undervoltage protection threshold	< 85 V AC
	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 V DC to –60.5 V DC 1. If overvoltage occurs inside a rectifier, the rectifier locks out. 2. If the external voltage is greater than –63 V for more than 500 ms, the rectifier locks out.
AC surge protection	Type 1 + Type 2	
DC surge protection	10 kA (8/20 μs) in differential mode; 20 kA (8/20 μs) in common mode	
Safety compliance	IEC/EN60950-1	
Mean time between failures (MTBF)	200,000 hours	

A.3 EMC Specifications

Table A-3 EMC specifications

Item	Specifications	
Electromagnetic interference (EMI)	Conducted emission (CE)	AC port: EN300386 Class B DC port: EN300386 Class A Signal port: EN300386 Class B
	Radiated emission (RE)	Class B, EN300386
	Harmonic current	IEC61000-3-12
	Voltage fluctuation and flicker	IEC61000-3-11
Electromagnetic susceptibility (EMS)	ESD	IEC61000-4-2 (criterion B) Contact discharge: 6 kV; air discharge: 8 kV
	Electrical fast transient (EFT)	IEC61000-4-4 (criterion B) AC power port: 2 kV; DC power port: 1 kV; signal port: 1 kV
	Radiated susceptibility (RS)	IEC61000-4-3 (criterion A) 10 V/m
	Conducted susceptibility (CS)	IEC6100-4-6 (criterion A) Power port: 10 V; signal port: 3 V
	Surge immunity	IEC61000-4-5 (criterion B) AC power port: differential mode: 2 kV (8/20 μs); common mode: 4 kV (8/20 μs) DC power port: differential mode: 2 kV (8/20 μs); common mode: 4 kV (8/20 μs) Signal port: differential mode: 0.5 kV; common mode: 1 kV
	Voltage dips immunity (DIP)	EN61000-4-11

A.4 Cabinet Specifications

Table A-4 Cabinet specifications

Item	Specifications
Cabinet dimensions (H x W x D)	• TP48200A-DX12A1: 1200 mm x 650 mm x 650 mm • Base: 150 mm x 650 mm x 650 mm
Cabinet weight	≤ 115 kg (excluding rectifiers and batteries)
Protection level	IP55

Item	Specifications
Installation mode	Floor-mounted
Maintenance mode	Operated and maintained from the front
Cabling	Routed in and out from the bottom

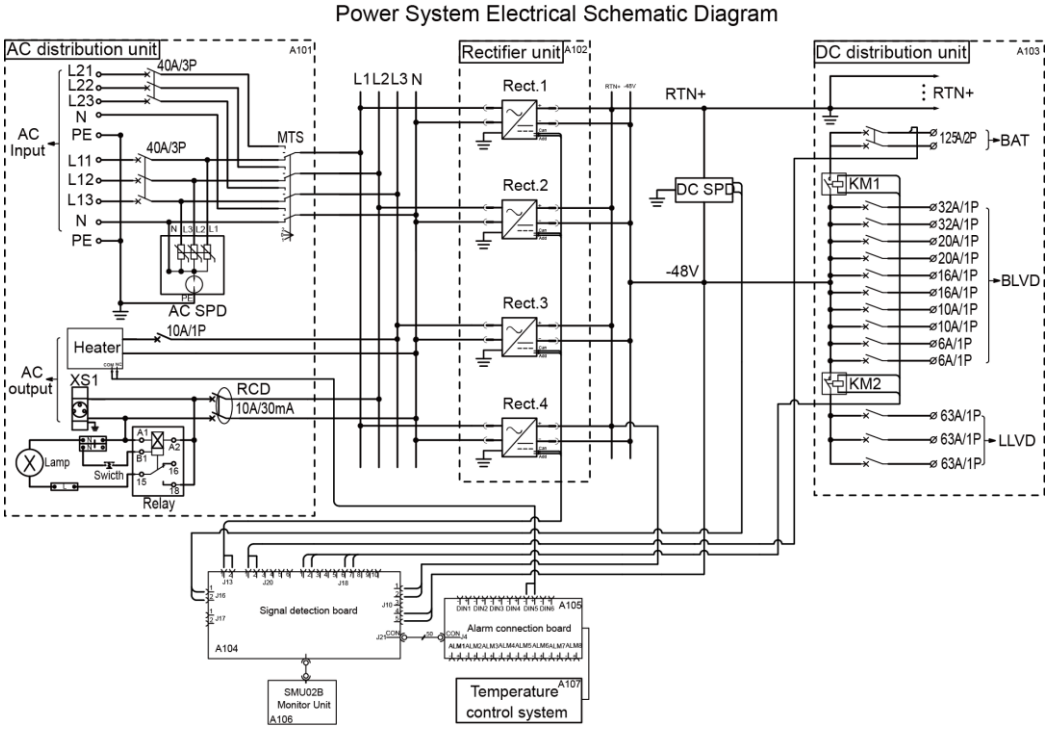
A.5 Heater Specifications

Table A-5 Heater specifications

Item	Specifications
Input voltage	220 V AC single-phase or 110 V AC dual-live wire
Voltage frequency	Rated frequency: 50 Hz or 60 Hz
Operating temperature	-40°C to +65°C (-40°F to +149°F)
Heater start and stop temperature	The heater starts when the temperature is 0°C and stops when the temperature is 15°C.
Operating humidity	5% RH to 95% RH
Heating power	> 500 W

B Electrical Conceptual Diagrams

Figure B-1 TP48200A-DX12A1 (DC2) electrical conceptual diagram



C Associations Between Alarms and Dry Contacts on the UIM

Table C-1 Associations between UIM02C dry contacts and alarms

Port Type	Silk Screen	Name	Category	Associated Alarm
Dry contact input ports	DIN1	-	-	Dry contact input 1 (open: normal; closed: alarm)
	DIN2	-	-	Dry contact input 2 (open: normal; closed: alarm)
	DIN3	-	-	Dry contact input 3 (open: normal; closed: alarm)
	DIN4	-	-	Dry contact input 4 (open: normal; closed: alarm)
	DIN5	-	-	Heater Fault (closed: normal; open: alarm)
	DIN6	-	-	Dry contact input 6 (open: normal; closed: alarm)
Dry contact output ports The default setting (closed: normal; open: alarm) can be modified.	ALM1	Urgent alarm	System incident	BLVD Warning/BLVD Disconnected/Batt. Fuse Break/SMU Fault/Batt Test Negative/Rectifier Fault/DC Undervolt./DC Ultra Undervolt.
	ALM2	Not urgent alarm	System incident	Insuff. Rdnt. Rects./Rectifier Fault/Fan Fault/AC Ph. Failure
	ALM3	System incident AC	AC main	AC Ph. Failure/AC Failure/Long Mains Failure
	ALM4	–	–	Ret. Vent TS Fault/Fan Fault
	ALM5	Rectifier incident	-	Rectifier Fault
	ALM6	Battery incident	-	Batt. Fuse Break/Batt Test Negative

Port Type	Silk Screen	Name	Category	Associated Alarm
	ALM7	Temperature alarm	High/low temperature	Batt. High Temp./Batt. Low Temp./High temp/Heater Fault
	ALM8	Door contact	Door open	Door Alarm

D Acronyms and Abbreviations

A	
AC	alternating current
B	
BLVD	battery low voltage disconnection
D	
DC	direct current
F	
FE	fast ethernet
H	
HAU	heater assembly unit
HTTPS	Hypertext Transfer Protocol Secure
I	
IP	Internet Protocol
L	
LCD	liquid crystal display
LLVD	load low voltage disconnection

S	
SMU	site monitoring unit
SNMP	Simple Network Management Protocol
T	
TCUC	Temperature control unit C
U	
UIM	user interface module

