

**TP48200A-D17A5-2 Telecom Power**

# **User Manual**

**Issue**      **04**  
**Date**        **2019-12-20**

**Copyright © Huawei Technologies Co., Ltd. 2019. All rights reserved.**

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd.

## **Trademarks and Permissions**



HUAWEI and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd.

All other trademarks and trade names mentioned in this document are the property of their respective holders.

## **Notice**

The purchased products, services and features are stipulated by the contract made between Huawei and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

# **Huawei Technologies Co., Ltd.**

Address: Huawei Industrial Base  
Bantian, Longgang  
Shenzhen 518129  
People's Republic of China

Website: <https://e.huawei.com>

# Preface

## Purpose

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

The figures of 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
 <b>DANGER</b>	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
 <b>NOTICE</b>	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.
 <b>NOTE</b>	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 (2016-06-01)**

Updated the section "Associations Between Alarms and Dry Contacts on the UIM."

### **Issue 02 (2016-01-10)**

Added the section "Replacing a TCUC."

### **Issue 01 (2015-11-10)**

This issue is the first official release.

---

# Contents

---

<b>Preface</b> .....	<b>ii</b>
<b>1 Safety Precautions</b> .....	<b>1</b>
1.1 General Safety.....	1
1.2 Personnel Requirements .....	5
1.3 Electrical Safety .....	5
1.4 Installation Environment Requirements.....	7
1.5 Mechanical Safety .....	8
1.6 Battery Safety.....	11
<b>2 Product Overview</b> .....	<b>15</b>
2.1 Introduction.....	15
2.2 Features.....	16
2.3 System Configurations.....	17
<b>3 Components</b> .....	<b>18</b>
3.1 Interior .....	18
3.2 PDU.....	20
3.3 Fan Assembly.....	21
3.4 Rectifier .....	21
3.5 SMU02B .....	23
3.6 UIM02C.....	26
3.7 Sensor and Lamp.....	30
3.7.1 Smoke Sensor.....	30
3.7.2 Temperature and Humidity Sensor .....	31
3.7.3 Battery Temperature Sensor .....	32
3.7.4 Light .....	32
<b>4 Maintenance</b> .....	<b>33</b>
4.1 Routine Maintenance.....	33
4.1.1 Cabinet.....	33
4.1.2 AC and DC Power Distribution .....	34
4.1.3 Rectifier .....	35
4.1.4 SMU .....	35
4.1.5 Parameters on the SMU .....	36

---

4.1.6 Cables .....	37
4.2 Identifying Component Faults.....	38
4.2.1 Identifying AC SPD Faults.....	38
4.2.2 Identifying Circuit Breaker Faults .....	38
4.2.3 Identifying Rectifier Faults .....	38
4.2.4 Identifying SMU Faults .....	38
4.3 Replacing Components.....	38
4.3.1 Replacing a Rectifier .....	39
4.3.2 Replacing an AC SPD.....	40
4.3.3 Replacing a Circuit Breaker .....	41
4.3.4 Replacing an SMU.....	43
4.3.5 Replacing the PCB of UIM02C.....	44
4.3.6 Replacing the Fan in the Fan Assembly.....	45
4.3.7 Replacing a TCUC Control Board.....	48
4.3.8 Replacing an Air Filter.....	51
4.3.9 Replacing a Smoke Sensor.....	52
4.3.10 Replacing a Battery Temperature Sensor .....	54
<b>A Technical Specifications.....</b>	<b>56</b>
A.1 Environmental Specifications.....	56
A.2 Electrical Specifications.....	56
A.3 EMC Specifications.....	58
A.4 Cabinet Specifications .....	58
<b>B Electrical Conceptual Diagram .....</b>	<b>59</b>
<b>C Associations Between Alarms and Dry Contacts on the UIM.....</b>	<b>60</b>
<b>D Acronyms and Abbreviations.....</b>	<b>61</b>

# 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.

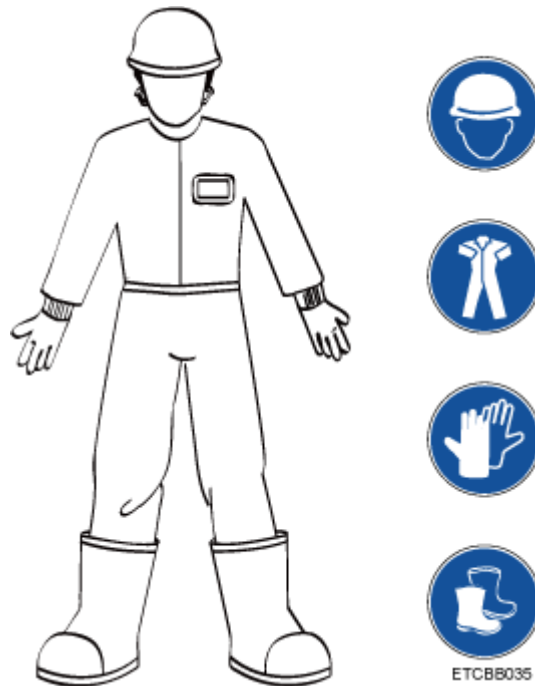
Huawei will not be liable for any consequences of the following circumstances:

- 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

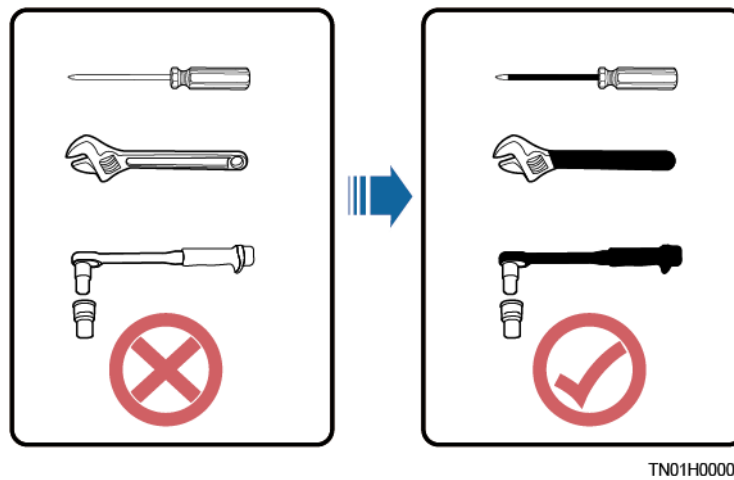
### General Requirements

- 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.

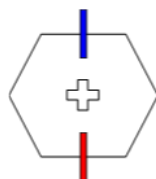
- When installing, operating, or maintaining the equipment, wear dedicated protective gears such as insulation gloves, goggles, and safety clothing, helmet, and shoes, as shown in the following figure.



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



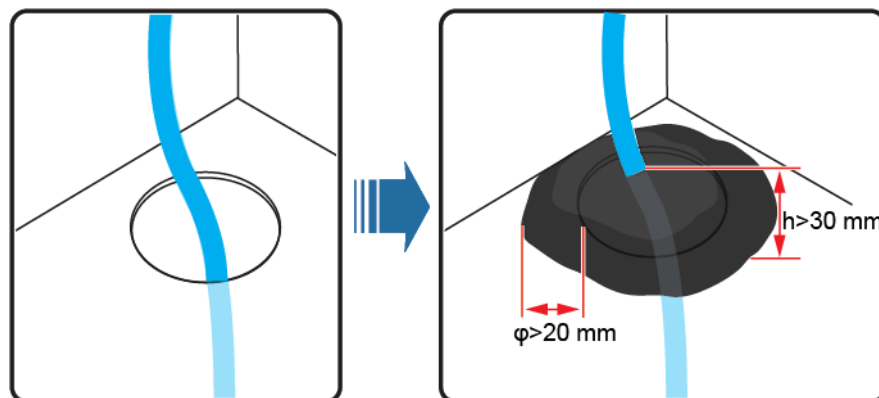
- Follow the specified procedures for installation, operation, and maintenance.
- Ensure that bolts are tightened with a torque wrench and marked using red or blue color. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm if the bolts are tightened and then mark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



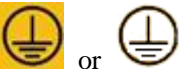






- Do not use water, alcohol, oil, or other solvents to clean electrical components inside and outside a cabinet.

## 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"> <li>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.</li> <li>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.</li> <li>3. If there are multiple slots, use the symbol near the slot</li> </ol>

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  $\leq 0.1$  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

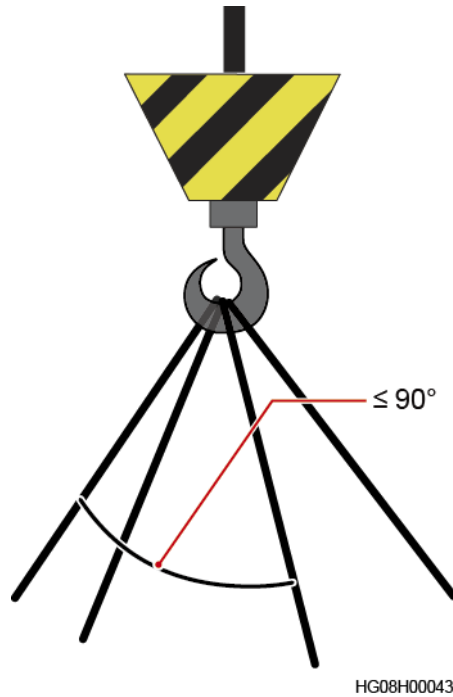
### Hoisting Devices

---

 **DANGER**

Do not walk under hoisted objects.

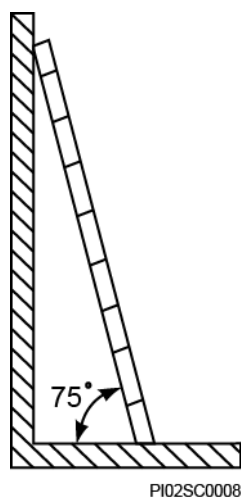
- 
- Only trained and qualified personnel should perform hoisting operations.
  - Check that hoisting tools are available and in good condition.
  - Before hoisting objects, ensure that hoisting tools are firmly secured onto a load-bearing object or wall.
  - Ensure that the angle formed by two hoisting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

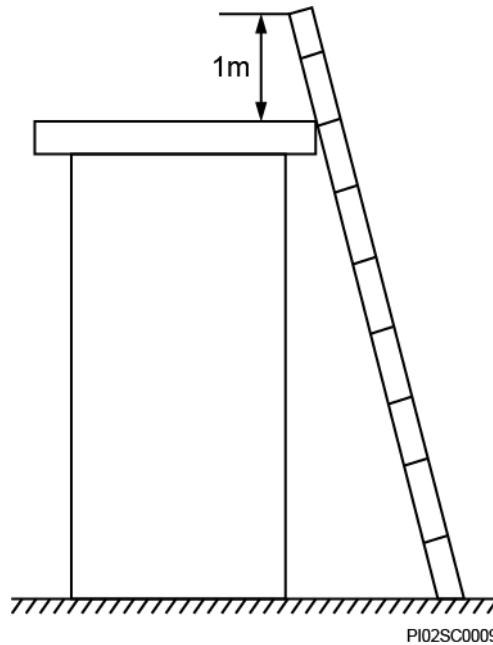
## Using Ladders

- 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:

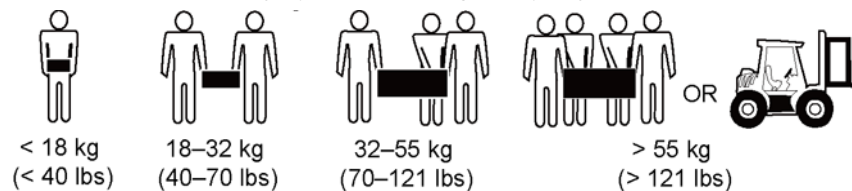
### NOTICE

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 (NaHCO<sub>3</sub>) or sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>).

## 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.

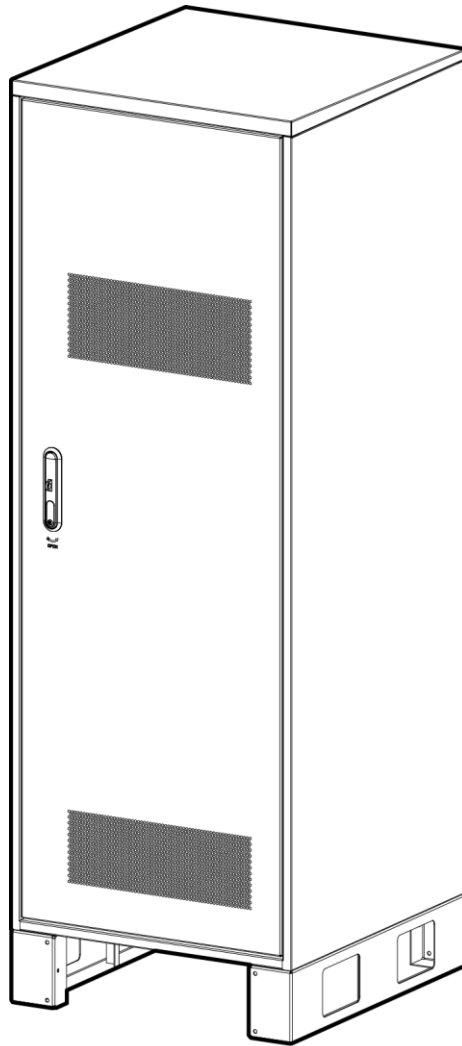
# 2 Product Overview

---

## 2.1 Introduction

The TP48200A-D17A5-2 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 shows the TP48200A-D17A5-2 cabinet.

**Figure 2-1** Cabinet exterior



PO01WC0911

## 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, Turkish, 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 lists the TP48200A-D17A5-2 configurations.

**Table 2-1** System configurations

Item	TP48200A-D17A5-2
Applicable environment	Class B
Rectifier	A maximum of four R4850G2s
Max. output current	200 A
Temperature control capacity	$\geq 85$ W/K
Heat dissipation	Direct ventilation
Monitoring module	SMU02B
User interface module (UIM)	UIM02C
Sensor	Mandatory: smoke sensor, temperature and humidity (T/H) sensor, water sensor, and battery temperature sensor
Light	Mandatory
Battery	A maximum of two 12 V/150 Ah battery strings

### 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, and 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

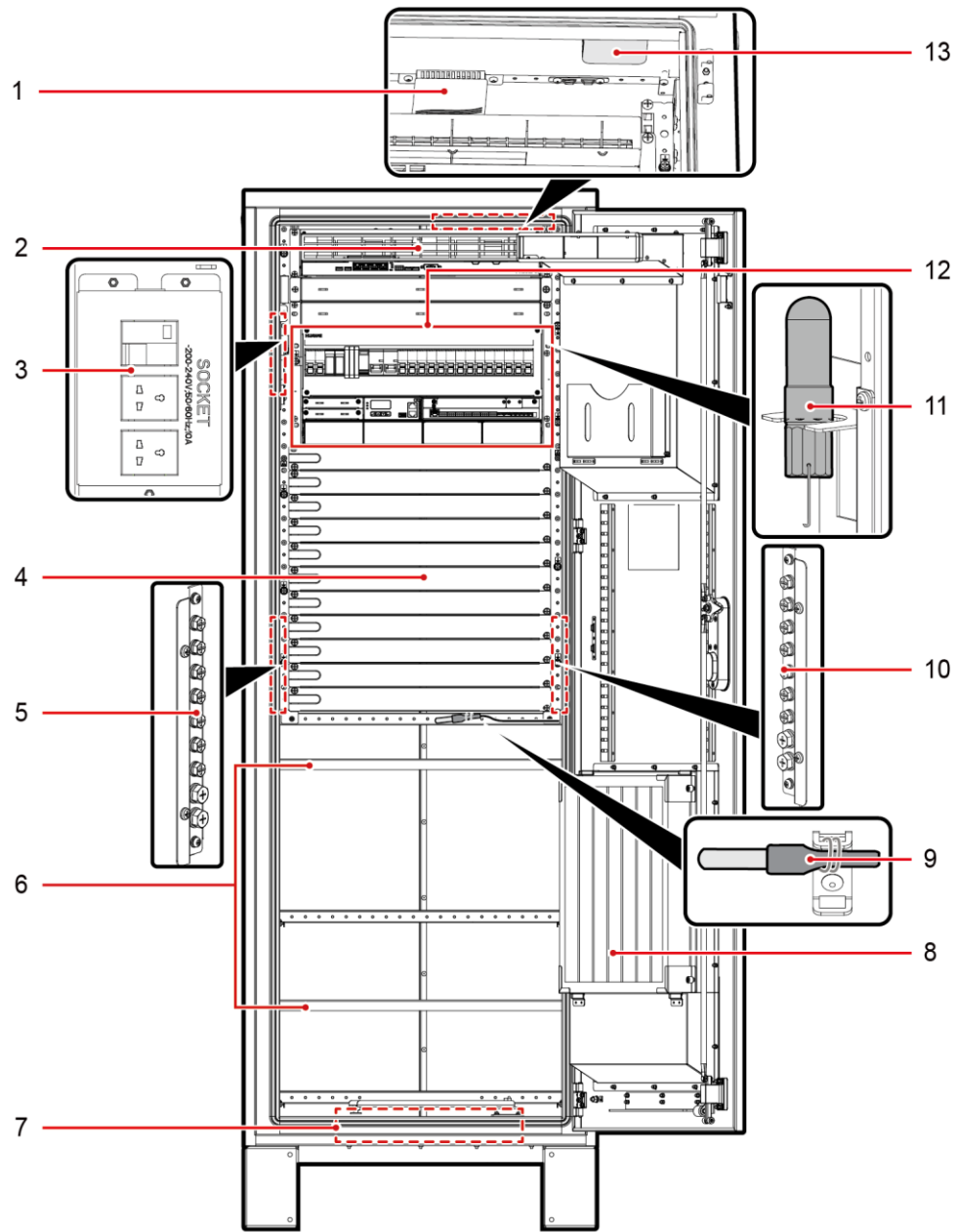
---

## 3.1 Interior

Figure 3-1 shows the TP48200A-D17A5-2 interior.



**Figure 3-1** Interior



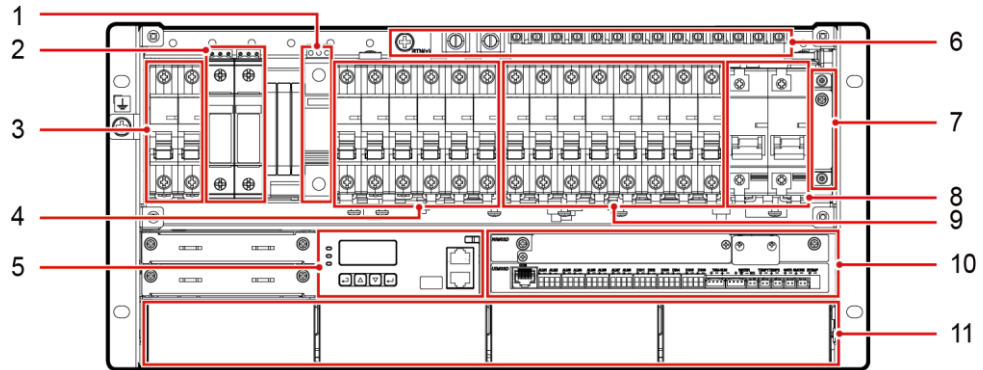
PO01WC0912

- |                                  |                  |                                     |
|----------------------------------|------------------|-------------------------------------|
| (1) T/H sensor                   | (2) Fan assembly | (3) AC output box                   |
| (4) Space for customer equipment | (5) Ground bar   | (6) Battery antitheft baffle plates |
| (7) Cable holes                  | (8) Air filter   | (9) Battery temperature sensor      |
| (10) Ground bar                  | (11) Light       | (12) Power subrack                  |
| (13) Smoke sensor                |                  |                                     |

### 3.2 PDU

Figure 3-2 shows the power subrack. Figure 3-3 shows the AC output box. Table 3-1 describes the power distribution specifications.

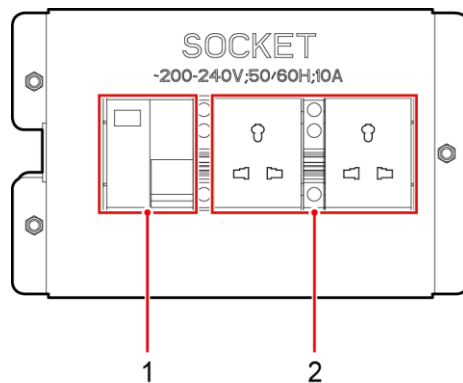
**Figure 3-2** Power subrack (without a cover)



PI03WC0082

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

**Figure 3-3** AC output box



PO01WC0919

- |                                      |                         |
|--------------------------------------|-------------------------|
| (1) Residual current circuit breaker | (2) Maintenance sockets |
|--------------------------------------|-------------------------|

**Table 3-1** Power distribution specifications

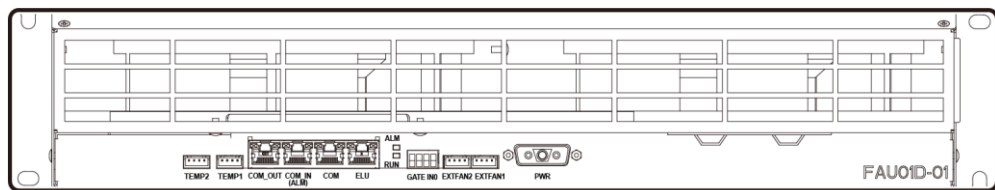
Item	Power Distribution Specifications
------	-----------------------------------

Item	Power Distribution Specifications
Input system	220 V AC single-phase
AC power distribution	<ul style="list-style-type: none"> <li>AC input: one 2-pole 50 A circuit breaker</li> <li>AC output: two maintenance sockets, one residual protection circuit breaker</li> </ul>
DC power distribution	<ul style="list-style-type: none"> <li>BLVD route: two 1-pole 10 A circuit breakers, three 1-pole 16 A circuit breakers, and one 1-pole 20 A circuit breaker</li> <li>LLVD route: three 1-pole 20 A circuit breakers and five 1-pole 63 A circuit breakers</li> </ul>
Battery circuit breaker	Two 1-pole 100 A circuit breakers

### 3.3 Fan Assembly

The following figure shows the fan assembly.

**Figure 3-4** Fan assembly

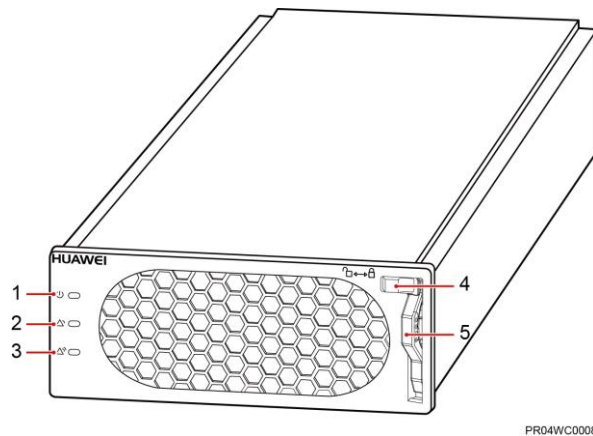


PI05WC0104

### 3.4 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

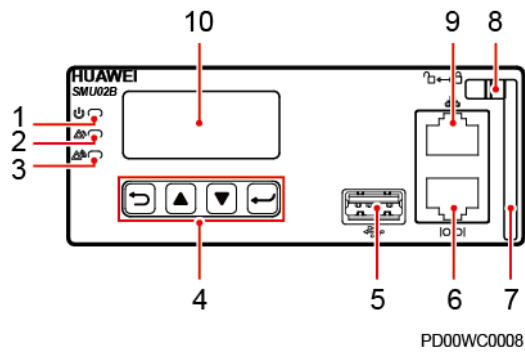
**Table 3-2** Rectifier indicators

Indicator	Color	Status	Description
Run indicator	Green	Steady on	The rectifier has an AC power input.
		Off	The rectifier has no AC power input.
		Blinking at 0.5 Hz	The rectifier is faulty.
		Blinking at 4 Hz	The rectifier is being queried.
Alarm indicator	Yellow	Off	The rectifier is loading an application program.
		Steady on	No alarm is generated.
			<ul style="list-style-type: none"> <li>The rectifier generates an alarm for power limiting due to ambient overtemperature.</li> <li>The rectifier generates an alarm for shutdown due to ambient overtemperature or undertemperature.</li> </ul>
			The rectifier protects against AC input overvoltage or undervoltage.
		The rectifier is hibernating.	
		Blinking at 0.5 Hz	The communication between the rectifier and the SMU is interrupted.
Fault indicator	Red	Off	The rectifier is running properly.
		Steady on	The rectifier locks out due to output overvoltage.
			The rectifier has no output due to an internal fault.

## 3.5 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 <b>Up</b> and <b>Down</b> 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	<ul style="list-style-type: none"> <li>Enters the main menu from the standby screen.</li> <li>Enters a submenu from the main menu.</li> <li>Saves menu settings on a submenu.</li> </ul>
<p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>The LCD screen becomes dark if no button is pressed within 30 seconds.</li> <li>You need to log in again if no button is pressed within 1 minute.</li> <li>To increase or decrease a parameter value quickly, hold down  or .</li> <li>To restart the SMU, hold down  and  for 10 seconds.</li> <li>To increase (or decrease) the LCD contrast ratio, hold down  and  (or ) for 2 seconds.</li> </ul>		

## 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

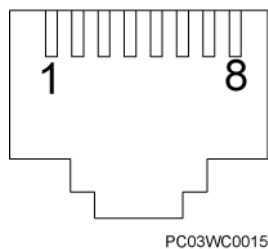
**Table 3-5** Communication port description

Communications Port	Communications Parameter	Communications Protocol

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
<b>NOTE</b> All these ports are protected by a security mechanism.		

**Figure 3-7** FE/RS485/RS232 port pins

RJ45 female connector



**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-	

Pin	Signal	Description
3	RX232	Receives data over RS232.
7	TX232	Transmits data over RS232.
6	PGND	Connects to the ground.
8	NA	–

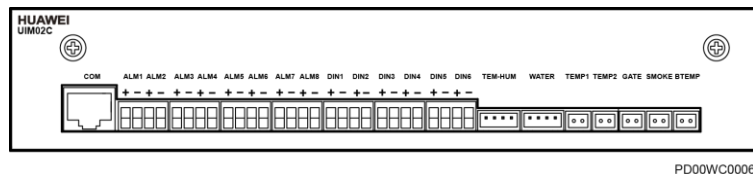
## 3.6 UIM02C

### Panel

The user interface module (UIM02C) supports eight dry contact outputs, nine dry contact inputs (including six universal dry contact inputs, one smoke sensor input, one water sensor input, and one door status sensor input), and four analog parameter inputs (including one ambient temperature and humidity input, two ambient temperature inputs, and one battery temperature input).

Figure 3-8 shows a UIM02C panel.

**Figure 3-8** UIM02C panel



PD00WC0006

### 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	<b>NOTE</b>



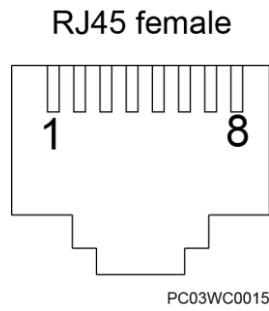
Port Type	Silk Screen	Description
	DIN2	For the associations between the dry contact input ports and alarms, see the appendix.
	DIN3	
	DIN4	
	DIN5	
	DIN6	
Dry contact output ports	ALM1	<b>NOTE</b> For the associations between the dry contact output ports and alarms, see the appendix.
	ALM2	
	ALM3	
	ALM4	
	ALM5	
	ALM6	
	ALM7	
	ALM8	
Communications port	COM	RS485 port

## Communication Port

**Table 3-9** COM communication port description

Communication Port	Communications Parameter	Communications Protocol	Function
COM port	Baud rate: 9600 bit/s, 19200 bit/s, 115200 bit/s	M/S and Modbus protocols	Connects to lower-level devices such as the battery voltage detector and DC air conditioner
<b>NOTE</b> The COM port supports the security mechanism.			

**Figure 3-9** Pins in the COM port



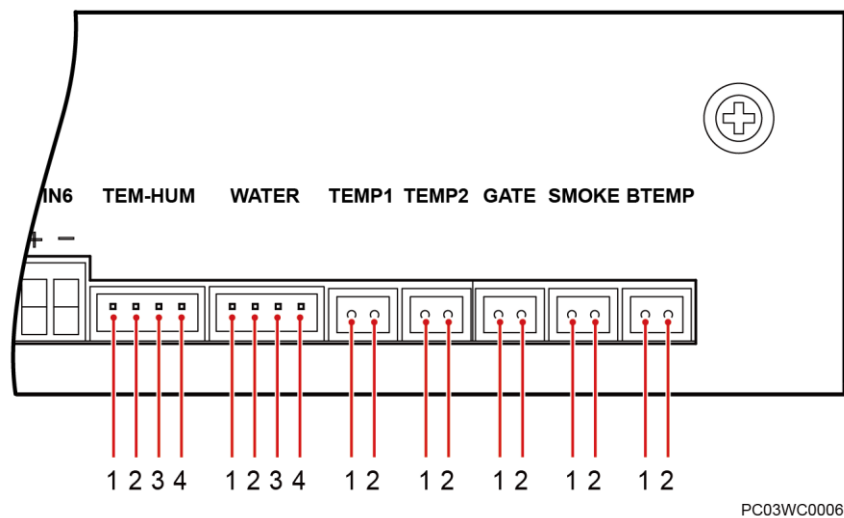
**Table 3-10** Pin definitions for the COM port

Pin	Signal	Description
1	RX+	Receives data over RS485.
2	RX-	
4	TX+	Sends data over RS485.
5	TX-	
6	PGND	Connects to the ground.
3, 7, 8	None	N/A

## Pins

Figure 3-10 shows the pin numbers of the sensor ports. Table 3-11 provides the pin definitions.

**Figure 3-10** UIM02C pin numbers



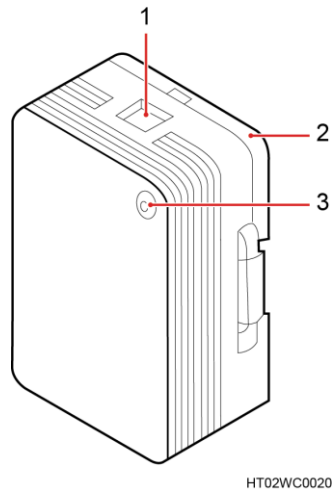
**Table 3-11** UIM02C pin definitions

Silkscreen	No.	Pin Definitions
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
GATE	1	GATE+
	2	GATE-
SMOKE	1	SMOKE
	2	12 V
BTEMP	1	GND
	2	BTEMP

## 3.7 Sensor and Lamp

### 3.7.1 Smoke Sensor

Figure 3-11 Smoke sensor 1

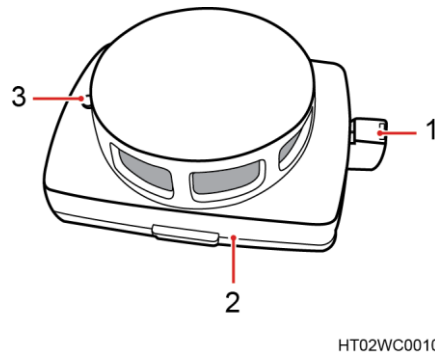


(1) Wiring port

(2) Base

(3) Indicator

Figure 3-12 Smoke sensor 2



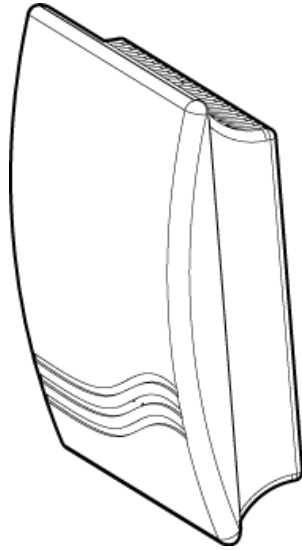
(1) Wiring port

(2) Base

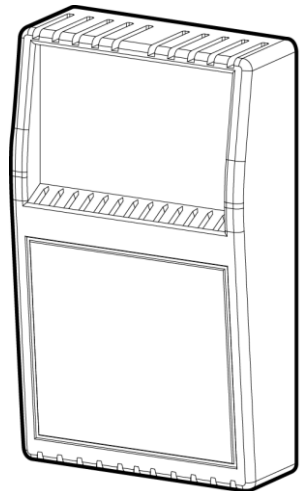
(3) Indicator

## 3.7.2 Temperature and Humidity Sensor

**Figure 3-13** Temperature and Humidity Sensor 1



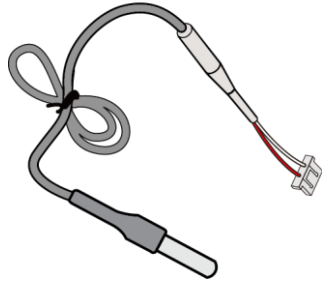
**Figure 3-14** Temperature and Humidity Sensor 2



PO01WC0248

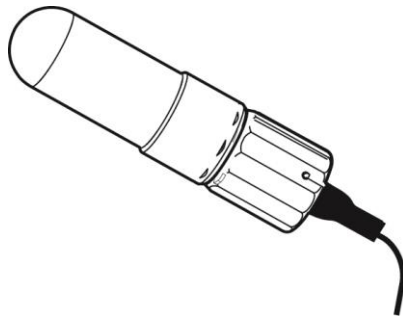
### 3.7.3 Battery Temperature Sensor

**Figure 3-15** Battery temperature sensor



### 3.7.4 Light

**Figure 3-16** Light



# 4 Maintenance

## 4.1 Routine Maintenance

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

### NOTICE

Do not maintain devices on raining days, preventing water from entering and damaging devices.

### 4.1.1 Cabinet

**Table 4-1** Cabinet maintenance

No.	Maintenance Item	If...	Then...
1	Check whether the cabinet paint is flaking off or there are scratches on the cabinet surface.	The cabinet is scratched.	Repaint the cabinet.
2	Check whether the cabinet is rusty or corroded.	The environment quality of the equipment room is poor.	Evaluate the risk and improve the environment of the equipment room.
3	Check whether the cabinet door lock is damaged.	The door lock is rusty or has been tampered with.	Replace the door lock.
4	Check whether the front and rear of rectifiers are blocked or dusty.	The front or rear of rectifiers is blocked or dusty.	Remove the blockage or clean up the dust.

## 4.1.2 AC and DC Power Distribution

**Table 4-2** AC and DC power distribution maintenance

No.	Maintenance Item	If...	Then...
1	Check whether an indicator on the surge protective device (SPD) is red.	<ul style="list-style-type: none"> <li>Red: The SPD is damaged due to a voltage surge or lightning strike.</li> <li>Green: The SPD is normal.</li> </ul>	Replace the SPD if it is damaged.
2	Check the SPD circuit breaker status.	<ul style="list-style-type: none"> <li>OFF: A voltage surge or lightning strike has occurred.</li> <li>ON: The SPD is normal.</li> </ul>	<ol style="list-style-type: none"> <li>1. Replace the circuit breaker if it is damaged, replace it</li> <li>2. Turn on the circuit breaker if the SPD is intact.</li> </ol>
3	Check for AC input undervoltage.	<ul style="list-style-type: none"> <li>AC input power cables have a large voltage drop.</li> <li>AC input power cables are in poor contact.</li> <li>The mains voltage is too low.</li> </ul>	<ol style="list-style-type: none"> <li>1. Replace AC input power cables with shorter or thicker cables.</li> <li>2. Connect AC input power cables securely.</li> <li>3. Provide the voltage data to the power supplier.</li> </ol>
4	Check for AC input overvoltage.	The mains voltage is too high.	Provide the voltage data to the power supplier.
5	Check whether the AC input voltage is open-phase.	<ul style="list-style-type: none"> <li>AC input power cables are in poor contact, short-circuited, or damaged.</li> <li>The mains supply has failed.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check and rectify the cables.</li> <li>2. Provide the open-phase data to the power supplier.</li> </ol>
6	Check whether a DC output circuit breaker is OFF and a fuse is blown.	<ul style="list-style-type: none"> <li>Load overcurrent occurs.</li> <li>Load short-circuit occurs.</li> </ul>	Rectify any overcurrent or short circuit. Turn on the circuit breaker or replace the fuse.
7	Check for DC busbar overvoltage.	A rectifier is abnormal.	Replace the abnormal rectifier.
8	Check for DC busbar undervoltage.	<ul style="list-style-type: none"> <li>The AC power supply has failed.</li> <li>The system is overloaded.</li> <li>A rectifier is abnormal.</li> </ul>	<ol style="list-style-type: none"> <li>1. Resume the AC power supply.</li> <li>2. Check the load status and rectify faults if any.</li> <li>3. Replace the abnormal rectifier.</li> </ol>
9	Check whether the temperature of a DC busbar working at room temperature exceeds 95°C.	<ul style="list-style-type: none"> <li>The DC busbar is loose or in poor contact.</li> <li>The system is overloaded.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check and secure cabinet busbar connections.</li> <li>2. Check the load status and rectify faults if any.</li> </ol>



## 4.1.3 Rectifier

**Table 4-3** Rectifier maintenance

No.	Maintenance Item	If...	Then...
1	Check the green indicator status (normal: steady on).	Off: <ul style="list-style-type: none"> <li>There is no AC input.</li> <li>The rectifier is faulty.</li> </ul>	<ol style="list-style-type: none"> <li>Check the rectifier AC input.</li> <li>Replace the rectifier.</li> </ol>
2	Check the yellow indicator status (normal: off).	Steady on: <ul style="list-style-type: none"> <li>Because the ambient temperature is high, the rectifier power is limited.</li> <li>Because the ambient temperature exceeds the upper or lower threshold, the rectifier shuts down for protection.</li> <li>AC input over/undervoltage protection is triggered.</li> <li>The rectifier is in hibernation.</li> </ul>	<ol style="list-style-type: none"> <li>Check the ambient temperature status, and clean the cabinet air channel.</li> <li>Rectify faults in the indoor temperature control system.</li> <li>Check the AC input voltage.</li> <li>The rectifier is in hibernation. No action is required.</li> </ol>
		Blinking: <ul style="list-style-type: none"> <li>The rectifier communication has failed</li> <li>The rectifier is faulty.</li> </ul>	<ol style="list-style-type: none"> <li>Check that the rectifier communications cable is securely connected.</li> <li>Replace the rectifier.</li> </ol>
3	Check the red indicator status (normal: off).	Steady on: <ul style="list-style-type: none"> <li>The rectifier is latched off due to output overvoltage.</li> <li>The rectifier is faulty.</li> </ul>	<ol style="list-style-type: none"> <li>Check that the cabinet is not connected to an external DC power source that has a voltage of greater than 58.5 V DC.</li> <li>Check that the rectifier output voltage is within 58.5 V DC.</li> <li>Replace the rectifier.</li> </ol>

## 4.1.4 SMU

**Table 4-4** SMU maintenance

No.	Maintenance Item	If...	Then...
1	Check the green indicator status.	Off: <ul style="list-style-type: none"> <li>There is no DC input.</li> <li>The SMU is faulty.</li> </ul>	<ol style="list-style-type: none"> <li>Check that the DC input power cable is securely connected.</li> <li>Check that the communications cable is</li> </ol>

No.	Maintenance Item	If...	Then...
			securely connected. 3. Replace the SMU.
2	Check the red indicator status.	Steady on: <ul style="list-style-type: none"> <li>A critical or major alarm is generated.</li> <li>The SMU is faulty.</li> </ul>	1. Check related components based on alarms. 2. Replace the SMU.
3	Check the LCD display status.	<ul style="list-style-type: none"> <li>The LCD flat cable is loose.</li> <li>The SMU is faulty.</li> </ul>	1. Check that the LCD flat cable is securely connected. 2. Replace the SMU.
4	Check that the SMU can communicate with the network management system (NMS).	<ul style="list-style-type: none"> <li>The communications cable is loose.</li> <li>Networking parameters are not correctly set.</li> </ul>	1. Check that the communications cable is securely connected. 2. Check that networking parameter settings are correct.

## 4.1.5 Parameters on the SMU

Table 4-5 SMU parameter maintenance

No.	Item	Possible Cause	Suggestion
1	Check whether the displayed battery capacity and number of battery strings are the same as the actual data.	<ul style="list-style-type: none"> <li>Parameters are set incorrectly.</li> <li>The number of batteries is changed, or batteries are replaced.</li> </ul>	Set battery parameters again.
2	Check <b>Charge Current Limit Coefficient</b> . The value is typically <b>0.15C10</b> and adjustable.	N/A	Change the value as required. Otherwise, retain <b>0.15C10</b> .
3	Check whether the displayed battery temperature is the same as the actual temperature.	<ul style="list-style-type: none"> <li>The battery temperature sensor is faulty.</li> <li>The SMU is faulty.</li> </ul>	1. Replace the battery temperature sensor. 2. Replace the SMU.
4	Check whether the displayed total load current is the same as the actual current measured by a clamp meter.	<ul style="list-style-type: none"> <li>The current monitoring cable is loose.</li> <li>The SMU is faulty.</li> </ul>	1. Check that the current monitoring cable is securely connected. 2. Replace the SMU.
5	Check whether the displayed battery charge current is the same as the actual current measured by a clamp meter.	<ul style="list-style-type: none"> <li>The current monitoring cable is loose.</li> <li>The SMU is faulty.</li> </ul>	1. Check that the current monitoring cable is securely connected. 2. Replace the SMU.
6	Check whether the difference between the displayed DC	<ul style="list-style-type: none"> <li>The cabinet busbar and cables are loose or in poor</li> </ul>	1. Check and secure the cabinet busbar and cable

No.	Item	Possible Cause	Suggestion
	output voltage and the measured DC busbar voltage is less than 0.5 V DC.	contact. • The SMU is faulty.	connections. 2. Replace the SMU.

## 4.1.6 Cables

**Table 4-6** Cable maintenance

No.	Maintenance Item	If...	Then...
1	Check whether signal cables and power cables are separately bound.	Cables are not properly installed.	Install cables properly, and bind signal cables and power cables separately.
2	Check whether cables are at least 20 mm away from DC negative busbars, fuses, and shunts.	Cables are not properly installed.	Install cables properly and ensure a safe distance.
3	Check whether all cables are bound properly.	Cables are not properly installed.	Bind cables properly.
4	Check whether the cabinet ground bar is securely connected to the site or equipment room ground point.	Cables are not properly installed.	Connect the cabinet ground bar to the site or equipment room ground point.
5	Check whether ground cables are rusty.	Cables corrode after being used for a long time.	Replace rusty cables.
6	Check whether the DC RTN+ busbar is grounded.	Cables are not properly installed.	Connect the ground cable to the DC RTN+ busbar properly.
7	Check whether cables have overheated and are deteriorating.	Cables are not properly installed.	Replace the cables and adjust the cable routing.
8	Check whether cables are misshapen by metal parts.	Cables are not properly installed.	Replace the cables and adjust the cable routing.
9	Check whether cables pass behind the air exhaust vents of rectifiers.	Cables are not properly installed.	Adjust the cable routing to prevent cable overheating.
10	Check whether power cables use standard terminals.	Cables are not properly installed.	Use standard terminals.

## 4.2 Identifying Component Faults

### 4.2.1 Identifying AC SPD Faults

Check the color of the AC SPD indication window. Green indicates that the AC SPD is normal. Red indicates the AC SPD is faulty.

### 4.2.2 Identifying Circuit Breaker Faults

The following lists the circuit breaker faults:

- 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 k $\Omega$  when the circuit breaker is OFF.

### 4.2.3 Identifying Rectifier Faults

The following lists the rectifier faults

- The AC input and slot connector are normal, but the Fault indicator (red) is steady on or all indicators are off.
- The slot connector and SMU are normal, but the Alarm indicator (yellow) still blinks after the rectifier is reinstalled.
- The AC input and SMU are normal, but the SMU cannot control the rectifier.

### 4.2.4 Identifying SMU Faults

The following lists the SMU faults:

- 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 whereas the power system does not experience the fault.
- 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.

## 4.3 Replacing Components

### NOTICE

- Ensure that loads are supplied with power when replacing major components. For example, keep the switches for primary loads in the ON position, and do not turn off the battery switch and AC input switch at the same time.
- Seek the customer's prior consent if load disconnection is required.
- Rectifiers and the SMU are hot-swappable.

## 4.3.1 Replacing a Rectifier

### Prerequisites

- You have obtained a pair of protective gloves and the cabinet door key.
- The new rectifier is intact.

### CAUTION

Protect yourself from being burnt when moving the rectifier because the rectifier has a high temperature.

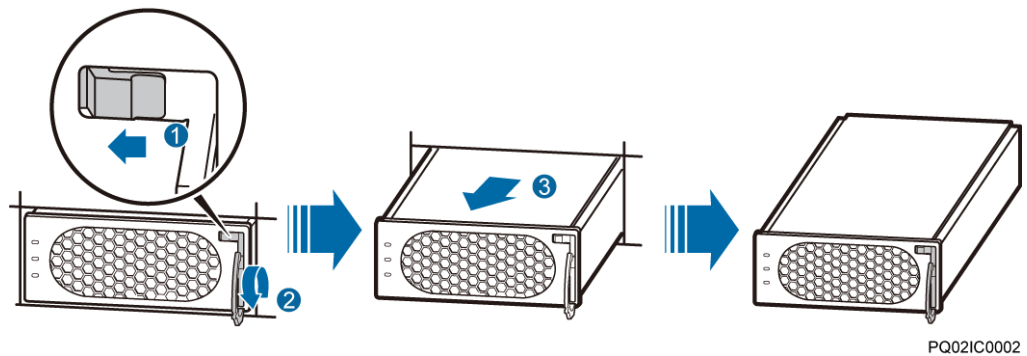
### Procedure

**Step 1** Put on protective gloves.

**Step 2** Push the locking latch at 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

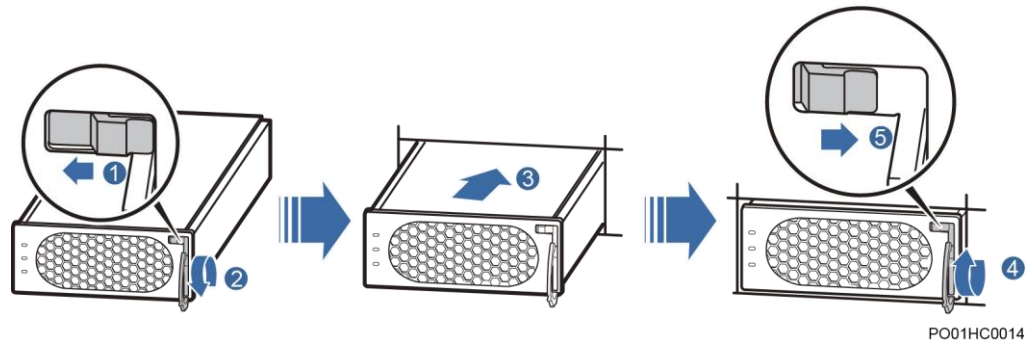


**Step 4** Push the locking latch on the new rectifier towards the left, and pull out the handle.

**Step 5** Place the new rectifier at the entry to the correct slot.

**Step 6** Gently slide the converter into the slot along 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** Take off protective gloves.

----End

## Follow-up Procedure

Pack the removed component, and return it to Huawei local warehouse.

## 4.3.2 Replacing an AC SPD

### Prerequisites

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

---

**⚠ DANGER**

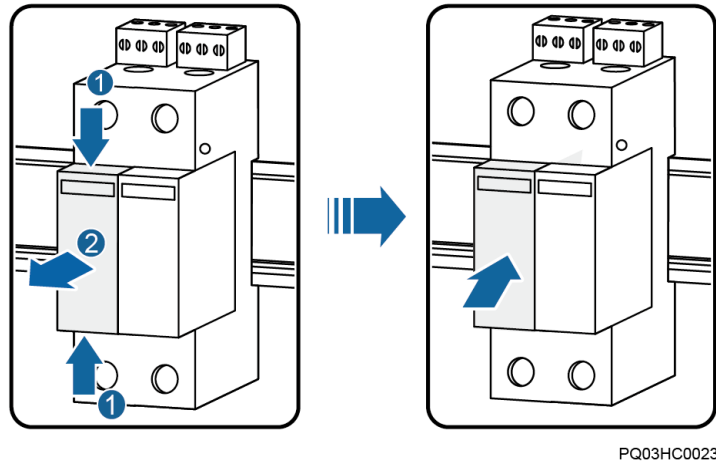
Do not replace the AC SPD during a thunderstorm.

---

### Procedure

- Step 1** Connect the ground cable to the ESD wrist strap, and put on the ESD wrist strap and ESD gloves.
- Step 2** Hold the faulty AC SPD and pull it out, as shown in Figure 4-3.
- Step 3** Install the new AC SPD, as shown in Figure 4-3.

**Figure 4-3** Replacing an AC SPD



**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 AC SPD alarm is cleared.

## 4.3.3 Replacing a Circuit Breaker

### Prerequisites

---

**⚠ DANGER**

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

---

- The cabinet door key, insulation tape, and required tools are available.
- The new circuit breaker is intact and has the same specifications as the original one.

### Procedure

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

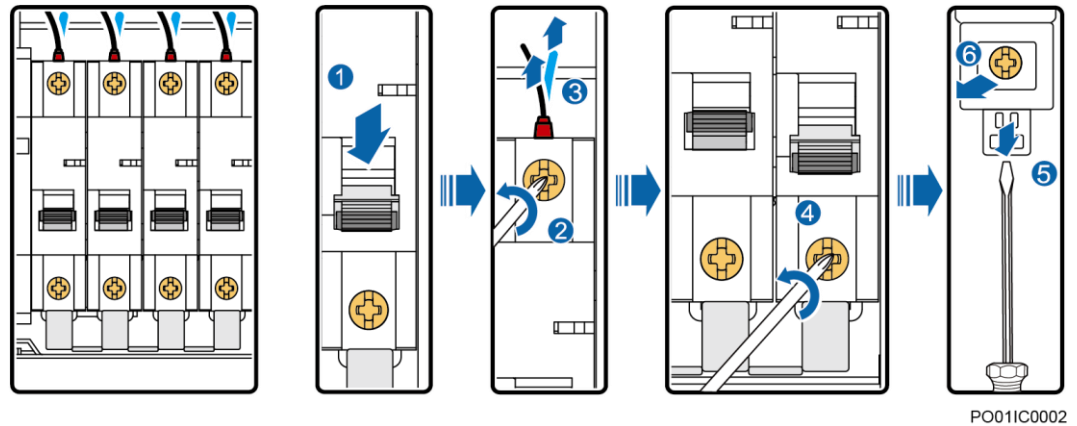
**Step 2** Switch off the circuit breaker that is to be replaced.

**Step 3** Record positions where the cables and signal cable terminals connect to the circuit breaker.

**Step 4** Loosen the screw that secures the upper port of the circuit breaker by using a Phillips screwdriver, and remove the power cable and signal cable terminals. Wrap the cable and terminals by using the insulation tape to prevent hazards.

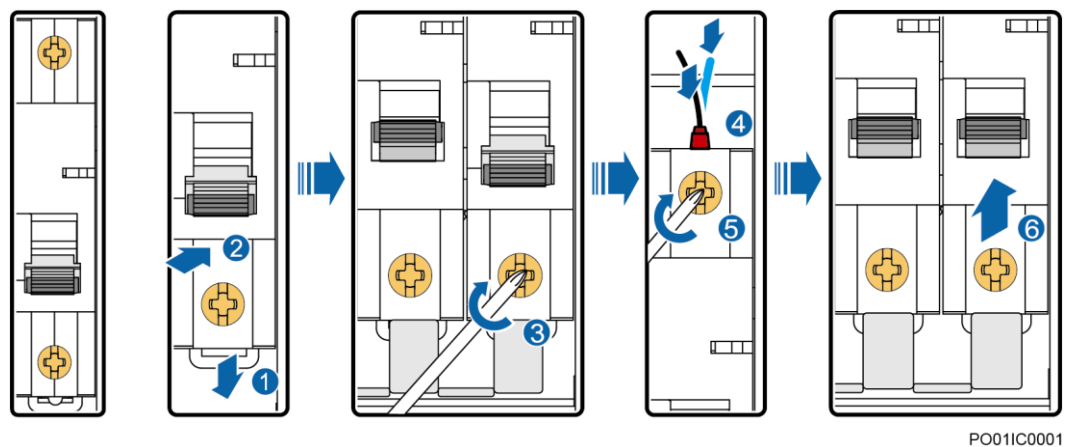
- Step 5** Loosen the screw that secures the lower port of the circuit breaker by using a Phillips screwdriver, and loosen the buckle at the circuit breaker base by using an insulated flat-head screwdriver.
- Step 6** Remove the circuit breaker from the guide rail. Figure 4-4 shows the procedure for removing the circuit breaker.

**Figure 4-4** 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 tape from the output power cable and signal cable terminals. Then connect the power cable and signal cable terminals to the upper port of the circuit breaker and tighten the screw.
- Step 10** Switch on the circuit breaker. Figure 4-5 shows the procedure for installing the new circuit breaker.

**Figure 4-5** Installing the circuit breaker



- Step 11** Place the cover before the circuit breaker, and tighten the screws.



----End

## 4.3.4 Replacing an SMU

### Prerequisites

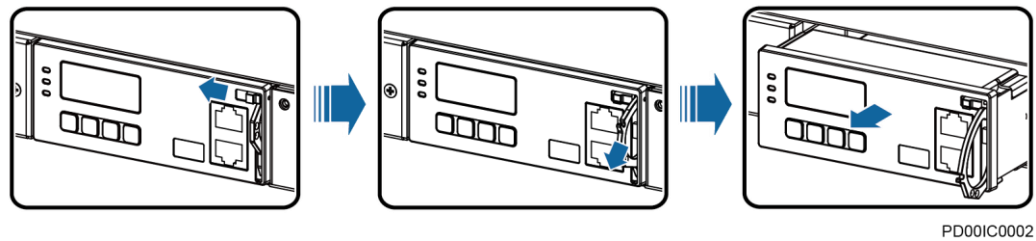
- The cabinet door key is available.
- The new SMU is intact.

### Procedure

**Step 1** Push the locking latch towards the left.

**Step 2** Pull the handle outwards and remove the SMU, as shown in Figure 4-6.

**Figure 4-6** Removing an SMU

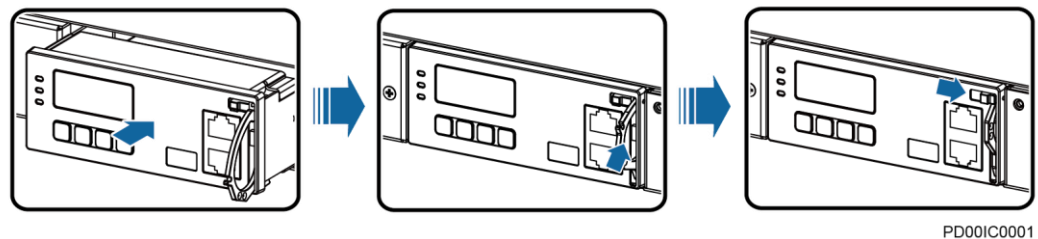


**Step 3** Insert the new SMU into the subrack, push the locking latch towards the left, and pull out the handle.

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

**Step 5** Reset parameters on the SMU.

**Figure 4-7** Installing an SMU



----End

### Follow-up Procedure

Pack the removed component, and return it to Huawei local warehouse.

## 4.3.5 Replacing the PCB of UIM02C

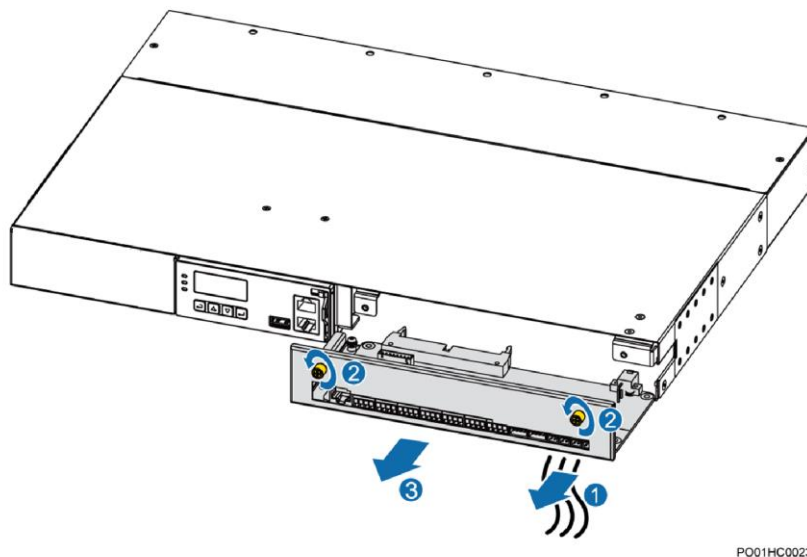
### Prerequisites

- 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 printed circuit board (PCB) of UIM02C is intact.

### Procedure

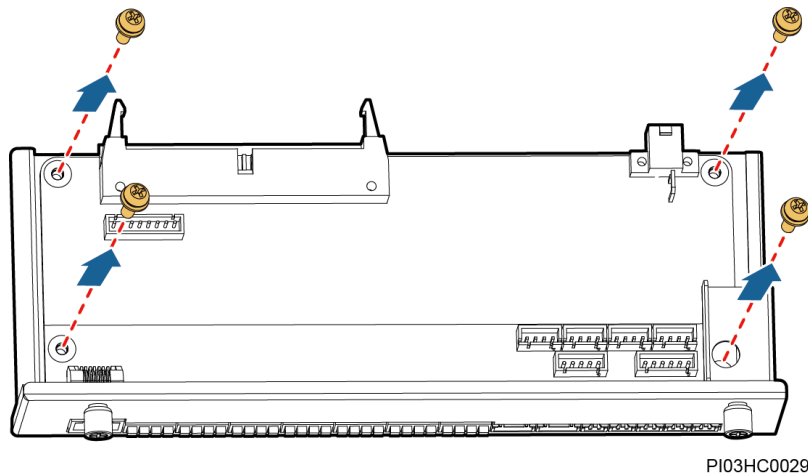
- Step 1** Connect the ground cable to the ESD wrist strap, and wear the ESD wrist strap and ESD gloves.
- Step 2** Record the positions on the UIM02C panel for connecting signal cables and disconnect the cables.
- Step 3** Unscrew the UIM02C panel and remove the UIM02C, as shown in Figure 4-8.

**Figure 4-8** Taking out the UIM02C



- Step 4** Record the positions where the PCB connects to all the cables, and then disconnect the cables.
- Step 5** Remove the PCB.

**Figure 4-9** Removing the PCB of UIM02C



- Step 6** Take out the new PCB and install it.
- Step 7** Connect all cables back to the new PCB based on the recorded information.
- Step 8** Push in the UIM02C and tighten the screws.
- Step 9** Reconnect signal cables to the UIM02C panel based on the recorded information.
- Step 10** Disconnect the ground cable from the ESD wrist strap, and remove the ESD wrist strap or ESD gloves.
- End

## Follow-up Procedure

Pack the removed component, and return it to Huawei local warehouse.

## 4.3.6 Replacing the Fan in the Fan Assembly

### Prerequisites

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

### Context

You need only to disconnect the fan power cable, instead of the AC input to the system.

### Procedure

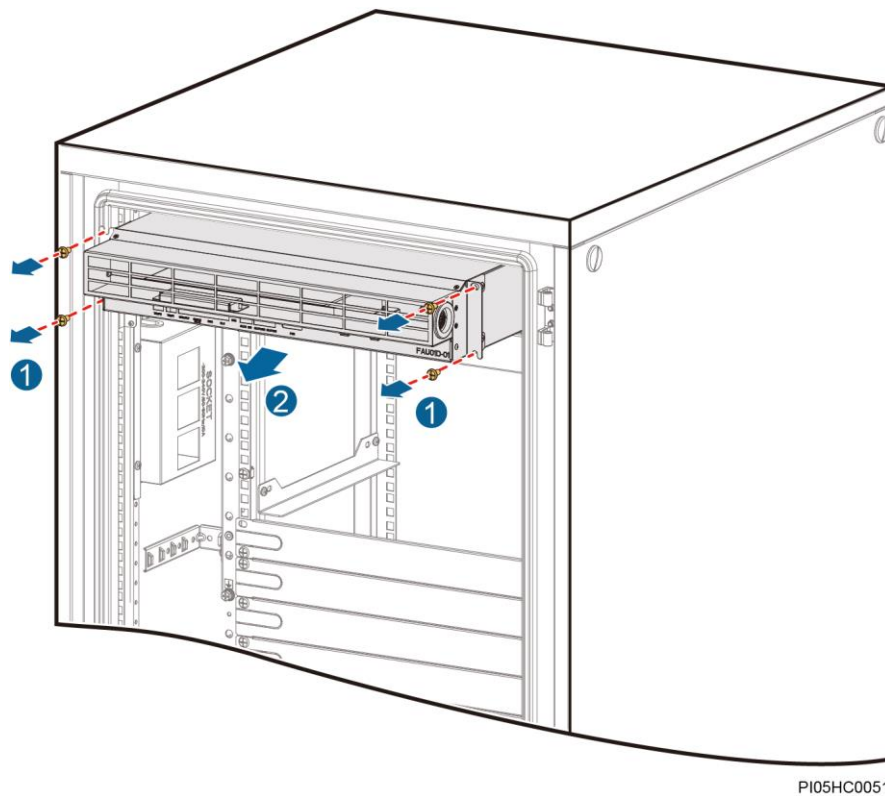
- Step 1** Connect the ground cable to the ESD wrist strap, and put on the ESD wrist strap and ESD gloves.
- Step 2** Disconnect the power cable from the UIM02C.

1. Record the position where the UIM02C panel connects to the signal cable, and then disconnect the signal cable.
2. Unscrew and then take out the UIM02C, as shown in Figure 4-8.

**Step 3** Take out the fan assembly.

1. Record the positions where cables connect to the fan assembly and then disconnect the cables.
2. Unscrew and take out the fan assembly, as shown in Figure 4-10.

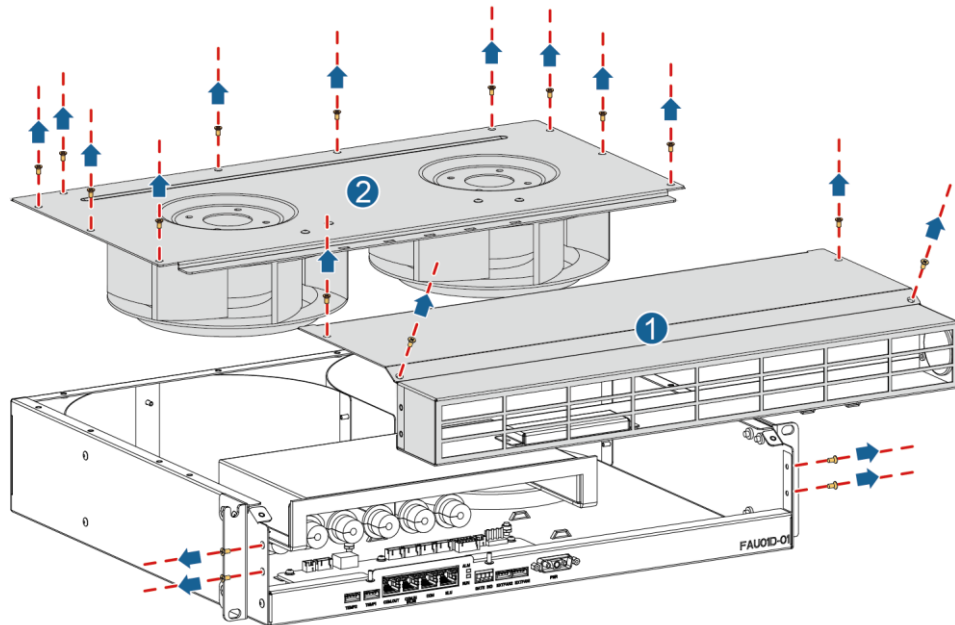
**Figure 4-10** Taking out the fan assembly



**Step 4** Remove the fan.

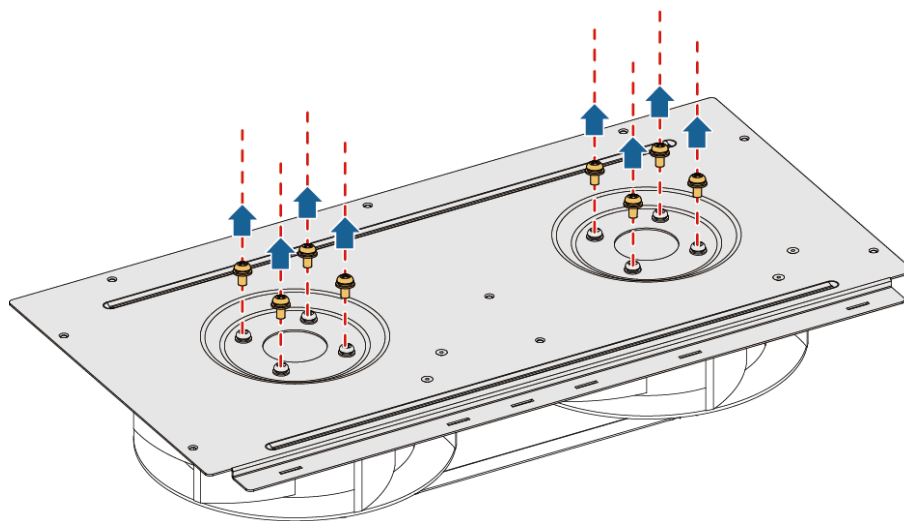
1. Unscrew and remove the cover from the fan assembly.
2. Unscrew the fan fixing plate and remove the plate from the fan, as shown in Figure 4-11.
3. Unscrew and remove the fan, as shown in Figure 4-12.

**Figure 4-11** Removing the cover and fan fixing plate from the fan



PO01HC0937

**Figure 4-12** Removing a fan



PO01HC0107

**Step 5** Install the new fan.

1. Properly place the fan into the fan assembly and tighten the screws for the fan.
2. Tighten the screws that secure the fan fixing plate.
3. Tighten the screws that secure the cover.

**Step 6** Install the fan assembly.

1. Push the fan assembly into the fan assembly slot and tighten the screws.

2. Connect cables to the fan assembly based on the recorded positions.

**Step 7** Install the UIM02C.

1. Reconnect the –48 V power cable to the UIM02C backplane.
2. Push in the UIM02C and tighten the screws.
3. Connect the signal cable to the UIM02C panel based on the recorded information.

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

----End

## 4.3.7 Replacing a TCUC Control Board

### 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 TCUC control board is intact.

### Context

You need only to disconnect the power supply to the TCUC, instead of the AC input to the power system.

### Procedure

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

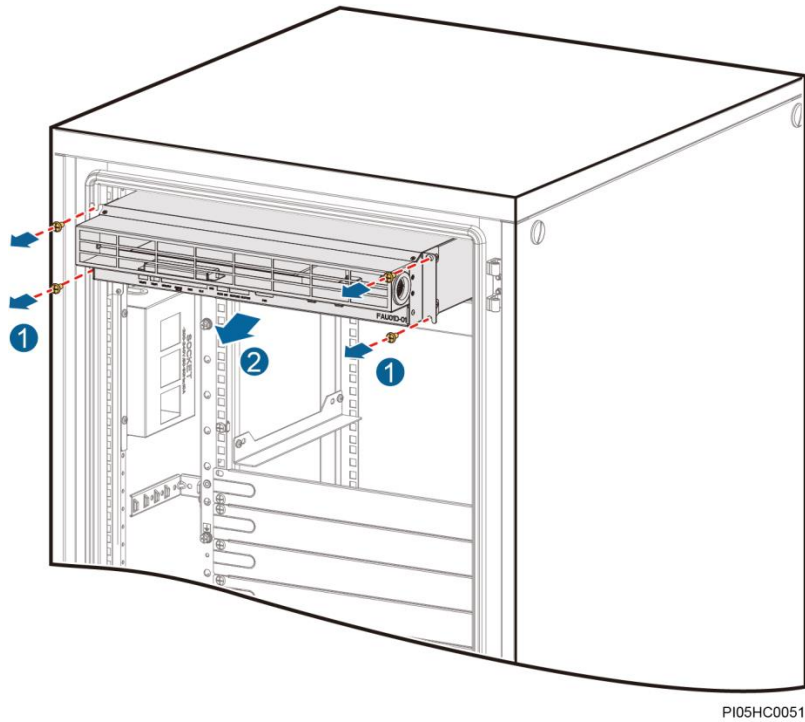
**Step 2** Disconnect the power cable from the UIM02C.

1. Record the position where the signal cable connects to the UIM02C panel, and then disconnect the signal cable.
2. Unscrew and remove the UIM02C, as shown in Figure 4-8.

**Step 3** Remove the fan assembly.

1. Record the positions where cables connect to the fan assembly, and then disconnect the cables.
2. Unscrew and remove the fan assembly.

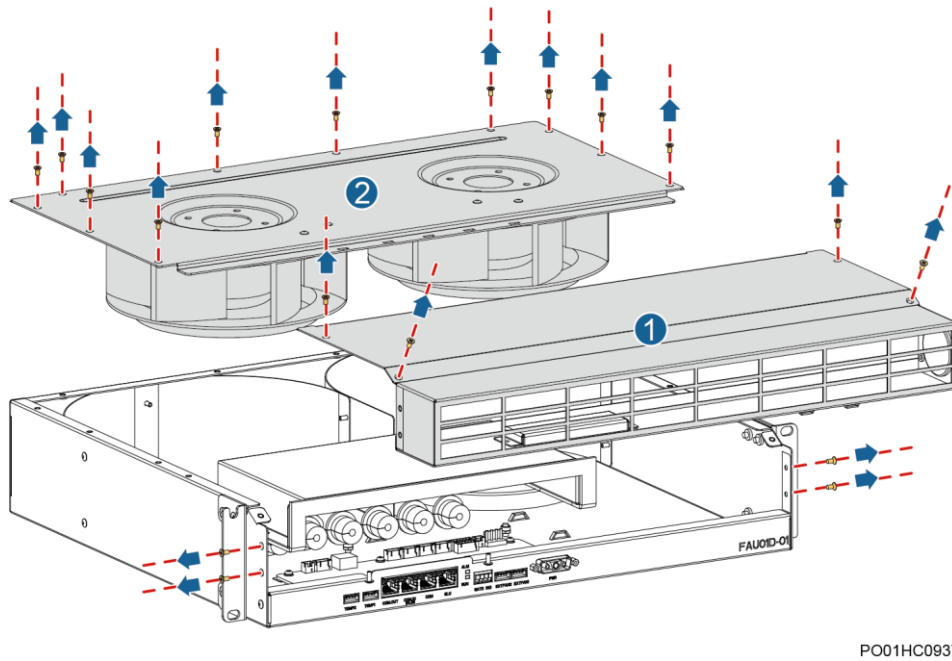
**Figure 4-13** Removing the fan assembly



**Step 4** Unscrew and remove the cover from the fan assembly.

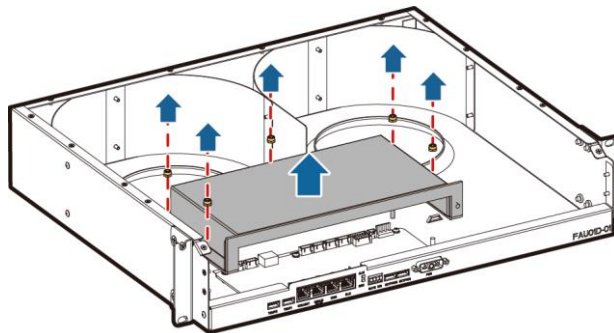
**Step 5** Unscrew and remove the fan fixing plate.

**Figure 4-14** Removing the fan assembly cover and fan fixing plate



**Step 6** Remove the TCUC.

**Figure 4-15** Removing the TCUC



PO01HC0955

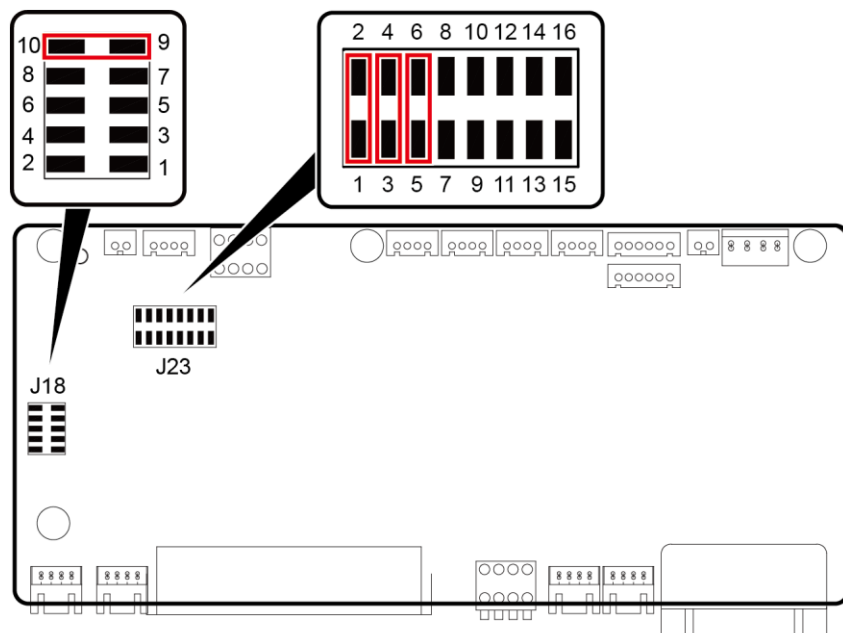
**Step 7** Remove the TCUC control board.

**Step 8** Record the positions of jumper caps on the TCUC control board.

**Step 9** Install the new TCUC control board.

1. Set jumper caps for the new TCUC control board based on the recorded information.

**Figure 4-16** Jumper cap information



PO01WC0995

2. Install the new TCUC control board in the TCUC.

**Step 10** Install the TCUC.

**Step 11** Install the fan assembly cover and fan fixing plate.

**Step 12** Install the fan assembly.



**Step 13** Connect cables based on the recorded information.

**Step 14** Connect the power cable to the UIM02C.

**Step 15** Disconnect the ground cable from the ESD wrist strap, and take off the ESD wrist strap and ESD gloves.

----End

## Follow-up Procedure

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

## 4.3.8 Replacing an Air Filter

### Prerequisites

- You have prepared an ESD wrist strap, a pair of ESD gloves, the cabinet door key, and the tool kit.
- The new air filter is intact.

### Context

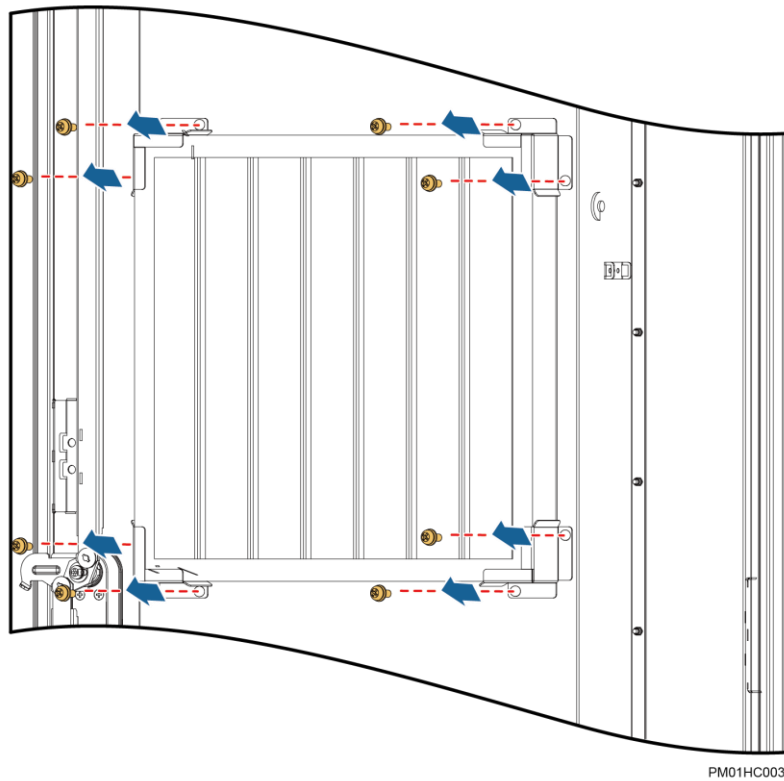
The air filter can be directly replaced without the need to disconnect the AC input to the system.

### Procedure

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

**Step 2** Remove the screws and take off the air filter, as shown in Figure 4-17.

**Figure 4-17** Removing an air filter



**Step 3** 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.

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

----End

## 4.3.9 Replacing a Smoke Sensor

### Prerequisites

- An ESD wrist strap, ESD gloves, ESD box or bag, cabinet door key, and required tools are available.
- The new smoke 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 smoke sensor, as shown in Figure 4-18.

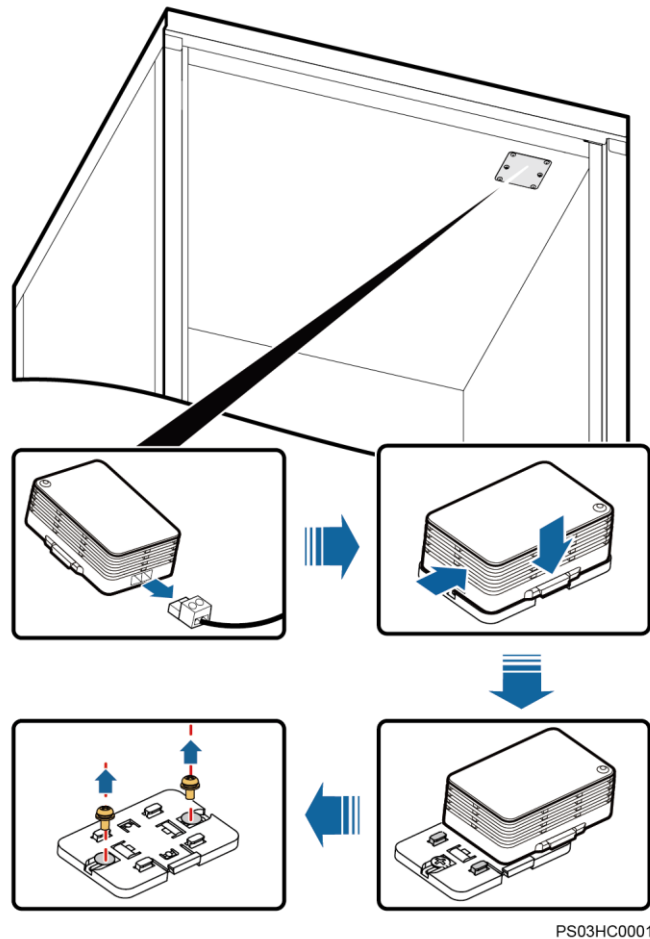
1. Remove the connected cables from the smoke sensor.
2. Hold down the button on the smoke sensor and push the smoke sensor in the OPEN direction.

3. Unscrew the smoke sensor base.

**NOTE**

There are two types of smoke sensors, and both can be replaced in the same manner.

**Figure 4-18** Removing the smoke sensor



**Step 3** Install the new smoke sensor.

1. Place the smoke sensor base correctly and tighten the screws for it.
2. Place the new smoke sensor correctly and press and push it in the CLOSE direction.
3. Reconnect the removed cables to the smoke sensor.

**Step 4** Disconnect the ground cable from the ESD wrist strap, and remove the ESD wrist strap and ESD gloves.

----End

## 4.3.10 Replacing a Battery Temperature Sensor

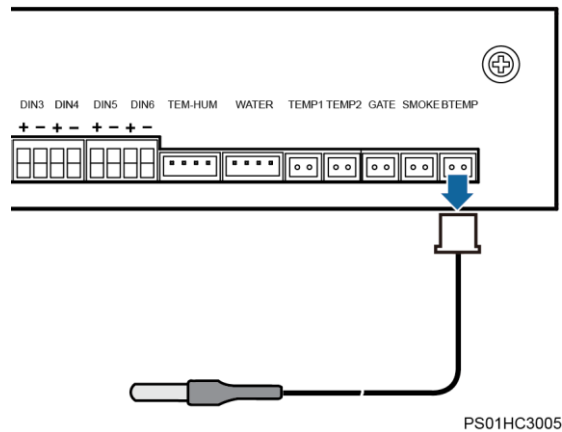
### Prerequisites

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

### Procedure

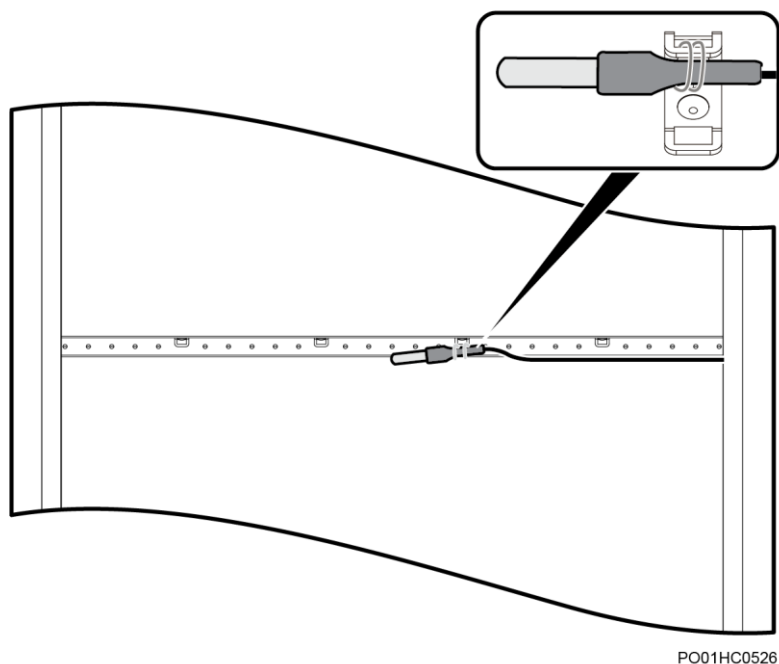
- Step 1** Connect the ground cable to the ESD wrist strap, and put on the ESD wrist strap and ESD gloves.
- Step 2** Remove the battery temperature sensor cable from the UIM, as shown in Figure 4-19.

**Figure 4-19** Removing a battery temperature sensor cable



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

**Figure 4-20** Position of a 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

# A Technical Specifications

## A.1 Environmental Specifications

**Table A-1** Environment specifications

Item	Specifications
Operating temperature	-10°C to +45°C with 1120 W/m <sup>2</sup> solar radiation
Transport temperature	-40°C to +70°C
Storage temperature	-40°C to +70°C
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.
Noise level	GR487, acoustic pressure level: ≤ 65 dBA at 1.5 m
Heat dissipation capacity	≥ 1400 W
Other requirements	<ul style="list-style-type: none"> <li>• There should be no conductive dust, corrosive gas, or explosion hazard.</li> <li>• Dust, corrosive substances, pests, molds, and other indicators should be controlled in accordance with class 4.1 temperature controlled environmental requirements in ETSI EN 300 019-1-4 (V2.2.1).</li> </ul>

## A.2 Electrical Specifications

**Table A-2** Electrical specifications

Item	Specifications	
AC input	Input system	220 V AC single-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	$\geq 0.99$ (load $\geq 50\%$ )
	THD	$\leq 5\%$ ( $V_{in}$ : 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	$\leq \pm 1\%$
	Ripple and noise	$\leq 200$ mVp-p
	Psophometrically weighted noise	$\leq 2$ mV
	Current imbalance	$< \pm 5\%$ (20%–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 <ol style="list-style-type: none"> <li>1. If overvoltage occurs inside a rectifier, the rectifier locks out.</li> <li>2. If the external voltage is greater than –63 V DC for more than 500 ms, the rectifier locks out.</li> </ol>
AC surge protection	Nominal lightning strike discharge current: 30 kA (8/20 $\mu$ s); maximum lightning strike discharge current: 60 kA (8/20 $\mu$ s)	
DC surge protection	15 kA (8/20 $\mu$ s) in differential mode; 40 kA (8/20 $\mu$ s) in common mode	
Safety compliance	IEC/EN60950-1	
Mean time between failures (MTBF)	200,000 hours (at 25°C)	

## A.3 EMC Specifications

**Table A-3** EMC specifications

Item	Specifications	
Electromagnetic interference (EMI)	Conducted emission (CE)	Class A, EN300386
	Radiated emission (RE)	Class A, EN300386
	Harmonic current	EN61000-3-12
	Voltage fluctuation and flicker	EN61000-3-11
Electromagnetic susceptibility (EMS)	ESD	EN61000-4-2, criterion B Contact discharge: 6 kV; air discharge: 8 kV
	Electrical fast transient (EFT)	EN61000-4-4, criterion B AC power port: $\pm 2$ kV; DC power port: $\pm 2$ kV; signal port: $\pm 1$ kV
	Radiated susceptibility (RS)	EN61000-4-3, criterion A 10 V/m
	Conducted susceptibility (CS)	EN61000-4-6, criterion A AC and DC power ports: 10 V; signal port: 3 V
	Surge susceptibility	EN61000-4-5, criterion B <ul style="list-style-type: none"> <li>AC power port: <math>\pm 2</math> kV in differential mode, <math>\pm 4</math> kV in common mode, 8/20 <math>\mu</math>s</li> <li>DC power port: <math>\pm 2</math> kV in differential mode, <math>\pm 4</math> kV in common mode, 8/20 <math>\mu</math>s</li> <li>Signal port: 0.5 kV in differential mode, 1 kV in common mode, 8/20 <math>\mu</math>s</li> </ul>
	Voltage dip immunity (DIP)	EN61000-4-11

## A.4 Cabinet Specifications

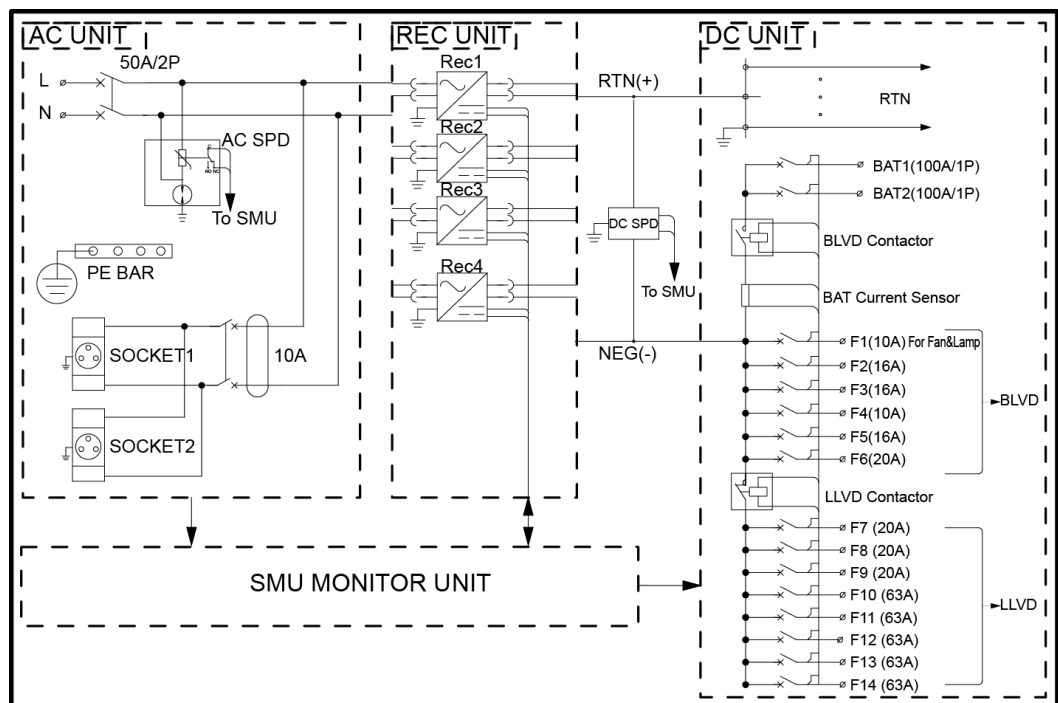
**Table A-4** Cabinet specifications

Item	TP48200A-D17A5-2
Dimensions (H x W x D)	1760 mm x 650 mm x 700 mm (excluding the base)
Weight	< 200 kg (excluding rectifiers and batteries)
Protection level	IP55
Maintenance mode	Operated and maintained from the front



# B Electrical Conceptual Diagram

Figure B-1 Electrical conceptual diagram



# C Associations Between Alarms and Dry Contacts on the UIM

**Table C-1** Associations between dry contacts and alarms

Port Type	Silk Screen	Associated Alarm
Dry contact input ports	DIN1	Dry contact input 1
	DIN2	Dry contact input 2
	DIN3	Dry contact input 3
	DIN4	Dry contact input 4
	DIN5	Dry contact input 5
	DIN6	Dry contact input 6
Dry contact output ports The default setting (closed: alarm; open: normal) can be modified.	ALM1	High battery temperature/high ambient temperature/TCU alarm/Rectifier fault/rectifier communication failure
	ALM2	Door status alarm
	ALM3	Battery fuse blown/Multi-rectifier fault/AC SPD fault
	ALM4	Battery fault
	ALM5	DC low voltage alarm
	ALM6	Smoke alarm
	ALM7	AC power failure
Default mode (closed: normal; open: alarm)	ALM8	SMU fault

# D Acronyms and Abbreviations

---

## B

**BLVD** Battery low voltage disconnection

## E

**EMC** Electromagnetic compatibility

**EMI** Electromagnetic interference

**EMS** Electromagnetic susceptibility

## H

**HTTPS** Hypertext Transfer Protocol Secure

## L

**LLVD** Load low voltage disconnection

## I

**IEC** International Electrotechnical Commission

## M

**MTBF** Mean time between failures

## P

**PDU** power distribution unit

## S

<b>SMU</b>	Site monitoring unit
<b>SNMP</b>	Simple Network Management Protocol
<b>SPD</b>	Surge protection device
<b>U</b>	
<b>UIM</b>	user interface module